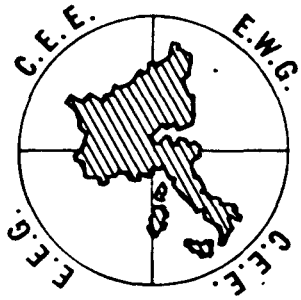

STUDIES

Options in transport tariff policy

Transport series

1

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1965

Options in transport tariff policy

STUDIES
TRANSPORT SERIES No. 1
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FOREWORD

by the Commission of the European Economic Community

I. In October 1963 the Commission asked a group of independent experts to study, from the point of view of economic theory, certain problems regarding tariff systems for transport services and charging policy for the use of infrastructures. The Commission's work in these two fields, and discussions at both national and Community level, had revealed the need for thorough examination of various questions. In the matter of transport services, the criteria for fixing tariffs had to be investigated, and in the matter of infrastructures, the knotty problem of apportioning their costs.

II. The Committee of experts was as follows:
Professor Maurice Allais, National School of Mines, Paris (Chairman);

Professor Mario Del Viscovo, University of Bari;

Professor Louis Duquesne de la Vinelle, Catholic University of Louvain, Adviser to the EEC Commission;
Professor Coenraad Jan Oort, University of Utrecht;
Professor Hellmuth Stefan Seidenfus, University of Münster.

III. The work of the group took nearly a year. The report it rendered to the Commission is essentially an exhaustive economic analysis of some of the chief problems of transport policy. The report contains no final conclusions but is particularly concerned with demonstrating the elements of the problems and with critically examining the various possible solutions.

IV. It must be emphasized that the Committee could not study all the problems of tariff policy which may arise. It had to limit its analysis to a situation governed by the two hypotheses of full employment and relatively steady economic growth, considering that problems likely to arise during recessions or depressions, and the specific measures of transport policy which might be necessary to solve them, should be the subject of another, separate study. Hence the Committee has not been able to do more than mention questions concerning passenger transport, although it has indicated that the various options for goods transport are mainly applicable to passenger transport as well.

V. It goes without saying that the opinions expressed in the report are those of its authors only, and that its distribution does not mean that the Commission is responsible for the arguments developed in it. Nevertheless, the Commission considers that this work is a very valuable contribution to the study of the fundamental problems of transport economy, and one to which reference may profitably be made for solutions to problems arising in implementing the common transport policy.

However, as the authors of the report have explicitly stated, the final choices are necessarily political ones which cannot be based solely on economic considerations. In the making of these choices, aims may play a part which do not come within the province of economics — notably political and social aims. Moreover, the choices will depend on the possibilities of implementing them, and on the practical consequences of the various options.

VI. The Commission wishes to express its warm thanks to the authors of the report for the important contribution they have made to the study of transport policy (1), and it is pleased to be able to inaugurate its new series of studies on transport with their work.

(1) The members of the Committee have kindly undertaken to check the translations, in their respective mother tongues, of the report, of which only the French version was officially adopted by the Committee.

THE GENERAL CONCEPTION OF THE REPORT

1

The primary object is to study the possible bases for a common transport policy, with special reference to the formation of prices for using infrastructure and for transport services.

2

The task of the Committee of independent experts was defined as follows under the title "Terms of reference for the study of options in a rational tariff policy for transport":

3

"The Committee's task is to inform the Commission of the European Economic Community as fully as possible on the problems of orientating and implementing a tariff policy, in the widest sense, in the context of the Community's common transport policy. Both the general principles of a rational policy of transport rates and a rational policy of charges for the use of infrastructures are to be defined.

4

"The Committee is to list and describe the various choices open to ensure a rational policy on transport rates and the charges to be imposed on the users of infrastructure, taking into account both the actual situation of transport from the structural and institutional angles and the teachings of pure and applied economic theory.

5

"Very special attention will have to be paid to the implications of the various options and to the possibilities of applying them in practice. Furthermore, for each tariff system chosen the nature and timing of the measures to ensure the transition from the present to the final situation should be indicated. In conclusion, it will be necessary to show how each system should fit into the overall transport policy, in particular from the poind of view of co-ordination of investment in infrastructure.

6

"The Committee is entirely free to take up any question not directly concerned with policy on tariffs or charges if it considers this will help it in carrying out its task.

7

"Finally, the Committee will be well advised to consult the documents on common transport policy drawn up by the Commission, on the understanding that the opinions expressed in such documents do not in any way restrict its freedom to deal with the problems concerned in the manner it considers most suitable."

8

In verbal comments on their terms of reference it was made clear to the Committee members that they were being consulted essentially as economists, and that, with regard to the various points specified, their chief task was to explain the content and scope of economic theory on the transport industry in general, and in particular to study whether economic theory affords a valid solution for fixing the upper and lower limits of tariffs, and which of the many concepts of costs discussed should be taken into consideration. Finally, they were asked how a coherent and rational policy on charges for the utilization of infrastructures could be defined. All these questions were to be considered primarily as regards the transport of goods.

9

Lastly, it was clearly specified that the final decision would necessarily take account, in addition to the strictly economic aspects, of quite a number of non-economic objectives, but that it would not be part of the experts' task to choose among these. They were at confine themselves to examining the implications of economic theory. The present report was planned in the light of the terms of reference thus interpreted.

10

The authors hope to make a useful contribution to working out a common transport policy by submitting its main features to a thorough economic analysis. But, as will be explained later, such an analysis cannot claim to be the last word in the great debate on this common policy.

11

The authors are conscious of their debt to the very many studies which have preceded theirs, not only at Community level but also on the national plane (1).

12

They are convinced that they are continuing the line of development traced out in all these studies. In particular, the conclusions emerging from their

(1) More particularly the European Parliament's reports and discussions on transport, the basic documents and proposals submitted by the EEC Commission, and the various studies carried out in each of the six member countries.

analysis are in the spirit of the policy proposals made previously.

13

The report make no formal recommendations laying down a policy. Although the economic analysis leads to a number of suggestions, these are not final conclusions but general lines of approach, the definite choice between which remains open. This restriction is necessary for two reasons.

14

The first is that the data available on some points seem inadequate. This applies especially to the real conditions and effects of competition in the market for transport services, particularly with regard to the dangers of abuse of dominant positions and of uneconomic competition. It is because of such inadequate information that the approach suggested throughout this report is essentially a pragmatic one.

15

The second reason concerns the objectives of the transport policy. By definition, economic analysis recognizes only strictly economic criteria, i.e. those which define an optimum allocation of resources as a function of preferences considered as given. But other objectives, may be, and in practice often are, imposed on transport policy. In fact this policy is traditionally the point where numerous interests, differing opinions, and social as well as political objectives meet. The authors, who were consulted mainly as economists, are inclined to consider the economic aspects, in the sense of optimum resource allocation, as particularly important; but other considerations can, in fact must, influence the final decisions on transport policy. In the last analysis, therefore, the final choice will be a political one and inevitably based on a certain weighting of the various possible objectives of transport policy.

CRITERIA FOR AN OPTIMUM ALLOCATION OF RESOURCES

16

The concept of an optimum allocation of resources, which will be used throughout as the principal criterion and is therefore of basic importance for the whole analysis, can give rise to erroneous interpretations. Although the first part of the report recapitulates all the main findings of economic theory as applied to transport, a few brief comments in this introduction may well be useful, in order to avoid any confusion regarding what we mean here by optimum resource allocation.

17

First of all, the criterion "optimum resource allocation" does not in itself imply one particular situation for the economy as a whole. It implies only a number of conditions which must be fulfilled if the economy is to function efficiently, i.e. if it is to avoid a situation in which the community concerned has a lower level of welfare than it could have obtained if these conditions had been fulfilled, irrespective of how this level of welfare is defined. In other words, the conditions corresponding to an optimum allocation of resources define the border between all the levels of welfare which can be attained with the existing resources of the community and those which cannot be thus obtained. Any position within of this border is inefficient and any position beyond is impossible, but all positions on the border consonant with the general objective of an optimum allocation of resources. Consequently, there is no contradiction per se between the general criterion of optimum resource allocation and the objective of maximum social welfare in the fullest meaning of this term, whatever its precise definition. In fact the latter is one of the objectives which can be achieved by optimum allocation of resources.

18

It is often claimed that the general criterion of an optimum allocation of resources merely implies certain rules of market organization (in particular with respect to the price system), considered as an end in themselves and not as a means. It is added that these rules could be in conflict with such general objectives of social and economic policy as full employment, steady economic growth, stability of the general price level, development of backward regions and an equitable distribution of income.

19

The relations between these various objectives will be examined briefly in Chapter 21, but we may state already, at this point, that in general no conflict of the sort exists. The general criterion of optimum allocation of resources simply requires a maximum performance of the economy, irrespective of the objectives pursued. Consequently, it implies full employment and steady economic growth. And, in so far as price stability and the development of backward regions help the long-term development of the economy as a whole, they too are implied by an optimum allocation of resources.

20

However, the theory of optimum allocation of resources as usually presented suggests criteria and methods which are strictly valid only under well-defined hypothese and may perhaps not be relevant when certain objectives, for instance a particular distribution of income, are pursued. But this does not mean that there is necessarily a conflict between the different objectives which may be pursued and the criteria and methods which can be deduced from

the now classic theory of optimum resource allocation. Often these objectives can be attained by means which are not incompatible with maximum economic efficiency, and often also they can be fully achieved only if there is optimum allocation of resources.

21

Whatever limitations the theory may have in its present form, it constitutes an indispensable analytical instrument for defining a rational transport policy. With its aid we can distinguish between those proposals which really imply optimum allocation of resources and those which are only arbitrary conventions subject to discussion and modification.

FIELD OF APPLICATION OF THE REPORT

22

This report mainly studies the problems of optimum allocation of resources in the specific field of transport. Hence, examination of the general aspects of such allocation, e.g. full employment, steady economic growth and price stability — general objectives of overall policy which concern all sectors of the economy — are clearly outside its scope.

23

However, there are certain links between these general economic objectives and transport policy. The various sectors of the economy, including transport, are subject to the requirements of macroeconomic policy and can be its instruments. For instance, measures taken by the public authorities to curb inflation may serve to restrict investments in transport. Measures of this kind can obviously not be profitably examined in the limited context of transport policy, since neither their aims nor their methods are specific to transport.

24

But there is another aspect of the links between transport and the economy in general which needs to be stressed. The criteria of optimum resource allocation may call for different transport policies according to whether the economy is in a situation of full employment and steady growth or not. The authors have confined themselves to studying the first alternative. At the present stage of their discussions they feel unable to say whether this limitation constitutes a serious defect. Further study would be necessary to determine whether, and if so on what points, their conclusions should be amended or amplified to meet the case of an economy in absolute or relative decline. It folows thas as long as no such study has been made these conclusions can be valid only for situations of full employment and relatively steady growth.

25

This is undoubtedly a very serious limitation. Its existence does not, of course, mean that the authors consider the problems of a recession or depression unimportant or unlikely to arise, but simply that they have been obliged to restrict the field of their investigations.

26

Important though it may be, this limitation does not affect the conclusions of the report as regards a transport policy if the two general conditions of full employment and steady growth are satisfied, at least approximately. Periods of recession or depression bring special problems calling for special measures. There is no reason to jeopardize the effective functioning of the economy by applying such measures during periods of full employment and economic growth. Moreover, a recession or a general depression would call primarily for measures of general macroeconomic policy.

27

Since, however, there is no guarantee that general macroeconomic policy will always be able to eliminate serious recessions or depressions, these considerations in no way reduce the importance of the limitations which the hypothesis of full employment imposes on the conclusions of the report. Consequently, the authors strongly recommend that a special study be made in the near future of the implications of such situations for transport policy.

28

The report has a further limitation. It is limited virtually to the examination of "inland transport", i.e. the railways, road haulage and inland shipping, the three modes of transport which are covered by the common transport policy envisaged in the Treaty of Rome. Other modes have been studied only where they affect policy on inland transport. Finally, outside the area of infrastructure policy, the study deals essentially with the transport of goods, and touches only incidentally on problems of passenger traffic.

29

All these limitations were imposed on the authors by their terms of reference, and by the need to submit the report within a specific period, which obviously made it impossible to study every aspect of transport policy.

30

The need to observe a deadline also explains why the form of the report is not all that could be desired. For lack of time the authors were obliged to sacrifice form to efficiency and clarity.

31

In particular this requirement explains evident repetitions in the report, a joint work whose different chapters were written at different times. But some repetition is inevitable. Certain questions are so complex that one can hardly grasp them completely without examining them from successive points of view. To enable the reader to find easily all the passages dealing with a particular subject, an index has been prepared which is as complete as possible. Reference should be made to this index if it is desired to get a very clear view not only of the fundamental aspects of a question but of all its implications.

PLAN OF THE REPORT

32

The report consists of three parts. Part I enunciates economic theory as it affects transport. Right from this initial stage of the analysis a systematic distinction is made between infrastructure and transport services. Infrastructure is shown to present certain distinct features which raise special problems both on the level of economic theory and on that of practical policy.

33

Part II deals with the criteria and options of transport policy. After a brief examination of economic, social and political objectives in Chapter 21, the criteria of optimum resource allocation, as worked out on a theoretical level in Part I, are briefly summed up in Chapter 22, special attention being given to problems of optimum allocation in the case of infrastructures (Chapter 23). In the final chapters of Part II various general policy options will be considered, first for infrastructure and then for transport services. The list of options studied does not claim to be exhaustive; it is limited to those which seem particularly important to the present discussions on transport policy.

34

Part III, "Analysis of Various Systems", also deals separately with infrastructure and with transport services, in Chapters 31 and 32 respectively. A third chapter deals with some questions of an institutional nature, and a final one gives the general line of approach suggested by the report. This third part, whose limitations are evident, analyses only a restricted number of possible systems. Discussion of these is sufficient to bring out the factors which have to be considered in judging any of the large number of systems that can be obtained by combining a limited number of basic variants.

35

Both Part I and the most important chapters of Parts II and III give general surveys in which a number of partial conclusions are deduced and defined. These surveys are made purely to show the general line of reasoning of the report, and must not be read in isolation. The reader who confines his attention to them alone is liable to fall into misapprehension.

36

The various parts and even individual chapters can be, to some extent, read independently. This system involves obvious repetitions. But in themselves such repetitions have real advantages, particularly from the practical point of view, for in each chapter and even in each section discussion revolves round certain specific aspects of transport policy. This procedure makes it possible to examine each of these aspects separately, as well as the various links between them.

OVERALL PICTURE

37

The report does not give definitive and detailed proposals for policy. Its essential aim is to analyse the major economic aspects of transport policy in general under conditions of full employment and steady growth, and on this basis to examine a number of systems which are of practical importance. Although certain conclusions emerge, they are in the nature of a critical review of the economic advantages and disadvantages of the various solutions and do not in any way lead to definite choices, which, in any case, can only be made in the light of factors largely outside the province of the report.

38

As regards infrastructure, the report examines a number of possible systems, which differ primarily in the method of financing the expenditure on investment and operation. The main question the authors were instructed to study was that of the prices to be charged to the users of infrastructure. Here, economic theory supplies a clear answer. The correct procedure is to charge prices which are calculated to lead to an optimum utilization of existing infrastructure. Apart from the difficulties of applying this solution — difficulties which could be overcome to some extent by approximative procedures — it will be shown that such prices would in general entail a deficit and that, if this deficit is large, it gives rise to serious problems of practical policy. Consequently other systems will be considered, all of them involving additional charges for users. Since none of these systems entirely satisfies the criteria of optimum resource allocation, their primary justification is institutional and sociological. Economic factors alone are an insufficient basis for making a choice between the system suggested by economic theory and the group of systems which

impose additional charges on the users in order to meet the problems of the deficit. This report leaves the choice open, although the balance of economic advantages and disadvantages is obviously not the same for all the systems analysed.

39

Among the conclusions on infrastructure which the authors put forward with some confidence, because they do not depend on the nature of the various systems envisaged, there is one which, in their opinion, is particularly important. No matter what price system is adopted for use of infrastructure, there must be a procedure for co-ordinating infrastructure, investments at the regional, national or Community level, both within each mode of transport and between the various competing modes. This conclusion follows from two essential features of infrastructure:

a) The infrastructure of each mode of transport forms an economic unit whose various parts are obviously closely interdependent; and

b) Infrastructure is subject to economic indivisibilities, which implies that every investment project will have repercussions outside the sector directly concerned, particularly on investment in the infrastructures of competing modes of transport.

40

These questions are elaborated in Chapter 31, at the end of which a general view is given of the suggestions concerning infrastructure arising from the report.

41

The economic structure of the market for transport services is different from that of infrastructure. A decentralized system, with competition between modes of transport and within each mode, can generally be organized (except within the railways) but is only desirable where it is not likely to have harmful consequences, i.e. where there is neither abuse of dominant positions nor uneconomic competition.

42

The facts available are insufficient for a judgment on the real frequency of abuse of dominant positions or of uneconomic competition, but the authors feel that these are less common today than they were in the past, when the railways still enjoyed a strong monopolistic position and when general depressions caused disturbances throughout the whole economy. However this may be, the policy suggested by the report in no way prejudices the final assessment of the frequency of such situations and is absolutely independent of this assessment.

43

In view of the differences between the present transport policies of the various Member States of the European Economic Community, inauguration of a common policy will require a period of adaptation and transition.

44

The common transport policy suggested is essentially pragmatic, and its starting point is the existing situation. Wherever abuse of dominant positions or uneconomic competition is found, the introduction of appropriate minimum and maximum rates ("forked tariffs" or bracket rates) is advocated. Where such situations do not exist but approved fixed tariffs or bracket rates are nevertheless applied, restrictions should be eased by replacing the fixed tariffs by bracket rates, or by widening the brackets where a bracket rate system is already in operation. Restrictions would thus be progressively reduced in all cases. A similar policy is suggested for dealing with quantitative restrictions.

45

Such a procedure would make it possible to introduce the common transport policy without further delay and without the need to define *a priori* and from the outset the systems which will finally be applied to each category of transport services. These systems would result gradually from experience.

46

The problems of transport policy are extremely complex, and present very many aspects. In this report, an attempt has been made to consider the most important of these aspects. If a conclusion emerges it is that any efficient policy must necessarily be flexible and take account of the different specific cases. In such a field there is no universally applicable formula, and although the policy applied must be coherent in relation to the final objectives, it cannot be uniform.

47

It is often said that any Community organization of transport should always entail the application of uniform principles or even rules, whether the situations concerned are identical or not. However, the only reasonable solution is to meet the various situations by applying principles and rules which permit the most effective attainment of the general objectives.

48

To conclude, the authors of this report emphasize that they are perfectly aware of the shortcomings of their work, as regards not only its field of application but also the analyses it contains.

49

They would have liked more time to improve the presentation and go more deeply into certain points, but one of their major concerns was to finish within the time-limit. They consider this report simply as a contribution to the discussion of measures to implement the common transport policy.

50

The preparation of the various parts of the report naturally led to broad exhanges of opinion and sometimes to the statement of opposing points of view. In general, the discussions led to fundamental agreement between the members of the Committee on the essential points. Where divergences could not be reconciled the report expresses them as completely as possible.

51

The report is submitted unanimously by the members of the Committee.

THE THEORY OF OPTIMUM RESOURCE ALLOCATION AND ITS APPLICATION TO TRANSPORT

52

The aim of the theory of optimum resource allocation is to define the conditions under which the economic system can attain maximum efficiency. Economic efficiency cannot, of course, constitute an end in itself; but it will always have to be a consideration, whatever policy may be pursued. It is therefore very important that the conditions under which an optimum allocation of resources can be achieved should be well understood.

53

In Part I our primary purpose is to present an instrument of analysis; its application has been left until Parts II and III. The present Part will serve to summarize those conclusions reached by the theory of optimum resource allocation that are of particular importance for transport.

54

The complexity of this theory is well known. However, few of its refinements are essential for the further analysis of our specific object of inquiry: the practical application of the theory to transport policy. Discussion of the reasoning underlying the various propositions of the theory is obviously outside the scope of this report, so we shall confine ourselves here to restating those propositions, and the assumptions upon which they are based, as clearly and simply as possible (1). When errors that are relatively important from the practical point of view have been or might be made in interpreting the theory, we shall give all the detail necessary.

55

In Chapter 10 we shall define and analyse the concept of optimum resource allocation, in Chapter 11 we shall set out the conditions that must be fulfilled if optimum resource allocation is to be achieved, in Chapter 12 we shall examine its scope and significance, and in Chapter 13 we shall comment on its particular implications for the infrastructure of transport.

56

We have deliberately avoided using mathematical formulae (2). This is not to say that we were not tempted to do so; but we considered that in our report the main emphasis should be laid on practical applications and that the aim should be not to prove the theory but to summarize its principal results in language that can be easily understood.

57

Some repetition will be inevitable for the sake of clarity. It would be only too easy to produce an over-concentrated report, but this would merely sacrifice content to form under a veneer of pseudo-clarity, concealing the essential facts behind formulae so condensed as to be obscure.

(1) For the reasoning behind the propositions, see the literature on the subject.

(2) Except in a few cases.

CHAPTER 10

THE CONCEPT OF OPTIMUM RESOURCE ALLOCATION

10.0 — *SITUATIONS OF OPTIMUM RESOURCE ALLOCATION*

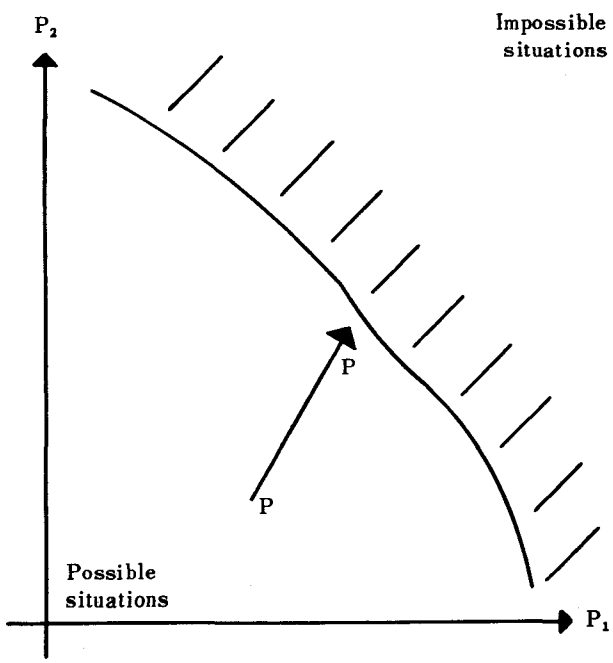
58

The essential aim of the theory of optimum resource allocation is to see how, given our present technical knowledge, the limited available resources (labour, natural wealth and capital equipment) can best be used to satisfy human wants.

59

The indices P_1, P_2, ..., P_k, ..., P_n may be taken to represent the situation of the various final consumers, whether individuals, communities or other entities. These indice denote functions of different quantities capable of being defined numerically in terms of the different characteristics of the economy (e.g. various levels of consumption, indices of inequality, etc.); each of the functions increases when, for each consumer, a given situation is replaced by a situation that he deems preferable. Such indicators can be termed preference indices (1).

FIGURE 1



60

It is possible to define the maximum of one of these indices, P_1, when the values of the other indices, which we denote by P_j, are fixed.

61

As resources are scarce, the maximum of P_1 is finite for any given set of P_j. Hence, in the hyperspace of the P_k indices, an area can be defined which cannot be attained under any circumstances, no matter how society is organized.

62

The line above represents topologically the boundary between situations that are attainable and situations that are not. At a point M on this line it is impossible to find a way in which society can be altered so that one of the indices — P_1, for example — will increase while the others are maintained at the given values. All the points on the boundary-line represent situations in which the allocation of resources may be regarded as optimum.

63

The action of any government springs from the belief that certain situations, characterized by certain values of the preference indices, are preferable to others. This amounts to saying that the government seeks to maximize a certain function P of the indices P_k (2); this maximization corresponds to what the government considers, for political reasons, to be the best way of organizing society. The choice of the function P may result explicitly from certain decisions or implicitly from certain rules of the game. It can be assumed that the function P is generally an increasing function of the various P_k indices.

64

The theory of optimum resource allocation in its most general form assumes that the P_k indices have a well-defined form, as also the function P, and that the function P is an increasing functions of the various P_k indices. It follows that the function P, whatever its form, can only be at a maximum at a point on the boundary.

65

Thus defined, the concept of optimum resource allocation implies only that society is organized at

(1) These are referred to again in Section 12.1.

(2) This can be expressed as: $P = P(P_1, P_2, \ldots, P_k, \ldots P_n)$.

maximum efficiency, whatever the ultimate objectives may be.

10.1 — *THE ECONOMIC THEORY OF OPTIMUM RESOURCE ALLOCATION*

66

In the general form in which we have just presented it, the theory of optimum resource allocation has a purely formal content, and it is only possible to develop it further if additional assumptions are introduced.

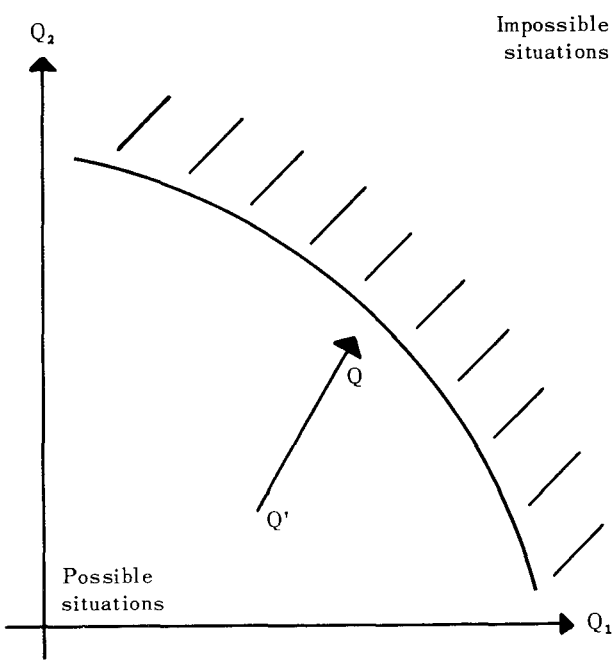
67

These additional assumptions are that any index depends only on the final consumption of the corresponding operator, and that the index is never a decreasing function of such consumption.

68

Hence, situations in which the optimum allocation of resources is attained are characterized by well-defined conditions which can be stated in simple terms and which are valid whatever may be the function P that is to be maximized. This theory can be extended to the case of an economy in which various events are uncertain (1).

FIGURE 2



10.10 — *Optimum resource allocation in production space*

69

Let $Q_1, Q_2, \ldots, Q_n$ represent final aggregate output, both present and future.

70

As before, we can distinguish an area of the possible and an area of the impossible, and a boundary between them that may be taken to represent situations of maximum efficiency as regards final output. In such situations an optimum allocation of resources has been achieved as regards output.

71

It is easy to show the necessary and sufficient condition for arriving at a certain point P within the space of the P_k preference indices (fig. 1) is that one should arrive at a point such as Q within the production space (fig. 2), but that the converse is not true.

72

In other words, optimum satisfaction of wants implies maximum efficiency of production, but the latter is not sufficient to ensure that a point has been reached on the boundary between the possible and the impossible within the space of the preference indices.

73

The conditions for an optimum allocation of resources as regards output are clearly of considerable importance, for they are completely independent not only of the function of aggregate preference P but also of the various P_k indices.

10.11 — *Economically inefficient situations*

74

If, within the space of the preference indices (fig. 1), we take a possible point P' not on the boundary-line, we find that there is an infinite number of possible displacements P'P which are such that for each of them all the indices increase, i.e. after such a displacement all the operators are in a situation that they deem preferable.

75

A similar statement may be made with regard to a point such as Q', which is attainable but is not on the boundary in the production space. There is an infinite number of possible modifications of the

(1) This generalization plays an important role, particularly in the concept of economic congestion (see Sec. 11.6).

economic system Q'Q which are such that in the displacement from Q' to Q all the quantities produced increase without any increase in the resources available.

76

Situations such as P' and Q' may be regarded as economically inefficient. We shall examine later the problems raised by the movement from such situations to situations where optimum allocation of resources is attained (1).

10.12 — *The structure of the preference fields*

77

Certain useful propositions can be derived from the properties of preference fields. The most important property is that of decreasing marginal utilities. This cannot be proved, but appears to be borne out by observed data, at least in situations that have been properly studied (2).

10.2 — *THE STRUCTURE OF PRODUCTION*

78

For each productive activity, the production techniques can be represented by the relationship between the quantities produced and the quantities of the production factors employed.

79

From a purely technical point of view, two sectors may be distinguished, the differentiated sector and the non-differentiated sector. The first corresponds to activities in which the best production technique (3) arises from juxtaposing different units of production, the second to those in which this condition is not met (4).

80

The differentiated sector is characterized by a convex production function (non-increasing returns), and the non-differentiated sector by a concave function (increasing returns).

81

Differentiation implies divisibility, since the best technique consists in dividing the aggregate production system into distinct units of production; conversely, non-differentiation implies indivisibility, since the best technique here is not divisibility in the above sense.

82

Transport infrastructures consisting of fixed installations and the services connected with them generally belong to the non-differentiated sector and are generally characterized by marked indivisibility.

83

But this does not apply to the provision of transport services, once the infrastructures are in existence. Traffic on a road is effected by different vehicles, and the activity concerned is therefore differentiated. A large number of railway transport services are likewise differentiated. Traffic on one railway line, for example, is "divisible", since the best technique consists in the use of different trains.

10.3 — *CONTINUITIES AND DISCONTINUITIES*

84

The theory of optimum resource allocation can be worked out, whether the quantities in question — consumptions or factors of production — vary continuously or not. If they do, the optimum conditions give rise to equalities between the first derivatives. If they do not, the conditions give rise to inequalities, the differences between the terms of the inequalities corresponding to economic rents.

85

In particular, factors of production and products may show indivisibilities which lead to discontinuities in the production function. A more important, because undoubtedly universal, category of discontinuities arises because there is, at any given moment, a limited stock of capital goods (durable factors of production) which can only be increased by investment. Investment results from production in the present and creates productive capacity for the future. Consequently, whenever production of a particular item reaches a point at which the available capacity of the durable factors of production is fully utilized, the productive function shows a discontinuity.

86

These discontinuities complicate, but do not essentially change, the economic nature of the conditions attendant upon an optimum allocation of resources.

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(1) See particularly Section 12.3.

(2) From a purely technical point of view, it can be shown that if there are decreasing marginal utilities the preference curves are convex.

(3) In the sense that, for each industry, each output is the maximum for given quantities of the factors of production and of the other outputs of that industry.

(4) These sectors cannot be demarcated once and for all; the dividing line may be modified by, for example, technical progress.

CHAPTER II

CONDITIONS OF OPTIMUM RESOURCE ALLOCATION

11.0 — *CRITERIA FOR OPTIMUM RESOURCE ALLOCATION*

11.00 — *Conditions of optimum resource allocation*

87

The conditions under which there is an economic situation of optimum resource allocation are as follows :

88

a) There is a single price system, the same for every buyer and seller comparable transactions (principle of single prices and non-discrimination).

89

b) This system is such that at any place and time total supply equals total demand for every product (principle of price-determined equality of supply and demand).

90

c) For any operator making decisions on final consumption the preferences index is maximum when the total value of the quantities consumed (1) is equal to the income available to him. This condition implies that any operator the marginal utilities of the different consumptions which can be varied continuously should be proportional to the corresponding prices.

91

d) In the differentiated sector, for any enterprise or unit of production (2), the investment and production programme characterized by present and future revenue and expenditure is such that the discounted value of the net revenue is both nil and maximum, the revenue and expenditure being calculated on the basis of prices considered as given. The rate of interest is also considered as given (3).

92

This maximum condition means that the price of any output is equal to its marginal cost if maximum production capacity is not reached, and to this price plus an economic rent component if this capacity is reached.

93

A further result is that, for given outputs of the unit of production considered, the cost production must be minimum.

94

e) In the non-differentiated sector the condition that the discounted net revenue be nil no longer exists, but all the other conditions remain the same as long as the production function is convex, that is to say if we are in a situation of non-increasing marginal returns.

95

Difficulties appear when there are increasing marginal returns. The conditions of the first order (stability conditions) (4) remain the same. This also applies to the conditions of the second order relative to the costs of production. For given quantities of present or future output, the discounted value of the costs must, in fact, still be minimum at prices of production factors considered as given.

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(1) Present and future.

(2) Irrespective of whether it produces one or more goods and whether this production is present or future.

(3) If R(t) and D(t) are revenue and expenditure per unit of time, the discounted value V(t) is defined in the most general case by the integral

$$(1) \qquad \bar{V}(t) = \int_t^{\infty} V(\tau)\, e^{-\int_t^{\tau} i(u)\,du}\, d\tau$$

in which i(t) is the continuous rate of interest at the moment t with

$$(2) \qquad V(\tau) = R(\tau) - D(\tau)$$

Naturally, the revenue and expenditure are calculated at optimum prices (condition (a) in the text).
Equality (1) implies that we have

$$(3) \qquad V(t) = -\frac{d\bar{V}(t)}{d(t)} + i\,\bar{V}(t)$$

This equality can be interpreted as meaning that in any period net revenue is equal to the diminution in value per unit of time of the good considered plus the interest on its value at the point in time considered.
If we use discontinuous notation, the relation(1) is written as follows:

$$(4) \qquad \bar{V}_0 = \frac{V_1}{1 + I_1} + \frac{V_2}{(1 + I_2)^2} + \ldots + \frac{V_n}{(1 + I_n)^n} + \ldots$$

in which I_n represents the rate of annual interest from t_0 to t_n, V_n the net revenue at the time t_n, and V_0 the discounted value at the point in time t_0.

(4) From the mathematical point of view the maximum conditions of a continuous and differentiable quantity F include on the one hand conditions of the first order, which express the fact that the first variation of F must be zero, and conditions of the second order, which imply that the second variation of F is negative. In the case of a funtion F(x) with a single variable, the condition of the first order expresses the fact that the tangent to the curve representing the function is horizontal and the condition of the second order that the curve is below this tangent.

96

On the other hand, the conditions of the second order relating to the discounted net revenue do not necessarily persist. The first differential must still be zero (stability), but the discounted net revenue may be maximum or minimum according to the case considered. Consequently, the condition according to which the discounted net revenue should be maximum at prices considered as given may no longer hold; instead, the opposite condition may be valid (1).

97

It follows from this that three points must be emphasized for the non-differentiated sector:

1. All the conditions of the first order remain the same.

2. The costs calculated at market prices must be minimum.

3. The discounted net revenue of any unit of of operation is stationary at prices considered as given.

98

From these three points of view, whose importance cannot be overestimated, there is no difference between the differentiated sector and the non-differentiated sector.

99

An essential difference may nevertheless exist. This is; that situations of optimum resource allocation can be situations of unstable equilibrium in the sense that in the neighbourhood of such points application of the rule of maximum discounted net revenue can have the effect of removing the economy from the situation of maximum efficiency corresponding to the allocation of revenue considered. This gives rise to very serious problems. Since, in general, nothing can be said *a priori* about the existence or non-existence of such a possibility in the different cases considered, special precautions must be taken and special rules applied (2). This is an essential aspect of the non-differentiated sector (3).

100

As regards transport, it would seem that for a given system of infrastructures increasing marginal returns in the supply of transport services occur only in relatively few cases, and that in general marginal returns are decreasing (4) (5). It follows that the difficulties we have just indicated are practically confined to the investment in infrastructure. This is the reason why we shall recommend a co-ordinated policy with regard to such investment.

101

These are the conditions for an optimum allocation of resources on the level of consumption and of production in the differentiated and the non-differentiated sectors. They are purely formal and are not operational, in that any given situation will usually not be one of optimum allocation of resources, and consequently the optimum price system will not be known.

102

From a practical point of view, in any situation where there is not an optimum allocation of resources it is useful to have operational rules which make it possible to take decisions that can improve efficiency.

103

Such rules are easily laid down in the case of the differentiated sector but are more complex, at least as regards investment decisions, in the non-differentiated sector — the one of special interest to transport economy, since it includes all infrastructures.

104

Before these rules are set out, the concept of distributable surplus must be defined.

11.01 — *The concept of distributable surplus*

105

Let us consider a given state of the economy and envisage a feasible modification such that all the preference indices would retain the same value as in the initial situation. The distributable surplus can be defined with respect to a particular good (employed as *numéraire*) as the maximum increase in the quantity of this good which the change considered can bring about (6). Thus defined, the distributable surplus is the objective representation of the psychological surplus, evaluated in terms of a phys-

(1) It can be shown that in such an eventuality any decision which would diminish the value of the discounted net revenue would still be disadvantageous, but that a decision which would increase the value of the discounted net revenue could be disadvantageous.

(2) See Subsection 11.02.

(3) On the level of practical application, the unrestricted validity of the rule of maximization of discounted net revenue seems to be generally accepted. However, application of this rule in all cases may give quite inaccurate results.

(4) This naturally does not imply that average returns are decreasing, because the costs include items which are independent of the volume of traffic.

(5) This is a very difficult question on the theoretical and, more particularly, on the practical level, and would definitely be worth studying systematically in the light of facts.

(6) The distributable surplus is therefore a physical quantity.

ical quantity, accruing to the whole of the community affected by the modification. It is immediately clear that, if this distributable surplus is positive, there was no optimum allocation of resources in the initial state. It can in fact be shown that the necessary and sufficient condition for optimum allocation of resources is that, for all feasible modifications, the distributable surplus in terms of any good should be negative or nil.

106

It can also be shown that the necessary and sufficient condition for optimum allocation of resources is that, for all feasible and reversible (1) modifications, the first differential of the distributable surplus with respect to the modification should be nil, and the second differential should be negative or nil.

107

Naturally, if a feasible modification of the economic situation is such that the distributable surplus is positive, the change is desirable from the point of view of efficiency, since it enables each operator to be placed in a preferred situation.

108

These three propositions have a great many applications and they are quite independent of the structure of the preference fields and of the techniques of production, i. e. whether there are diminishing returns or not, and whether there is convexity or not.

109

The propositions are obviously rather abstract, but they are capable of supplying useful operational rules.

110

It can be shown that if for every operator the marginal utilities of the final goods and services are proportional to their prices, and if we ignore quantities higher than the first order, the value of the distributable surplus is equal to the total net value of the variations in the final outputs (2).

111

Consequently, if, for prices a, b ... c of the final goods considered as given, the modification concerned creates value (3), it is advantageous and should be carried out (4). This proposition can also be applied to discrete variations as a first approximation (5).

112

If the different operators are free to distribute their incomes between their different consumptions, the condition of proportionality of marginal utilities to final prices will be satisfied at least approximately, and the above proposition will be applicable.

113

Whether returns are increasing or diminishing, it will then form a criterion which is applicable in general and thus to infrastructure decisions in partic-

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(1) Viz., capable of being carried out in one direction or the opposite.

(2) In fact, where there exists for all consumers (whether they be individuals or collectivities) a system of prices a, b, ... c (in discounted terms for future consumptions) of the present or future final goods A, B ... C, such that the marginal utilities for each consumer are proportional to the corresponding prices, the first differential of the distributable surplus τ_A can be expressed by

$$d\tau_A = \frac{1}{a}[a\,dA + b\,dB + \ldots\ldots\ldots\ldots + c\,dC]$$

where dA, dB, ... dC are the variations of the final total consumptions in the modification concerned.
The final goods include the leisure time available to each consumer, which is equal to the total available time minus the time spent on work in the production process.
The proportionality of utilities to prices amounts to supposing that condition (*c*) of Subsection 11.00 is fulfilled, i.e. that the conditions for optimum allocation of resources are satisfied at least for the consumption sector. This will generally be the case at all times if the consumers have freedom of choice.
The above formulation is, of course, only strictly true of marginal variations and cannot be used for discrete variations except as a first approximation.

(3) That is to say, if

$$\sum_B bdB = a\,dA + b\,dB + \ldots\ldots + c\,dC > 0.$$

(4) If the first differential $d\tau_A$ of the distributable surplus τ_A is nil, the second differential must be considered, and it can be shown that we have

$$d^2\tau_A = \frac{1}{a}\left[\sum_B b\,d^2B + \sum_B d\,B\,d\,b\right]$$

where d^2B is the second differential of B and d b is the variation of b in the displacement concerned.
The term b d^2B will be positive or negative according to whether the modification creates value or not in the production system at prices considered as given.
The expression of the second differential of the distributable surplus is valid in all cases, but its content is very complex and in the most general case it can no longer yield any operational rule.
On the other hand, if the marginal utilities are decreasing, the quantity Σ d B d b is necessarily negative. Hence, if Σ b d^2 B is negative, i.e. if at prices considered as given the modification in question does not create value, the displacement is certainly disadvantageous, but if Σ b d^2B is positive no more can be said. In this case it is better to do nothing. As uncertainty exists only when the first differential of the distributable surplus is nil, i.e. when we are close to a situation of maximum efficiency, the absence of an operational criterion in this case is no practical disadvantage.

(5) It should be pointed out here that a discrete variation in the size of an investment is reflected at the level of consumption by generally small variations in consumption by the final consumers.

ular. Its practical importance [1] can therefore not be overemphasized [2].

114

According to what has been said, this criterion applies even if the prices throughout the production system are not optimum, i.e. if there is no optimum allocation of resources, and whether returns are increasing or decreasing.

11.02 — *Operational criteria for achieving a situation of optimum allocation of resources*

115

The rules of a decentralized free market economy can be defined as follows :

116

a) Maximization of every preference index under the constraint of a balanced budget [3], prices being considered as given, which implies that the consumer has freedom of choice subject only to the budget constraint ;

117

b) Maximization of the discounted net income for every unit of production, market prices being considered as given, which implies that the unit of production has freedom of decision subject only to technological constraints ;

118

c) Price-determined equality (the same for all operators) between supply and demand of every good at all times and places.

Condition *b)* implies:

119

i) That the total cost defined as the discounted value of all present and future expenditure is minimized in each production process;

120

ii) That investment in durable goods is pushed to the point at which the sum of present marginal revenue and of discounted future marginal revenues (on the basis of prices considered as constants) is equal to the present marginal cost of the investment plus the sum of the discounted future marginal operating and maintenance expenditures ;

121

iii) That current production is developed to the point of full utilization of the available capacity of durable factors, or to the point at which the price is equal to the marginal cost if such a point exists [4].

122

Let us consider an economy in which marginal utilities are decreasing and there are no non-differentiated activities. It is possible to show that if, for given preferences and given technology, this economy observes the rules of a free market economy which we have just stated, it evolves towards a single and stable situation of equilibrium corresponding to a point in the area of maximum possibilities in the space of the preference indices. A certain distribution of income corresponds to this point.

123

This proposition is of very great practical importance, since it supplies operational rules by which a situation of optimum resource allocation can be achieved. It still remains valid for the non-differentiated sector when the marginal returns are not increasing, but it may no longer be applicable when the economy includes non-differentiated activities and marginal returns are increasing. In this case the rule concerning maximization of the net discounted income of a unit of production at current prices may not be valid in that it diverts the economy from the conditions of maximum efficiency [5].

---

[1] Especially for the non-differentiated sector, for which the usual rule of maximization of net discounted revenue is no longer valid (see Subsection 11.00). The concept of distributable surplus, and the very simple and practical expression of its first differential, are then particularly useful.

[2] To illustrate the application of this criterion, let us suppose for simplicity's sake that all transport services are identical and that the same is true of labour services. Let Q be the total quantity of transport services consumed and X the total quantity of labour supplied, and let us suppose that the building of an infrastructure is capable of furnishing additional services dQ_1, dQ_2, ... dQ_n by means of quantities of labour dX_1, dX_2, ... dX_n at the periods t_1, t_2, ... t_n. If q_1, q_2 ... q_n and x_1, x_2, ... x_n are the corresponding final prices (discounted for future services), the infrastructure will be advantageous if

$$(q_1dQ_1+q_2dQ_2+...+q_ndQ_n)-(x_1dX_1+x_2dX_2+...x_ndX_n)>0$$

that is to say if the discounted total value of the services supplied is greater than the discounted total expenditure. The difference between these two terms represents the final benefit in money terms of the infrastructure considered.

[3] The budget constraint means that total (present and future) expenditure is equal to total (present and future) disposable income, both expressed in present values.

[4] This last proposition can be formulated inversely by the following proposition: The price must be equal to the marginal cost plus an element of marginal rent which is nil when the available durable factors are not fully utilized and which, in the other cases, is just high enough to limit demand to available capacity.

[5] This proposition sounds rather paradoxical, as we are so used to taking for granted the rule of maximization of the income of an enterprise for prices considered as given. But we have indicated (Subsection 11.00, condition *c*) that this rule may not apply, and it is easy to quote very simple examples to illustrate the possibility.

124

However, if in the non-differentiated sector and in the special cases of increasing marginal returns, the following rules are applied:

125

d) for given outputs the costs at current prices are minimized;

126

e) only those operations are carried out which create value at final prices and final consumptions considered as constants; the economy as a whole will evolve in the direction of optimum allocation of resources (1).

127

It is thus clear that conditions *a), b), c), d)* and *e)* in Subsection 11.00 constitute a body of operational rules whose application makes possible a situation of optimum allocation of resources.

128

In general these rules are identical for the differentiated and the non-differentiated sectors, but when there are increasing marginal returns certain of the rules take a different form.

11.1 — *TRANSPORT AND THE THEORY OF OPTIMUM RESOURCE ALLOCATION*

129

Each mode of transport can be divided into two parts: first, infrastructure and all the management services independent of the volume of traffic associated with it; and secondly, the production of transport services by means of road vehicles, railway rolling stock and inland shipping (2) (3).

130

All infrastructures of road, rail and waterway transport show very marked indivisibility and belong to the non-differentiated sector.

131

On the other hand, if the infrastructure is considered as given, the supply of transport services in road haulage and inland shipping, belongs as a general rule to the differentiated sector.

132

As regards railways, indivisibilities, when they exist, are much less marked in the supply of services than in infrastructure and the management services associated with the latter (4). Furthermore, numerous activities in the supply of services are differentiated.

133

From the point of view of practical applications, two factors play a particularly important role: the decrease or the increase of the average returns, and the decrease or increase of the marginal returns. The importance of the first stems from the existence of a deficit when there is an increase in average returns and economically optimum management. As we have pointed out, the importance of the second is due to the fact that certain rules of the market economy may not be applicable with increasing marginal returns.

134

a) Increasing average returns appear to be the general rule in transport infrastructures.

135

In the supply of services by road and inland waterways, differentiation in a situation of optimum allocation of resources implies constant or decreasing average returns. The same is true of railways when there is differentiation. When there is no differentiation, the increase in average returns appears in general to be much less marked than for infrastructure.

136

b) If there is optimum allocation of resources, decreasing marginal returns appear to be the rule in supply of transport services. This is not only the case with roads and inland waterways, since the decrease then results from the differentiation, but also with railways, at least in the majority of instances. Increasing marginal returns seem in fact to be relatively exceptional when rail services are supplied from a given infrastructure.

137

All in all, it would seem that increasing marginal returns on a notable scale can practically only occur in infrastructure investments.

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(1) In fact the application of criterion *e)* which follows from the reasoning in Subsection 11.01 on the distributable surplus makes it possible to overcome the considerable difficulty of the operational non-validity, in the non-differentiated sector, of the principle of maximization of the discounted net income at current prices.

(2) The distinction in practice between infrastructure and supply of services seems entirely justified for roads and waterways, but it is, of course, only theoretical for railways.

(3) It should be pointed out here that production of transport services also includes management services independent of traffic.

(4) It should be noted that in the case of railways the division between expenditure connected with infrastructure and other expenditure independent of traffic is obviously partly conventional.

138

From this it follows that the operational rules of a free market economy, as we have defined them, are generally applicable except in the case of investment in infrastructure (1).

139

It should be pointed out that the vitally important decisions on infrastructures are taken only at the time when these are established or closed down. The special difficulties of management with increasing marginal returns therefore occur only when a new infrastructure is established and brought into service.

140

Thus there is generally no real difficulty in applying the criteria of optimum management to investment decisions in transport. We have pointed out that with increasing marginal returns the application of the rules of the free market economy to all decisions on investment or disinvestment in infrastructure and associated services could lead to faulty decisions. A special procedure of co-ordination of infrastructure investments must therefore be provided for the benefit of these decisions. This condition plays an important role in what follows.

141

However, once an infrastructure has been set up, and as long as it remains in service, the difficulties of optimum allocation of resources with increasing marginal returns practically cease to arise, and all the operational rules of a free market economy should be applicable. It should be borne in mind that, if we consider preferences and technical structure as given, application of these rules will lead to a stable equilibrium which will at the same time fulfil the conditions of optimum resource allocation (2).

142

The theory of optimum resource allocation regards an existing infrastructure as playing the same role as natural wealth; and it may be claimed that, if the aim is to ensure optimum allocation of resources, the price of using the infrastructure to produce transport services should be independent not only of the investment costs, which belong to the past, but also of operational costs independent of traffic.

143

Let us call the optimum price for the use of an infrastructure the economic charge; the marginal cost of management of the infrastructure in relation to the traffic, the cost charge; and the excess of the economic charge over the cost charge, the cost charge, the congestion charge. The conditions of optimum management of the infrastructure which result from the general principles we have indicated are then as follows:

144

a) If, at a price equal to the cost charge, demand is below capacity, the congestion charge should be nil;

145

b) If, at a price equal to the cost charge, demand exceeds capacity, the congestion charge should be fixed at a level which is such that demand becomes stabilized at the level of capacity (3).

11.2 — *CONDITIONS RELATING TO CAPITAL EQUIPMENT FOR AN OPTIMUM ALLOCATION OF RESOURCES*

146

Since the theory of optimum resource allocation can easily be misinterpreted, we must be very explicit. Two cases have to be distinguished, according to whether the equipments are divisible or indivisible. These cases present striking similarities, but are nevertheless not identical. The first is that of the differentiated and the second that of the non-differentiated sector.

11.20 — *Differentiated sector — Divisible equipment*

147

In the differentiated sector the conditions (4) corresponding to an optimum allocation of resources are the following:

148

a) At the initial point in time when the production decision is made, the discounted value of the future net income expected from an item of capital equipment exceeds or equals its cost and the difference between these two quantities is maximum, at market prices considered as given;

149

b) At the initial point in time, the cost of any item of capital equipment (5) equals the sum of the discounted values of its expected future marginal net revenue;

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(1) See Subsection 11.02.

(2) See Subsection 11.00.

(3) When demand is subject to chance fluctuations it should be considered as a probability (see Sec. 11.6).

(4) For the sake of clarity, these various conditions are set out separately, but they are not all independent of each other.

(5) Viz., the market price for any component of equipment (such as a particular machine) and the marginal cost for every whole (such as a factory).

150

c) At any time, the price of utilization of any item of capital equipment equates supply and demand for the utilization of that item;

151

d) At all times the price of an item of capital equipment is equal to the discounted value of the future net income to be derived from it ;

152

e) At the initial point in time, the equipment's output is such that its marginal cost is equal to the market price, and the discounted costs of production are exactly covered by the discounted revenue from the output at market prices.

153

Conditions *a)* and *c)* follow from the fact that to arrive at a situation of optimum allocation of resources in the differentiated sector it is sufficient to apply the rules of a free market economy, in particular to maximize incomes (the market prices being considered as given) and to equate supply and demand through price.

154

Condition *b)* is a natural consequence of condition *a).*

155

Condition *c)* means that at all times the optimum price for the utilization of an item of capital equipment is in the nature of an economic rent, the level of which is fixed by confronting the available quantity of the item with the demand for its utilization.

156

Condition *d)* means that at all times the decrease in the value of the item, i.e. its amortization, is equal to its utilization value as determined by condition *c)* minus the interest on its value (1). If the forecasts were correct, the value of the item at any given time is equal to its residual value, i.e. its initial cost minus the total of the successive amortizations.

157

We therefore see that it is the scarcity rent attaching to the item which ensures coverage of the relevant financial charges but that, in terms of cause and effect, the utilization value determines the amortization, not the reverse.

158

The optimum amortization from the point of view of optimum resource allocation is determined by the scarcity rent and equals this rent minus interest charges.

159

From this angle, all the amortization rules usually employed are purely conventional. They may have their advantages for industrial accounting but they have no real economic meaning and, moreover, the actual amortization can only be effected in the light of the results of exploitation which themselves follow from condition *c),* i.e. from the demand situation for the goods produced with the aid of the capital equipment.

160

Condition *d)* is naturally closely linked with condition *c),* since both these relations determine amortization from two different formal angles.

161

If, on the average, returns from a given type of capital equipment are such that it is still capable of producing income after complete amortization of the initial cost (2), there would be an advantage in increasing production, and vice versa. The final result of these actions and reactions will be that the discounted value of the net returns actually derived from a given item of capital equipment will differ little from its cost.

162

Condition *c)* stems from the fact that the production of the services, supplied by the capital equipment, takes place in distinct production units and that competition, if present, tends to ensure optimum dimensions for these units which are such that discounted costs are exactly covered by discounted revenue at market prices.

163

All these conditions and their interpretation are relatively complex. But the case of the non-differentiated sector is still more difficult and is particularly germane to transport economy, since the whole infrastructure of transport falls within the non-differentiated sector.

11.21 — *Non-differentiated sector — Transport infrastructure*

164

In the case of a transport infrastructure, and taking account of the associated costs of management, the

(1) The full significance of this proposition becomes clear if we refer to the points in footnote (3) on page 21. Condition *d)* is expressed by condition (1) of this footnote and condition (3), to which the comments in the text apply, follows from this condition (1).

(2) According to the principles we have just indicated, with amortization determined at all times by the utilization price which equates supply and demand.

conditions of optimum allocation of resources are as follows:

165

a) At the initial point in time when the decision is taken to establish an infrastructure, the discounted net total value of the future final services expected to be derived from it should exceed its investment costs plus the discounted value of the management costs independent of traffic ([1]), the prices considered being at all times those at the stage of final consumption. This condition simply expresses the fact that the corresponding distributable surplus must be positive. The optimum size of the infrastructure must be such that the corresponding distributable surplus, which represents the total benefit derived from the infrastructure, is maximum;

166

b) At the initial point in time the marginal cost of building the infrastructure in relation to its capacity plus the marginal discounted value, in relation to capacity, of the management costs independent of traffic is generally equal ([2]) to the sum of the discounted values of the congestion charges, i.e. of the expected future marginal net income from the infrastructure;

167

c) At any later period the optimum price for using the infrastructure, i.e. the economic charge, is equal to the sum of the cost charge and the congestion charge ([3]);

168

d) At any time the residual value of the infrastructure is equal to the excess of the discounted value of the congestion charges over the discounted value of the management costs independent of traffic;

169

e) The marginal value, in relation to capacity, of the sum of the cost of establishing the infrastructure and the discounted value of the management costs independent of traffic is not necessarily equal to the average value of this sum per unit of capacity ([4]).

170

If the first element is smaller than the second there is a deficit, and this deficit is a negative rent.

171

For optimum allocation of resources this deficit must be financed by taxes on rents which are such as not to modify marginal behaviours in any way. Such taxes are said to be neutral.

172

All these conditions can cause real difficulties only at the time of the investment decisions, in calculating the distributable surplus and, during the period of operation, in the financing of the deficit.

173

Remarks similar to those already made concerning the capital equipment of the differentiated sector can, of course, be made about the interdependence of the different criteria of optimum management. However, there are two essential differences:

174

1. There is no tendency here towards equality of the discounted value of the congestion charges with the sum of the cost of investment and the discounted value of the management costs independent of traffic. There is only equality of the discounted value of the congestion charges per unit of capacity with the marginal value, in relation to capacity, of the sum of the cost of investment and the discounted value of the management costs independent of traffic.

175

2. There is no tendency towards equality of average values and marginal values, in relation to capacity, of the sum of the cost of investment and the discounted value of the management costs. The marginal value will be less than the average value if there are increasing returns.

176

The above remarks are essential for an understanding of the inaccuracies in certain very commonly held viewpoints. It is the complexity of the interplay of the first three conditions *a), b)* and *c)* which explains a very great part of the difficulties met with in the practical applications of the theory ([5]).

177

Condition *b),* a consequence of condition *a),* is generally the only one to receive attention, although *c)* plays a vital role. The precise implications of *a),* particularly with regard to *c),* are generally not clearly explained.

([1]) All these costs corresponding to the original factors of production, i.e. to the quantities of labour supplied (see Subsec. 11.01), so that utilities and disutilities must be compared at the level of final consumption (see Subsec. 11.01).

([2]) See condition *c)* of Subsection 11.20.

([3]) As defined in Section 11.0.

([4]) For instance, such will not be the case when theoretically optimum capacity is below the minimum which can technically be achieved, or when there are discontinuities.

([5]) See for instance Section 12.4 and Subsections 13.20, 13.22 and 13.23.

178

Condition *d)*, which is very important, is dealt with in the following section.

179

Conditions *a), b), c)* and *d)* occur in quite a similar way in the differentiated and the non-differentiated sectors. The essential result is that the utilization value of an item of capital equipment can follow only from the confrontation of supply and demand. Admittedly, in a situation of optimum allocation of resources, the marginal cost of all equipment (1) is equal to the discounted value of future marginal income therefrom. But this equality is an overall one and does not permit the optimum utilization value of the equipment to be determined from its original value. In view of its practical importance the question will be discussed below in some detail (2).

11.3 — *INCREASING RETURNS AND THE ECONOMIC DEFICIT*

180

There are increasing average returns if the total cost of production increases less than proportionately to production.

181

When production makes use of capital equipment it must be defined as the total of all the outputs considered, both present and future, and the total cost must be defined as the sum of the present and discounted future expenditures incurred by these outputs. Similarly, in the case of linked production all the quantities produced should be considered at the same time as the total expenditure. There are increasing returns if, when all the outputs are multiplied by a given factor *k)*, the total cost of production grows less than proportionately to *k)*.

182

Increasing returns provoke a deficit if prices and outputs are determined in conformity with the criteria of optimum resource allocation. The exact nature of this deficit must be studied, for it plays an important part in what follows.

183

In its basic economic sense the deficit is defined as the sum of all present and discounted future economic expenditures for all outputs considered minus the sum of all present and discounted future economic revenues at prices corresponding to an optimum allocation of ressources. Such a definition is strictly valid only at the point in time when the production process commences, or at the entry into service of the item of capital equipment. At a later date, the definition of the deficit brings in a term which is economically arbitrary but which could be fixed at the non-amortized value of the equipment. The deficit must then be defined as the sum of all present and future discounted expenditures plus the non-amortized part of the initial investment and minus the discounted value of all present and future revenue (3).

184

The existence of a deficit is linked with the existence of increasing returns and not with that of "fixed costs". According to a widely-held opinion, the application of criteria ensuring an optimum allocation of ressources would lead to a deficit equal to the "fixed costs" of production, such "fixed costs" being implicitly defined as that part of total cost not covered by revenue from prices equal to the marginal costs (4). This view, even if it were true in a general way, would obviously lead to the incorrect conclusion that practically every unit of production, whether in the differentiated sector or not, would incur a deficit if the criteria of optimum resource allocation were applied to it. This reasoning rests on a faulty interpretation of the rules for prices and production implied by those criteria (5). The criteria do not in fact imply that the price should be equal to the marginal cost plus. They demand that it should be equal to the marginal cost plus a marginal rent component. Under conditions of optimum allocation of resources and of continuity, the revenue from all present and discounted future marginal rents is just equal to the marginal investment cost of additional capacity (capacity being expressed in units of production) (6).

185

If we adopt this correct interpretation, the optimum prices can be seen to involve a deficit only in certain

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(1) Equal to its average cost in the case of the capital equipment of the differentiated sector.

(2) See in particular Subsections 12.22 and 13.10.

(3) The problem of defining the deficit will be examined in Part II of the report (see page 82, footnote (4)).

(4) Viz., the partial derivative of the total cost with respect to a particular type of production in a particular period, if this partial derivative exists. In the case of multiple production it is quite possible that such partial derivatives do not exist. As we will show in Subsection 12.40 this does not in any way alter the fact that the prices corresponding to an optimum allocation of resources are perfectly well defined.

(5) Another mistake often made is to assume that total cost, and consequently the deficit and amortization of the initial investment, can be determined separately for each separate period of time. No such determination is possible on the basis of economic criteria.

(6) See Subsection 11.02 and Section 11.2.

very special circumstances. In fact, capacity or current production must be subject to decreasing marginal cost, or the total production cost must include a constant component (due to an indivisible factor). The size of the deficit for any given output can be derived immediately from these features of the cost function.

186

As regards the definition of the deficit in the economic sense, three remarks of some importance for the subsequent analyses should be made here :

187

1. The total deficit is defined as the sum of discounted deficits for all the present and future periods considered. The deficit for each period is defined as the difference between expenditure and revenue.

188

If there is a possibility of borrowing, no special significance can be attached in practice to this pattern of deficits expected for each future year (or for any other period), since the pattern can be changed at will by floating loans or obtaining credit.

189

2. Economic theory provides no method of imputing the total economic deficit as defined above to the different outputs in each future period and for each different type. The same applies to the total cost. We will come back to this point in the next section.

190

3. The real financial deficit recorded during the whole future period is not necessarily equal to the deficit foreseen, for the forecasts may have been inaccurate.

191

In the following parts of this report we shall show that the building of infrastructure in the inland transport sector yields generally increasing returns. In fact the total investment cost grows less than proportionately to capacity. This is the case in all three modes of inland transport. However, the existence of increasing returns in infrastructure by no means implies that competition is excluded within and between all the types of inland transport. In both road and inland waterway transport, it is possible — and is in fact current practice — to exploit infrastructure as a distinct "industry", separate from the provision of transport services. By charging prices for the use of infrastructure which, for the individual carrier, do not reflect the increasing returns from that infrastructure, road and inland waterway transport are reduced to a situation of "institutional convexity" (1). Competition is then possible in these sectors. In the case of the railways a solution of this type seems impracticable for technical reasons: decentralized operation of transport services by competing operators on one and the same network is impossible.

192

We have already shown that there are basic economic reasons for considering infrastructure and transport services separately, not only on the plane of pure and applied economic theory, but also, and particularly, with regard to practical problems. The distinction between these two stages in the process of the production of transport services will therefore be made everywhere in the rest of the report. A theoretical analysis of the problems peculiar to infrastructure will be submitted in the last chapter of this Part.

11.4 — *CONVEXITY, STABLE EQUILIBRIUM AND EFFICIENCY*

193

If the rules of the free market economy as set out above (2) are observed (3), a decentralized regime in transport can give rise to situations of unstable equilibrium only when there are increasing marginal returns — which, generally speaking, can only occur in practice for decisions of investment in transport infrastructure (4). We have also pointed out that, for a given system of infrastructures, the stable equilibrium resulting from application of these rules would correspond to a situation of optimum resource allocation which is in accordance with the interest of the community, in so far, of course, as maximum efficiency of the economy is aimed at.

194

This being so, once infrastructures exist, application of the optimum prices as defined cannot have injurious consequences for the community from the

(1) This is naturally the case if the prices correspond to an optimum allocation of resources, for they are then independent of infrastructure costs and hence of the increasing returns for this infrastructure.

(2) See Subsection 11.02.

(3) We shall study later the cases of uneconomic competition and abuse of dominant positions, in which these rules are not observed.

(4) In fact, as we have already pointed out, in the field of current operation, i.e. for a given equipment (in the case of transport for a given infrastructure), increasing marginal returns may be considered unlikely. On the other hand, for the construction of indivisible equipment, particulary infrastructure, marginal returns can increase. This is one of the reasons why investment in infrastructure must be centralized.

point of view of economic efficiency (1) — quite the contrary !

195

In fact, if two modes of transport compete over a given route there can only be optimum allocation of resources in one of the three following cases:

196

a) The two modes are in a situation of decreasing or constant marginal returns on the route, and equilibrium is stable;

197

b) One mode only is in a situation of increasing marginal returns, the other being in a situation of decreasing marginal returns, and equilibrium may be unstable;

198

c) The production of substitutable services is concentrated in one only of the two modes (2).

199

Application of the rules of a free market and competitive economy is not incompatible with the criteria of optimum resource allocation except in case *b),* in which marginal returns are increasing in one mode of transport. But, as we have just recalled, this practically never occurs in the supply of transport services from given infrastructures.

200

Hence, if a new infrastructure is built and traffic is transferred to it to the detriment of older infrastructures, the loss of traffic cannot be considered undesirable from the point of view of economic efficiency, because it would simply be due to the impossibility of meeting the financial burdens of the old infrastructures.

201

The resulting decline in the rent components can lead to "losses of capital" and financial difficulties. But, from the economic point of view, the losses are only apparent and correspond in reality to a more efficient economy. These conclusions are valid whether the decision to build the new infrastructure was correct or not (3).

202

If we consider that increasing marginal returns are generally encountered only in connection with infrastructures, we see that the danger of instability and inefficiency is, in practice, only very marked when decisions to invest or disinvest in infrastructure are taken; but then it is unfortunately only too real. Decisions which are economically faulty are then bound to have very unpleasant economic consequences.

203

When, for one reason or another, mistakes have been made, nothing would be more regrettable than to oppose an optimum economic management, whatever harmful economic consequences it might appear (but only appear) to have.

204

It must be realized that optimum decisions on investment or disinvestment in infrastructure cannot be arrived at by applying the usual criteria of a price-based decentralized economy, and this is why we go on to recommend co-ordination of infrastructure investments.

11.5 — *TOTAL BENEFITS AND SURPLUSES*

205

The total benefit for a "final consumer" from utilization of an infrastructure, expressed in money, is equal to the most that user would be prepared to pay to retain the advantage of utilization. The surplus is equal to this total benefit minus what the user actually pays. In a situation of optimum resource allocation the surplus thus equal to the total benefit less the price corresponding to an optimum allocation of resources.

206

At the outset the total benefit from an infrastructure is equal to the sum of the discounted total benefits for the different users.

207

At least as a first approximation, the distributable surplus (4) in money terms corresponding to the establishment of an infrastructure can be considered as equal to its total benefit less the sum of its investment cost and the discounted value of its management costs independent of traffic.

208

If it were possible to levy neutral taxes on the rents of the final users there would be no deficit. But

(1) The social aspects will be examined later.

(2) Case *b)* shows that it is wrong to claim, as is often done, that whenever a sector is subject to increasing marginal returns at the optimum level of production, the principle of minimization of costs would necessarily entail concentrating all the output of the sector in a single unit of production.

(3) This question of loss of traffic will be examined again in Part II, in particular from the angle of the deficit.

(4) As defined in Section 11.1.

such a levy meets with a great many difficulties. The discounted revenue from the congestion charges would only cover the marginal value of the costs of establishing and operating the infrastructure. Hence a deficit, consideration of which will play an important part in what follows.

209

The practical difficulties in evaluating the consumers' surplus are well known. They are particulary complex in the case of a sector which produces not a final good but a factor of production. The consumers' surplus is then the maximum sum which the final consumers would be prepared to pay to prevent the effect that elimination of the factor would have on the prices of the final goods. It is important to emphasize here that the surpluses connected with the various stages of the production process ("the producers' surplus" and "consumers' surplus") cannot be added together, since this would lead to duplication. It should also be noted that in general the consumers' surpluses relating to different final goods (or different factors of production) cannot be added together either. For two complementary goods, the total surplus is lower than the sum of their individual surpluses. For two substitutable goods, the total surplus is higher than that sum (1).

11.6 — *CONGESTION — PHYSICAL AND ECONOMIC*

210

The concept of congestion, and its implications for the operational rules of optimum resource allocation, call for some comment.

211

The sight of empty seats in a train may lead us to conclude the existence of a situation of increasing returns, in which the optimum tariff would be equal to the marginal cost, that is to say extremely low. Thus, in the case of a traveller arriving at a station when there are still empty seats in a train about to leave, we may be tempted to think that, since the marginal cost of the transport is lower than the price of the ticket, it might be wortwhile granting him a reduction to persuade him to take the train.

212

However, the situation must be interpreted in economic terms. If the railway system is managed in such a way (as in fact it is, expressly or by implication) that the probability of being unable to carry a seated passenger is fairly low (probability of failure), it is certain that when p = 1 : 1 000, for instance, 999 times out of 1 000 there will be empty seats in the train.

213

Nevertheless, in such a situation the train must be regarded as being fully utilized in economic terms, and hence there is no reason to grant our traveller a reduction. The explanation for this is that the service sold by the railway company is transport plus the certainty of transportation, and in fact the tariff ensures equality between the expected demand and the capacity of the train, with the probability of insufficient capacity reduced to p. A careful distinction must therefore be made between full utilization (congestion) in the economic and in the physical sense, or, in more technical terms, between the real non-increase in average or marginal returns and their apparent increase.

214

These considerations can, of course, be applied without difficulty to transport infrastructure. They show that it is not possible to conclude economic non-congestion from apparent non-congestion.

11.7 — *REALIZATION OF THE CONDITIONS OF OPTIMUM RESOURCE ALLOCATION*

215

To achieve optimum resource allocation, two basic procedures can be applied *a priori*. The first is to have the system of optimum conditions formulated and applied by a central agency, the second is to organize the economy on a decentralized bases and apply the operational rules we have indicated (2).

216

From a strictly logical point of view, the two solutions are equivalent in that they do not involve any contradiction. But on the technical plane the first presents two intrinsic difficulties: how to keep the central office informed of the preference indices of the operators and the functions of production, and how to resolve a system of equations containing very many unknown quantities (3). These two difficulties are practically insurmountable, even with the aid of the most powerful means of calculation available today.

217

The second solution therefore appears preferable to the first, irrespective of whether the means of production are privately or publicly owned.

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(1) Some aspects of the consumers' surplus which are particularly important in transport will be examined in Section 22.2.

(2) See Subsection 11.02.

(3) Strictly speaking, such a system would include tens of millions of equations with hundreds of millions of unknowns.

218

However, various degrees of decentralization can be imagined. Choices in this respect must take account of physical or economic indivisibilities and the psychological, sociological and political circumstances. This is why an economy organized on the principle of decentralization must operate in an appropriate institutional framework which is such that various operators apply the rules we have specified above, some of which differ according to whether they concern the differentiated or the non-differentiated sector.

219

In all the differentiated fields (which include production of transport services on the basis of existing infrastructures, with the exception of the rail services, for which there may be increasing marginal returns), application of the rules of the free market economy cannot fail to lead to situations of optimum allocation of resources (1).

220

As we have already pointed out, these rules cannot be applied as they stand to the transport infrastructures themselves, since the rule of maximization of the discounted net income at current prices is no longer necessarily valid. Hence the only possible procedure is to centralize decisions on investment or disinvestment in infrastructure. But this question only arises at the time when the decision is taken to build an infrastructure. After the decision has been taken, the situation is generally one of constant or decreasing marginal returns (2)

(1) See Subsection 11.02.
(2) Viz., conditions of convexity.

CHAPTER 12

SCOPE AND SIGNIFICANCE OF THE CONDITIONS OF OPTIMUM RESOURCE ALLOCATION

12.0 — *GENERAL*

221

The conditions we have just outlined — or at any rate most of them — are very simple, but difficulties may arise if they are wrongly interpreted. We therefore believe that an exposition of the practical significance of these conditions will be of use here.

12.1 — *THE SIGNIFICANCE OF OPTIMUM RESOURCE ALLOCATION*

222

It follows from what has been said that an optimum allocation of resources implies no more than that the economy is using its productive capacity at maximum efficiency, i.e. in such a way that there is no possibility of achieving a better result with the same means. This criterion does not define a particular situation of the economy. i.e. a specific combination of goods and services produced and consumed, in the present or in the future. It implies only that the preferences of society, whatever elements these comprise (notably, individual and collective wants), should be satisfied as fully as possible by the available resources of society (i.e. the factors of production: labour, natural wealth and existing capital assets). If the economy is to meet the requirement of maximum efficiency as defined above, a number of conditions must be fulfilled, and it is these that constitute the criterion of optimum resource allocation.

223

Assuming that preference indices can be defined for the various consumers, whoever they may be (1), and that the index for each consumer is dependent only on his final consumption, the conditions for an optimum allocation of resources are particularly simple and practical.

224

The conditions relating to the production sector are, moreover, untrammelled by any assumption as regards preference indices. They are related to the boundary of all possible combinations of final goods and services which could be produced now and in the future, given the productive resources available to society at present. This boundary-line itself denotes all combinations of goods and services which are such that production of any one component cannot be increased without reducing production of other components. Thus the boundary links all attainable situations of maximum efficiency. Naturally any policy which seeks to be economically efficient should take into account the conditions characterizing this boundary.

225

Optimum allocation of resources implies that all the available factors of production are utilized to the full and at maximum efficiency. Thus, full employment is one of the conditions of an optimum allocation of resources. Similarly, since a policy aimed at stimulating economic growth implies an optimum utilization of resources and technical knowledge, it must include the conditions of an optimum allocation of resources.

226

In the case of the preference indices of the various consumers, we have shown it to be possible to define, just as for physical quantities, an area of maximum possibilities which is the boundary between the possible and the impossible. At any point on this boundary the preference index of any operator must be at the maximum when the other indices have given values. And any economic policy that seeks to allow for the preferences of final consumers, whether these consumers be individuals or private or public groups, must, of course, take into account the conditions characterizing this boundary.

227

Consideration of the preference indices is based on no other assumption than that any operator gives preference to whatever he deems preferable. This assumption is, in turn, based only on the assumption that ordered fields of choice exist. This amounts to supposing that, for any final consumer (whether an individual or entity of any sort), the various possible groups of consumptions can be arranged in order of preference. Hence, it is possible to define a preference index (or preference function) for each operator which is such that this index increases when a given consumption is replaced by a consumption the operator prefers.

(1) That is, if one can assume that ordered preference fields exist.

228

It is also important to emphasize that the conditions found for an optimum allocation of resources may be deduced without taking any account of the "social welfare" function (1) (which gives rise to a great number of well-known difficulties that do not fall directly within the scope of the present inquiry), but that if the social welfare function is taken into account it must be an increasing function of the preference indices of the various operators (2). For any distribution of income there is one, and only one, situation of optimum resource allocation. Therefore, in so far as the distribution of income is regarded as equitable, there can be no contradiction between the conditions for equity and the conditions for an optimum allocation of resources.

229

In fact, although in theory the conditions of maximum efficiency corresponding to any given distribution of income can always be determined, in practice difficulties arise when the aim is to achieve, in a "neutral" manner from the point of view of optimum resource allocation, such transfers of income as are considered desirable; we shall give many examples of this later on.

12.2 — *THE CONDITIONS FOR OPTIMUM MANAGEMENT*

12.20 — *The marginal conditions*

230

If the conditions for an optimum allocation of resources are fulfilled, all the marginal equivalences of all goods and services, considered in pairs, are equal for all operators taking decisions on consumption and for all units of production when the corresponding quantities are continuously variable. These marginal equivalences are equal to the ratios of the corresponding prices.

231

This is so in both the non-differentiated and in the differentiated sector. Utilization of a sigle price system by all economic agents, consumers or producers, is thus seen to be an essential condition for optimum allocation of resources.

232

If optimum allocation of resources is not attained in the production sector, equality of the marginal equivalences is not attained, and it is no longer possible to give a univocal definition of the marginal cost of a particular output, since this can only be done if costs are minimized.

233

Even so, consideration of the various marginal costs for the different factors can, of course, provide information which is useful in guiding the production process towards greater efficiency. But as long as marginal costs have not been equalized, use of the marginal cost to fix the optimum selling price has no objective basis, and the error is the greater, the greater the divergence.

234

It follows from this that prices can only have their full economic significance when costs are as low as possible.

235

When the factors of production are not continuously variable, price and marginal cost are no longer equal. This is the case, for instance, when an infrastructure is fully utilized; here the optimum price is equal to the sum of the cost charge and the congestion charge (3).

236

Consequently, it would seem preferable to reject the usual formulation of the condition for an opti-

(1) This is the function P mentioned in Section 10.0.

(2) Whether these indices refer to individual consumers or to entities of any sort that take decisions on consumption.

(3) The marginal cost of current output is defined as the partial derivative of the cost function with respect to current output. Given the capacity of the durable factors of production, it is generally defined only up to the point of full utilization of these factors (for a discussion of the concept of full utilization in the relevant economic sense, see Section 11.6). At the point of full utilization in the physical sense, only the partial derivative in the negative direction will generally be defined. When the text refers to "marginal cost at the point of full utilization", it is this derivative in the negative direction that is meant. To avoid the necessity of introducing a scarcity rent not having the nature of a cost, some writers say that when output approaches the limit of full utilization the marginal cost will in general rise very steeply, reflecting the fact that the cost of producing an additional unit (i.e. the cost in terms of the variable factors of production) increases rapidly as the limit of capacity becomes more and more of a bottleneck. Unless factor proportions are completely rigid, this means that the optimum output condition, formulated as the equality between marginal cost and price, could likewise be applied. This argument is, however, almost meaningless from a practical point of view, and it is even highly misleading, because the measurement of the marginal cost function close to the point of full utilization is obviously subject to a very high probability of error. In practice, the marginal cost function can be (and in fact usually is) approximated by a constant only up to the point of full capacity in the economic sense. Beyond this point, any attempt to regard the scarcity rent as a cost makes no economic sense. In fact, at the limit of capacity it is generally not possible to define the optimum condition for a given enterprise in terms of equality between marginal cost and price; this condition should be formulated as indicated in the text. It follows from this that the optimum price will generally exceed marginal cost whenever production takes place at the point of full utilization of capacity.

mum allocation of resources (i.e. that output should be pushed to the point where the marginal cost is equal to the price of the product) — a formulation which may be inaccurate — and to retain the correct proposition, which consists of the following conditions:

237

a) The marginal investment cost of the equipment is equal to the discounted value of its future net marginal receipts;

238

b) Production should take place at the point where the existing durable factors are fully utilized, if the marginal cost at that point is equal to, or less than, the price which equates supply and demand; otherwise, production should take place at the point where the marginal cost is equal to the price.

239

Here we might emphasize once more that these conditions cannot exert their full effect, from the point of view of optimum resource allocation, unless the total cost of production is minimized at the same time.

12.21 — *Minimization of costs*

240

The various points dealt with above lead to the conclusion that optimum resource allocation can only be achieved if each production unit minimizes the total cost of its production — expressed in discounted value and taking all prices as constants for the purposes of such calculations (1).

241

There would be little need to discuss cost minimization here, were it not for the fact that this principle, which is an essential criterion for optimum allocation of resources, is often disregarded in applying economic theory (2).

242

In fact, where practical applications are concerned, it is important to stress the need for cost minimization, and to consider it as a separate requirement that even takes precedence to some extent, both theoretically and practically, over the other maximum conditions corresponding to an optimum allocation of resources. As we have just shown, the "marginal" conditions can only play their full part if the condition of cost minimization is fulfilled. If this is not the case, the formal conditions of equality between prices and marginal costs lose some of their effectiveness; moreover, it is then no longer possible to give a univocal definition of marginal costs. For this reason, cost minimization may be regarded as having a certain logical priority, and it must be clearly understood that in practice, if costs are not minimized, most of the criteria corresponding to an optimum allocation of resources can have only a very limited effect.

243

Cost minimization is also a requirement of great practical importance, in that constant readjustment and constant pressure are needed to ensure that production actually takes place at minimum total cost. To disregard these conditions in one way or another involves the very real danger of a serious misallocation of resources.

244

For all these reasons, when the criteria for optimum allocation of resources are to be applied, it is important that the principle of cost minimization should be emphasized.

245

The most important practical problems raised by cost minimization are of an institutional and technical nature, because it calls for a continuous readjustment to changing conditions, the rapid adoption of new techniques, and a constant effort to develop such new techniques. It is in fact largely because of the problems they pose with regard to cost minimization that the dynamic aspects of optimum resource allocation play an essential role.

246

The economic system should be organized so as to exert the greatest possible pressure in favour of cost minimization, interpreted in this general dynamic sense. Competition need not be perfect in order to be effective. Even if there are no products that are perfect substitutes (such as a homogeneous commodity produced by various independent operators), competition may exert sufficient pressure to ensure that costs are minimized. Nevertheless, competition is not always sufficiently powerful, nor can it always exist, because there may be, for example, positions of substantial monopoly power that are the result of inherent economic facts, such as increasing returns. In such cases it would be necessary to devise appropriate institutional measures by which sufficient pressure could be exerted to bring about cost minimization. This point will be important in the subsequent parts of this report.

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(1) Total cost must be defined as the sum of present and discounted future expenditure incurred in the production process. The length of the period to be taken into account depends upon the economic life of the capital equipment or upon the economic horizon, whichever is the shorter.

(2) For example, much of the literature emphasizes marginal conditions to the exclusion of almost all others.

247

It is also worth mentioning that the theory of optimum resource allocation presupposes a study of the optimum conditions for utilization of available resources, quantities of which are limited, the aim being to satisfy demand as fully as technical knowledge permits. But it is clear that in a dynamic situation such technical knowledge can no longer be taken as a constant. This raises a major problem, that of technical progress; rapid technical progress can only be achieved within an appropriate institutional setting.

12.22 — *Price-determined equality of supply and demand*

248

As we have shown, in a situation of optimum resource allocation everything happens as though there were explicitly or implicitly a single price system for all economic agents, representing their marginal equivalences.

249

This price system is such that, for each good, demand is equal to supply at any one time or place. This condition, which is essential for optimum allocation of resources, is all too often misunderstood.

250

It implies, that, in every production process, the price must be equal to the marginal cost of production excluding any return on durable equipment if that equipment is not fully utilized [1], and that, if this is not so, the price must be equal to this marginal cost plus a rent just large enough to ensure that demand is equal to productive capacity.

251

Thus the optimum price of utilization of an item of capital equipment is the sum of two components:

i) The marginal cost of production, and

ii) A marginal rent.

252

The second component is nil when capacity is not fully utilized; otherwise, it is just large enough to limit demand to the available capacity of the equipment. This component is therefore determined by comparing the available quantity of the capital equipment with the demand for the product.

253

It should be emphasized that the second component is not a "cost" in any sense of the term, nor can it be interpreted as a cost. It is a pure scarcity price, serving to limit demand to the available capacity of the capital equipment. Of course, as the investment decision has normally been taken in such a way that the discounted value of these rents per unit of capacity is equal to the marginal cost of the equipment, this component will not always be nil — in fact, not usually — for if that were so the investment decision would have been incorrect.

254

From this analysis [2], two important conclusions can be drawn with regard to the optimum price. The first is that the optimum price is usually not equal to the marginal cost. This should be obvious from what has just been said, but it is nevertheless worth emphasizing because the opposite opinion is very widely held. The second is that it is not usually possible to determine the optimum price at a given moment simply from cost factors. This is because the rent component of the optimum price cannot, by its very nature, be determined from cost factors.

255

It follows that it is also not usually possible to fix an optimum price and output policy by determining the production price *a priori* from the marginal cost (or any other measure of cost) and leaving output to be determined by the demand at that price.

256

Of course, it is generally possible to determine the pattern of the rent component in time if the demand and cost conditions are specified. This is, for example, what happens in the case of capital equipment with a constant rate of output. In that case, the rent is fixed, on the average, at a level which is such that the marginal equipment cost can be seen to be equal to the discounted value of the rents. If this discontend value remained, on the average, higher than the cost, output would be increased; in the opposite case it would be decreased. But only the averages are then equal, whereas optimum allocation of resources requires — and efficiency is, of course, in the interest of society — that the price of an item of capital equipment at any one moment should be such as to ensure that demand is equal to capacity.

257

The rent component makes it possible to cover, on the one hand, amortization and the interest on capital not due for repayment and, on the other, the fixed costs that are not dependent on the volume of production. But the best schedule amortization cannot be determined *a priori*. It must be fixed

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[1] In the economic sense of the term (see Sec. 11.5).

[2] This is very important for the purposes of diagnosing uneconomic competition and fixing upper and lower price limits.

at each period in terms of the price that will equate demand with capacity.

258

It is thus clear, that if the optimum production price is stable, the following conditions should also be satisfied:

259

a) Demand is constant or is continuously increasing (1). If demand decreases at any particular time, the existing capacity of the capital equipment will no longer be fully utilized; in order to ensure its full utilization, the price will have to be lowered (and consequently the rent component of the price);

260

b) All past and present investment decisions are correct. This in turn implies perfect forecasting;

261

c) The capital equipment is continuously divisible. When this condition is not fulfilled capacity (and therefore rent) will vary over a period of time if demand is constant; but if demand is continuously increasing, capacity cannot be fully adapted to demand at any one moment, and rent will therefore vary again.

262

These three conditions are, of course, highly unrealistic, especially the second (that all past and present investment decisions are correct). Moreover, it is particularly unlikely that the first condition (constant or continuously increasing demand) will be satisfied in respect of services that cannot be stored and for the different quantities of which, produced at different times, there are no perfect substitutes. Also, there are several cases in which the condition that the capital equipment be continuously divisible may not be met; one of these is the case of infrastructure, which we shall examine later.

263

The conclusion to be drawn from all this is that the rent component, and therefore the optimum price, is generally not constant, and that the rent component cannot usually be determined from cost factors alone. For a given available capacity of equipment — regardless of whether it is the result of correct or incorrect investment decisions — the optimum price is determined by comparing the intensity of demand with that capacity. Marginal cost determines the optimum price only when the available capacity is not fully utilized; but we have shown that this is not general.

264

With this analysis in mind, the problem of peak demand presents little difficulty. The criteria of optimum resource allocation imply that at times of peak demand, when capacity is presumably fully utilized, prices should be fixed at a level which is such as to limit demand to the available capacity; at times when demand is slack and capacity is not fully utilized, prices should simply be equal to marginal costs. Investment in additional capacity should be undertaken if the expected additional revenue, i.e. the sum of discounted future marginal rents, exceeds the marginal investment cost.

265

Only one problem arises here: in pricing output at times of peak demand and at times when demand is slack, account should be taken of the elasticity of substitution. For simplicity's sake we have not mentioned this consideration before. The prices should be such that capacity will remain fully utilized at times of peak demand (i.e. the price should not be so high as to induce a shift of demand that will reduce utilization to a point below capacity) and no excess demand will develop at times when demand is less intense. For the rest, the above conclusions can be applied without modification.

266

When demand tends to fluctuate, prices should be highly flexible. Flexibility has obvious advantages, which will be discussed with particular reference to transport services in Parts II and III of this report. It ensures that capacity is fully utilized at times when demand is weak. It does this in two ways: firstly, with flexible prices the selling price of output produced at these times of slack demand is low because it is equal only to the marginal cost; secondly, with flexible prices the selling price of output produced at times of peak demand is high, which may automatically induce a shift of demand towars periods when utilization of capacity is low. Furthermore, at times of peak demand such flexibility makes it possible to use the price system to ration the available capacity (i.e. by means of the rent component) and avoid adopting other rationing methods which not only distort investment decisions (since these depend on the rent component) but may also be less efficient from a general economic point of view.

267

This analysis applies in toto to all capital equipment, whether movables such as lorries and locomotives or fixed infrastructure installations such as roads and railway lines. Later in this report a special study will be made of the case of infrastructure, for which the analysis is particularly important.

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(1) Strictly speaking, it is sufficient to assume that demand never decreases faster than the natural rate of deterioration of the capital equipment.

12.23 — *Investment and operation*

268

The price and output policy implied by the criteria of optimum resource allocation can be derived from the general theory. We have shown that the prices and quantities corresponding to an optimum allocation of resources — investment in durable assets, and current output and current price — are determined simultaneously for all present and future periods that are linked by the common utilization of capital equipment.

269

This interdependence becomes clearly evident when it is remembered that investment depends on output and price in the current period and in all relevant future periods. But, as we have seen, it is none the less essential to define separately the optimum conditions for, on the one hand, investment in capital equipment and, on the other, the price and quantity of current output. This approach is inspired by the fact that these two aspects of the total problem represent two apparently distinct types of decisions, both of which must be taken in the present. It must, however, be constantly borne in mind that the two types are interdependent.

270

When we examine current output and price, the available capacity of the capital equipment is taken as given. In this context, and in a situation of optimum resource allocation, the optimum price and output can, as we have seen, be regarded as depending on two conditions:

271

1. Output is equal to the quantity demanded at the price charged.

272

2. The price must be equal to the marginal cost of output if capacity is not fully utilized at that price; if capacity is fully utilized, the price must exceed the marginal cost by an amount sufficient to ensure that demand remains at the level of current productive capacity.

273

Investment policy should satisfy the condition of equality between marginal investment cost and marginal value of the sum of discounted future revenue, prices being taken as constant.

274

The above conditions relate to a situation in which optimum allocation of resources is achieved. The operational rules that should be adopted in order to arrive at such a situation are somewhat more complex, and differ according to whether one is dealing with the differentiated or the non-differentiated sector [1].

275

In the case of transport, economies of scale do not seem particulary important except where infrastructure is concerned; such economies can, moreover, only be made at the moment when decisions are taken to install or to close down. From this it is obvious that management of the current output of transport services is generally much simpler and raises far fewer difficulties, at least on a general line.

12.24 — *Only the future counts*

276

Where optimum allocation of resources is concerned, only the future is relevant. A decision can only be beneficial if it takes account of the future alone — the immediate as well as the future.

277

In consequence, the principles of an optimum policy must be determined quite independently of the past, i.e. of past costs.

278

This does not mean, however, that the past is to be ignored entirely: virtually no forecast can be made without taking the past as a basis. Consequently, although only the future must be considered when an optimum policy is formulated, the past plays a part by providing information on the future and can and must be used to check forecasts.

279

If, moreover, the forecasts made in the past have been correct, we find that what cost a lot is still worth a lot. But this in no way detracts from the value of an asset equals the discounted value of its future income and thus depends on such income alone.

12.3 — *INCOME DISTRIBUTION*

280

In any situation other than one of maximum efficiency, economic theory shows that there are ways in which the economy can be modified in accordance with environmental conditions, and which are such that, as a result, all operators will find themselves in a situation that is preferable.

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[1] See Subsection 11.02.

281

In pratice, however, it is usually very difficult to find modifications that will benefit everyone and also be politically acceptable and sociologically attainable. For one thing, the legitimacy of certain existing situations may be disputed — they may arise from positions of *de facto* or *de jure* monopoly power; also, the distributable surplus that it is possible to obtain may be apportioned in very different ways, depending on the methods envisaged.

282

It is a fact — and a very important one — that the creation of an efficient economy raises very many ethical problems connected with the distribution of incomes. The system adopted to promote efficiency may be thought not to result in an ethically acceptable distribution. The equation of supply and demand by price (i.e. the rationing by price of an almost limitless demand for scarce resources), which is necessary to achieve efficiency, is only ethically acceptable if the distribution of incomes can be considered "right". Similarly, the "capital losses" inevitably incurred when the economy is transformed in a way that is beneficial to society as a whole, but which puts the whole burden of progress on certain people only, may also be deemed unacceptable for ethical reasons. Compensation for such capital losses will then be deemed necessary.

283

In theory, it is possible, to achieve any particular distribution or redistribution of incomes that society desires, and to obtain all the resources necessary to satisfy collective wants if this is thought advisable, by transfers of income that do not affect the marginal decisions of economic agents (consumers or producers), i.e. by transfers of "rent" income that may be termed "neutral transfers". But this assumption is, admittedly, unrealistic; it can only serve to separate the problems of financing collective wants and of income distribution from the aspects of economic efficiency with which this report is concerned.

284

We shall examine later [1] some aspects of the link that may exist in practice, through the price system, between economic efficiency and the question of income distribution or other questions when this assumption of neutral transfers is not made.

12.4 — *IMPUTATION OF COSTS*

12.40 — *Imputation of costs to different outputs at a given moment*

285

Linked production occurs when two or more goods, which are not perfect substitutes for each other at either the consumption or the production stage, are obtained by the same production process, i.e. by processes using at least one factor of production in common. On a formal level, linked production is entirely analogous to production of a single homogeneous good over a period of time with the aid of capital equipment. The former case raises the problem of imputation of costs to different outputs at a given moment, the latter the problem of imputation of equipment costs over a period of time. In practice the two problems are indissolubly bound up together, but for the sake of clarity it will be advisable to study them separately.

286

There are two types of linked production, differing both in nature and origin. However, since they give rise to exactly the same problems of imputation no distinction will be made between them in this report. Nevertheless, a brief analysis of the two types can profitably be given here, since their differentiation plays a part in discussions of transport policy [2].

287

The first type of linked production occurs when the various categories of output make use of exactly the same aspect of the factor of production they have in common. For example, all the categories of traffic on a particular road at a given moment are using the common factor "road" in exactly the same way. The various services produced by the road (i.e. the passage afforded to the various categories of traffic) can be substituted for each other to a certain extent, and are mutually exclusive. Common production will therefore generally take place only if the common factor is subject to increasing returns. If it is not, the goods and services could just as well be produced separately, and one would then be dealing with the differentiated sector, which is characterized by constant or decreasing returns. A problem of imputation therefore arises, because the prices corresponding to an optimum allocation of resources occasion a deficit which can only be shared out among the various categories of traffic by conventional means.

288

The second type of linked production occurs when the various categories of output make use of different aspects of the factor of production they have in common. One example of this is the production of coke and gas at a gasworks. Another example is the capital equipment employed in production at

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[1] See Chapter 21.

[2] In the literature on this subject the two types of linked production are often given special names, such as "common production" and "joint production" respectively.

different times. Examples of linked production in the customary sense are the irrigation and traffic functions of certain canals, and rail transport in opposite directions effected by the same rolling stock. The services rendered by a common factor are imperfect substitutes in production, and they may even be available only in fixed, or virtually fixed, proportions. A problem of imputation may arise in the latter case as in the former.

289

In both types of linked production, the optimum prices can only be arrived at by considering the entire combined output.

290

Let us begin by considering the output of a road, as an example of linked production of the first type. If there is no congestion, the separate prices are equal to the marginal costs of production, but the level of the marginal cost may depend upon the volume of total output, since common production implies increasing returns to the common factor. If there is congestion, the optimum prices depend upon the contribution of each category of vehicles to the congestion.

291

Similarly, in the second type of linked production, the optimum prices of the different services rendered by the common factor depend on the demand for these different services. If the aim is to achieve optimum allocation of resources, and if the composition of demand is variable (as, for example, in the case of transport in opposite directions), prices should be flexible so as to ensure optimum output. In addition, the criteria of optimum resource allocation require that every aspect of the price for their utilization should be equal to the marginal cost (1). In certain cases, particularly if the proportions are fixed or almost fixed (as in the case of transport in opposite directions), great differences may result between the optimum prices of the separate outputs.

292

In conclusion, when different goods or different services are produced by the same process, the total cost must be defined as the sum of all expenses incurred in the process. The prices of the various categories of output can only be determined simultaneously and by imposing the condition that supply and demand be equal. A problem of imputation arises if the prices corresponding to an optimum allocation of resources occasion a deficit. This problem is the same for the two types of linked production that have been analysed above. The problems of imputing the deficit to the various categories of output will be examined in Part II of this report (2).

12.41 — *Imputation of costs in time, and amortization*

293

According to a widespread misapprehension, the prices that would correspond to an optimum allocation of resources can be determined by distributing the total cost of production among the various components of output (3). This view is incorrect for several reasons. The three basic fallacies involved are the following:

294

1. The idea that an optimum allocation of resources requires that total discounted revenue be equal to total discounted cost. This view is erroneous. As we have seen, a sector will incur a surplus or a deficit according to whether it is subject to decreasing or increasing returns. Only in the special case of constant returns coupled with consistently correct forecasting of future demand (so that the capacity of the capital equipment is always perfectly adapted to demand) will total revenue be equal to total cost at optimum prices (4).

295

2. The idea that the prices corresponding to an optimum allocation of resources can be determined by distributing the total cost of production among the various components of output, the price of each component being fixed so as to equal the average of the "total cost" per separate component thus determined. The only problems which should arise in a distribution of the total cost in this way concern the prices of the common factors employed for the production of several different components of output. This is the case with the capital equipment for outputs produced at different times, and with the common factors employed in linked production. The distribution of these elements of the total cost among the various components of output is commonly referred to as "amortization" in the first case (capital equipment) and "imputation" in the second (common factors) (5).

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(1) Viz., to the partial derivative of the total cost, the capacity of the common factors being taken as constant.

(2) See Section 24.4.

(3) We have defined total cost as the sum of present and discounted future economic expenditure incurred in the production of all the outputs in question.

(4) In a situation of competition, the surplus the sector may achieve in the case of decreasing average returns takes the form of rent payments that will be considered as a production cost by the individual operators. For each individual operator total cost will equal total revenue, provided his forecasts with respect to future prices are consistently correct (so that capacity is always perfectly adapted to demand).

(5) A special analysis of such imputation was given in Subsection 12.40.

296

This view is also erroneous. The optimum prices are simply not equal to the average distributed costs, whatever the method of distribution adopted, except in very special cases.

297

3. The idea that the prices corresponding to an optimum allocation of resources can be determined from past expenditure. This idea is not an absolutely essential element of the point of view in question, but it is practically always linked to it. It implies that distribution of the total cost takes place not as a function of future prospects but on the basis of past costs. The method used consists in charging each successive period of the economic life of an item of capital equipment with a part of its initial investment cost. The initial cost and the length of the economic life of the asset in question may be adjusted in the course of time, but this does not change the fundamental fact that this method is essentially based on past expenditure. Whatever practical advantages it may have, this is a fatal flaw from the point of view of both pure and applied economic theory. Past expenditure is completely irrelevant to present decisions, whether they are based on the criteria of optimum resource allocation or on the (often coincident) requirement of maximization of net discounted revenue (1). To be sure, past experience does generally provide information of use in guiding present decisions. But this certainly does not mean that current prices should be based on past expenditure, no matter how the latter are "corrected" to allow for changed economic conditions.

298

In view of these three basic fallacies, there would seem to be little point in going further into the method of price determination based on amortization and imputation. It may none the less be useful to examine a few related points, which will play an important role in Parts II and III of this report.

299

In the first place they are important because the method under review springs from a very common misinterpretation of economic theory which has often had a great and, it is to be feared, a seriously misleading influence on economic decisions. There is therefore every reason to reiterate that this view is erroneous and leads, as can be demonstrated, to incorrect conclusions on many points we shall have to consider.

300

There is also another reason why this matter is important. We have already seen that, if the price, investment and output criteria of optimum resource allocation are applied to a sector of the economy which is subject to increasing average returns, that sector will incur a deficit. In the transport sector, this is valid particularly for infrastructure. Consequently, if the criteria of optimum resource allocation are applied to infrastructure — the criteria concerning investment as well as those concerning the prices to be charged for its utilization — a deficit may be incurred in operation of the infrastructure. In Part II we shall discuss the reasons why it is important to impose the constraint of budgetary equilibrium on infrastructure, even though this distorts the optimum allocation of resources. Without at this point going into the question of budgetary equilibrium itself, we might point out that it would entail an additional charge on the users of infrastructure (additional, that is, to the optimum charges). It might then be thought that these additional charges could be determined by the method mentioned above for amortization and imputation of the total cost of infrastructure.

301

In discussing this approach, one point should be made at the outset. Budgetary equilibrium is an additional constraint; it does not replace the criteria of optimum resource allocation. This implies that the charges for the utilization of infrastructure should in any case not be lower than those corresponding to an optimum allocation of resources without the constraint of budgetary equilibrium. Consequently, whatever may be the merits or demerits of any particular method of imputation and amortization, the method adopted must always be supplemented by a procedure that will make it impossible for prices to be reduced below the optimum level.

302

For the rest, economic theory does not permit more than the general conclusion that any method of amortization and imputation is arbitrary (2).

303

One final point should be mentioned here, since it is particulary important, not so much for transport infrastructure as for services. The method discussed in the present section, which consists in determining the prices of output by a distribution of the total cost, leads to, or is at least commonly associated with, a particular conception of price and output policy. The distribution of total cost is usually undertaken in order to establish a set of prices which are to be kept constant as long as there is no change in cost and demand conditions that is likely to be

(1) See Subsection 12.34.

(2) This matter will be examined in detail and in a more general way in Part II (see Sec. 24.4).

more than temporary. Unforeseen fluctuations of demand must be met solely by adjustments of supply, which will depend on the extent to which existing capacity can accommodate fluctuations of demand at predetermined prices. If demand outruns existing capacity, a system of rationing must be adopted to apportion the insufficient output among the users; otherwise some such system will develop spontaneously — for example, the system of rationing by queue that is well known in urban passenger transport.

304

From an economic point of view, the drawback of this method of determining the prices of output is that it prevents optimum utilization of capacity at certain times whilst at others it may lead to some system of rationing demand, the economic disadvantages of which are obvious. These points, which involve the merits and demerits of price flexibility, will be dealt with again in the subsequent parts of this report.

305

To conclude : when production is effected with the aid of capital equipment, the total cost of production during any given period can only be determined by charging part of the price of the equipment to the output produced during the same period. Economic theory shows that, assuming this to be possible, such an imputation could only be made *a posteriori* — if done in a manner consistent with the optimum allocation of resources — for it would be necessary to know the prices for each commodity that equate supply with demand at any one moment. This means that amortization depends essentially on the various price developments. There is, in fact, no other criterion than the conventional one for determining the best rate of amortization *a priori,* i.e. the optimum imputation based on a knowledge of costs alone. Any imputation of this kind must therefore always be arbitrary and meaningless if the aim is to achieve an optimum allocation of resources. This conclusion is also valid in the case of linked production.

CHAPTER 13

APPLICATION OF THE THEORY OF OPTIMUM RESOURCE ALLOCATION TO INFRASTRUCTURE

13.0 — *General*

306

Although all essential propositions concerning durable factors of production in general have already been given, it would appear profitable to sum them up and comment on them briefly for the special case of infrastructure.

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Infrastructure mainly consists of fixed installations with a long economic life. Furthermore, it is generally characterized by marked indivisibility and increasing returns. Finally, its production is not homogeneous. For instance, the passage of a private car and that of a truck along one and the same road are not identical services.

308

The conditions of an optimum allocation of resources with respect to capital equipment, as applied to the special cases of the non-differentiated sector and related productions, are therefore very important factors in decisions on infrastructure investment and management.

13.1 — *INVESTMENT*

13.10 — *Investment decisions*

309

The social value of an infrastructure is equal to the discounted total benefits connected with its use, these benefits being considered at the final consumption stage. The social value of the infrastructure is naturally a function of its capacity, as are also its construction costs.

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Hence, a correct investment decision presupposes:

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a) That the social value of the infrastructure is greater than the sum of its investment cost and of the discounted value of the operating costs;

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b) That the difference is maximum, the calculation being made for final prices considered as given.

313

The two conditions *a)* and *b)* determine the optimum size of the infrastructure.

314

In cases where infrastructure is likely to vary continuously, the second condition implies marginal equalities. The most important of these for what follows is equality between the marginal cost of the infrastructure and its discounted marginal benefits, minus the discounted marginal costs of utilization, all calculated in relation to the capacity of the infrastructure (1).

315

The calculations for every new project of investment in infrastructure must be made in isolation, but must take account of the extent to which the new infrastructure complements or can replace others, particularly as regards the traffic it may be expected to carry and the variations in traffic it will involve for the older infrastructures. Account should also be taken not only of the cost of the new investment and its discounted operating costs, but also of the existing infrastructure which it can supplement or replace.

316

The equality between, on the one hand, the sum of the marginal investment costs of the infrastructure and the discounted operating costs, and on the other hand the discounted optimum charges implies that, although the capacity of the infrastructure can vary continuously, it is impossible that there should never be congestion. This means that the optimum charge will be greater than the cost charge during at least part of the life of the infrastructure. But if there is a minimum size of the infrastructure below which it is impossible to go, and if the economically optimum size were smaller than this minimum, the equality mentioned would no longer apply and the establishment and operation of an infrastructure could be advantageous even though it would never be fully utilized.

13.11 — *Investment criteria and the deficit*

317

First a distinction must be made between, on the one hand, the establishment of the infrastructure and its

(1) See in particular Subsection 11.02, and Sections 11.1, 11.2.

subsequent operation in so far as this is independent of traffic, and, on the other hand, the production of transport services with the help of the infrastructure. Once the infrastructure has been established and is maintained in working condition, it is like any other form of natural wealth. It exists, and there is no reason to make it play any one particular role.

318

As with every form of natural wealth its utilization can give rise to an economic rent which we have called congestion charge, if demand at a tariff equal to the cost charge exceeds capacity. The only difference between infrastructure and natural wealth — admittedly a fundamental one — is that the latter is a free gift of nature whereas infrastructure not only involves expenditure for its construction but also continues to call for operating expenditure independent of all traffic. This operating expenditure is naturally not investment expenditure; but in fact it plays a quite comparable role for, being independent of traffic, it stems simply from the earlier investment decision, at least for such time as no decision has been taken to close down the infrastructure.

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This being so, the capitalized value of the congestion charge may very easily be lower than the value of the initial investment costs plus the discounted value of the operating expenditure independent of traffic. We can doubtless consider such to be the usual case (1).

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We have already said that the whole of the infrastructure and the associated operating services is generally subject to increasing average returns. A supplementary outlay at the start generally effects a more than proportional increase in the present and future capacity of the infrastructure. The result is that if the infrastructure investment is made in conformity with the criteria of optimum resource allocation, and if the users pay prices established on the same basis (2), the infrastructure will incur a deficit (3). It should be emphasized that the size of the deficit is determined solely by the technical characteristics of the infrastructure, that is to say be the extent to which its establishment is subject to increasing average returns or, in other words, by the extent to which the initial expenditure, consisting of both the establishment costs and the discounted operating costs independent of traffic, grows less than proportionately to capacity (4).

321

The cost charges are not sufficient to cover the operating costs (5). From this it follows that the sum of the investment cost and the discounted operating costs which depend purely on capacity can be covered only by congestion charges, and if there are increasing average returns in the building of the infrastructure this sum is covered only partially by these charges.

322

From the angle of the theory of optimum resource allocation the deficit does not pose any particular problems. It has to be financed with the help of neutral transfers (i.e., transfers which do not modify marginal behaviours), and these are in theory always possible (6). This will be the case whenever transfers of income are transfers of rents (7). The optimum investment in the infrastructure, as well as the optimum prices to be charged users, are determined by the criteria of optimum resource allocation, which do not in any way postulate "budgetary equilibrium"

323

These conditions are essential, and any policy which tried to cover the deficit by applying higher tariffs than the economic charges corresponding to an optimum allocation of resources would, from this point of view, merely jeopardize efficient management

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Since, in any case, at the time when the investment decision is made the discounted benefits for final direct or indirect users must be at least equal to the investment cost plus the discounted operating costs, it is not impossible in principle to levy the resources needed to cover the deficit from the surpluses of the direct or indirect users, on condition, once again, that this levy is a standard amount, for example a tax giving the right to use the infrastructure independent of the extent of such use (8).

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(1) This proposition naturally has a qualitative character, with no implications as to orders of magnitude (see Subsection 24.47).

(2) See Subsection 13.20.

(3) This will be so unless future demand has been considerably underestimated, making effective congestion charges notably higher than those taken into account at the time of investment.

(4) The effective size of this deficit will be studied below (see Subsection 24.47). It is clear that the practical importance of all considerations concerning the deficit depend on it.

(5) There is no difference between expenditure on the upkeep of a road, which is essentially investment, and the initial expenditure on building it. The problems arising, and their solution, are exactly the same.

(6) See Subsection 23.30 for a more detailed study of this point.

(7) We shall revert to this later.

(8) The neutrality of this method is of course quite relative for, strictly speaking, such a lump-sum tax cannot be considered as neutral vis-à-vis potential users.

325

However, in applied economics the question presents itself differently. In fact, the financing of the deficit with the help of neutral transfers of income is a source of many problems. However, arguments can be advanced for imposing the constraint of budgetary equilibrium on infrastructure. The reasons for doing this, and its consequences, will be examined later (1).

13.2 — *CHARGES FOR THE USE OF INFRASTRUCTURE*

13.20 — *Optimum charge levels for infrastructure*

326

The operating cost of infrastructure consists on the one hand of the running costs, including the cost of ancillary services such as safety installations, lighting, etc., which are in practice inseparable from the infrastructure itself, and on the other hand the costs depending on traffic.

327

At any given time, the marginal cost of management of the infrastructure, calculated in relation to the traffic, is called the cost charge (2). The optimum management conditions of infrastructure corresponding to an optimum allocation of resources differ according to whether, at a tariff equal to the cost charge, is below or above capacity, i.e. whether or not there is congestion. The optimum tariff for use of the infrastructure is called the economic charge.

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If there is no congestion, the economic charge is equal to the cost charge. If there is congestion, the economic charge equates demand with capacity. Following the definition of saturation, the economic charge is higher than the cost charge, and the difference has been called the congestion charge (2).

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It will be obvious that the congestion charge varies with the intensity of demand in relation to the existing capacity of the infrastructure. The congestion charge is therefore a scarcity rent.

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The concepts of "full utilization" and "congestion" of the infrastructure must always be interpreted in the economic and not in the physical sense (3). An item of capital equipment such as infrastructure is considered as being fully utilized in the economic sense when the probability of full utilization reaches a certain level, determined on the basis of practical considerations (4).

331

When the level of full utilization is exceeded, which is generally the case if rationing is effected not by price but by queuing, we shall use the term "congestion" in this report.

332

It must be clearly understood that once the infrastructure is built the only absolute necessity from the angle of optimum resource allocation (whether the initial calculations and forecasts were right or not) is to use it to the best advantage. Consequently, the congestion charge should be imposed only if demand at a charge equal to the cost charge exceeds the capacity of the infrastructure, and it should then be fixed at such a level that demand equals capacity.

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We would recall that the necessary corollary of the principle "only the future counts" (5) is that the optimum tariff system at any given moment is independent of past costs, i.e. of past expenditure.

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The optimum tariff for the use of a tunnel, for instance, has nothing to do with the cost of building it. The optimum tariff is the one which limits demand to the capacity of the tunnel.

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If, at a tariff equal to the cost charge, which is generally very low, demand is below the capacity of the tunnel, the optimum tariff for its use will be the cost charge. But if, at a tariff equal to the cost charge, demand exceeds capacity, the optimum tariff is the one which equates demand with the capacity of the tunnel.

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The same applies to optimum allocation of resources for parking in cities. For a given probability of congestion p, for example 1 : 1 000, parking on the public highway should be free if there is only one chance in a thousand of a driver not finding room at a given time and place. Parking should be charged for if this is not the case, and the optimum

(1) See in particular Sections, 23.3 and 24.4.

(2) See Subsection 11.1.

(3) See the general information already given in Section 11.6.

(4) The search for the optimum economic value of the probability of congestion is, of course, outside the scope of this study.

(5) See Subsection 12.24.

tariff is the one which reduces demand to such a level that there is only one chance in a thousand of our driver not finding a place free.

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The same is also true of motorways. Let us again suppose that the desired probability of congestion p = 1 : 1 000, which means that we are aiming for conditions which are such that there will only be one chance in a thousand of a motorist's being obliged to drive at less than the normal speed. At any given time and on a given day the optimum tariff for using the motorway is the one at which the probability is less than 1 : 1 000. It is reduced to the cost charge — which is generally very low — if, at a tariff equal to this charge, traffic is such that the probability is actually less than 1 : 1 000.

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In all cases, to ensure optimum allocation of resources the fundamental rule in formulating a tariff must be based on a comparison between capacity and demand (1).

13.21 — *The congestion charge is a rent and not a cost*

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From what we have just said, it follows that the congestion charge is a rent and not a cost (2). The capacity of an existing infrastructure at any time should be considered as a given quantity. Hence, the congestion charge is entirely determined by demand, and can in no way be considered as a production cost.

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It cannot therefore be admitted, explicitly or implicitly, that the optimum tariff for use of the infrastructure could be calculated simply by considering the investment costs.

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This error originates in a wrong interpretation at the time of the investment decision of equality between the sum of the marginal investment cost of infrastructure and the discounted marginal operating costs on the one hand, and the discounted marginal benefits from the infrastructure on the other, all calculated in relation to capacity (3).

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Because the first term of this equation is actually a cost, the second term is often interpreted as a sum of costs. But such an interpretation is purely conventional and can only lead to confusion.

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In fact, from this interpretation of the benefits and operating costs we deduce that a congestion charge equal to the marginal benefit minus the cost charge would itself be a cost and therefore could be calculated simply on the basis of the investment costs. This is incorrect, since the congestion charge always depends essentially on demand. It can also be said that at all times and by definition the discounted marginal benefit from the infrastructure is equal to the discounted marginal utility. It follows from this equality that the marginal benefit from utilization is always equal to the reduction in discounted value plus the interest on the discounted value. The interpretation we mention is tantamount to regarding the variation of the discounted benefit as an amortization, which it is not.

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In fact it cannot in any way be concluded that the congestion charge is a cost. Because two magnitudes are equal under certain conditions we cannot conclude that they are identical, nor *a fortiori* that their elements are identical when these magnitudes are themselves integrals. The congestion charge is essentially an economic rent, and from this follows the proposition — essential for any policy of optimum management of existing infrastructures — that the optimum value of the congestion charge, and consequently the optimum tariffs for the use of an infrastructure, cannot be determined on the basis of the investment costs.

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It can further be said that the optimum marginal depreciation of an investment in infrastructure (4) cannot be determined from *a priori* considerations. It can only be deduced from the congestion charge, which cannot be deduced from depreciation value calculated *a priori*.

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The optimum congestion charge cannot therefore be calculated from the depreciation. In reality, the optimum marginal depreciation can only be

(1) Naturally, these observations are not valid only for transport infrastructures; they could also be applied, for instance, to the optimum operation of hydroelectric dams.

(2) The congestion charge is, of course, considered here from the point of view of management of the infrastructure. From the user's angle, the congestion charge is a cost.

(3) Calculated in relation to capacity, the marginal benefit from the infrastructure at any given time is nil if it is not fully utilised, and it is equal to the economic charge if it is fully utilised.

(4) Calculated, of course, in relation to capacity.

determined from the optimum congestion charge, which itself results from the comparison at all times of demand and the capacity of the infrastructure (1).

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In general, the optimum charge can only be interpreted conventionally in the sense of a cost when the initial calculations for the infrastructure were correct and the forecasts on which they were based were accurate.

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Even if these two conditions are present, the congestion charge always retains its character as a pure marginal rent, and this rent is determined by equating demand with the existing capacity of the infrastructure through a tariff equal to the economic charge. The interpretation of optimum congestion charge as a cost is completely conventional. Its only interest is academic; it presents no practical advantage. On the contrary, it complicates all questions quite needlessly and can only lead operators to take wrong decisions.

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A fortiori, if the two conditions of correct calculation and perfect forecasting are not fulfilled — as is generally the case in actual fact — the congestion charge can no longer be interpreted in any way as a cost, even within a framework of formal equality (2).

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Moreover, we must add that although the marginal utility of the use of infrastructure equal to the economic charge can be conventionally interpreted as a cost, this interpretation is no longer possible for the total benefit. It is therefore only possible marginally.

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Accordingly, any system of tariffs for use of an infrastructure which is based on investment costs makes no sense economically.

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From the point of view of optimum management, investment costs should only be considered once — when the decision is taken to build the infrastructure (3). They are then, of course, of prime importance.

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Hence there are two decisive reasons why the congestion charge cannot be interpreted as a cost, even conventionally on the pretext that, at the time of the investment decision, there is a relationship between the cost of the marginal investment in relation to capacity and the expected future revenues from the congestion charge. The first reason is that there is no guarantee that the forecasts will prove right. If they are wrong — as they usually are (4) — the congestion charge is determined exclusively by actual demand and actual capacity, and the cost of past investment does not affect the issue. In the second place, the fact that the sum of the discounted congestion charges throughout the whole economic life of the infrastructure can be represented as a cost is no indication of what the appropriate level of the congestion charge must be at any given time.

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Consequently, the congestion charge cannot be considered as a cost. It is a pure scarcity price, an economic rent which is determined by the level of demand, that is to say the volume of traffic, in relation to the existing capacity of the infrastructure. From this it again follows that the optimum tariff level for the use of an infrastructure cannot be determined from investment costs.

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This proposition enables us to form a judgment, from the point of view of optimum resource allocation, on two suggested methods of fixing tariffs for the use of infrastructures: the development cost and calculated total cost methods.

13.22 — *The development cost method*

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This method will be analysed in detail later. However, it appears advisable to say a few words about

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(1) This optimum marginal depreciation can easily be shown to be equal to the congestion charge minus the marginal cost of operation, calculated in relation to capacity, and minus the interest on the non-depreciated marginal value of the investment. Hence, when the congestion charge is nil the optimum marginal depreciation is negative (these properties follow directly from footnote (3), p. 21).

(2) Of terms which are themselves integrals of marginal elements.

(3) The only theoretical case in which the optimum congestion charge could be determined from the investment costs is where the depreciation of these costs could be determined *a priori.* This is true of a permanent system of perfect forecasting applied to an infrastructure of infinite duration for which the initial calculations were perfect. Depreciation would then be equal to zero and the congestion charge would be formally equal to the marginal management cost in relation to capacity plus the interest on the investment cost of the infrastructure. This purely theoretical case is of no practical interest, for it corresponds to hypotheses which are never fulfilled in reality. Moreover, even if they were fulfilled, the congestion charge would still be a rent, not a cost.

(4) For instance, since the volume of traffic fluctuates markedly from one season to another and from one hour to another, correct forecasts of the level of demand for the whole of the infrastructure's life will be rendered impossible by the length of that life.

it here, purely from the point of view of optimum resource allocation.

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Contrary to what we said above (1) it has been suggested that the optimum tariff for the use of infrastructure, and in particular the congestion charge element, could be deduced from a specific concept of cost known as "development cost". There are many variants of this theory but they all seem to be based on the following definition: "the development cost is the quotient resulting when the total discounted cost of additional capacities of infrastructure is divided by the discounted sum of revenue from the resulting additional traffic". In another variant the divisor is the sum of the discounted additional future capacities created by the marginal infrastructure investment. In other words, the capacity is considered instead of the actual traffic.

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This last formulation assumes equality between the economic charges and the marginal value, calculated in relation to the capacity, of the sum of the costs of establishment and the operating costs; and the optimum charge can be derived from this, provided the marginal benefit is considered as a constant (2).

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In the case of the first variant the derivation is more complex, but it still rests on a certain convention, viz. that the charges are constant (3).

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The different variants of the development cost theory are presented as having the advantage of enabling the optimum charge to be calculated solely on the basis of costs; and it is certain that if this formulation were valid such a calculation would be possible.

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Thus the theory of development cost assumes that the optimum tariff level for an existing infrastructure can be determined from investment costs. Such a convention can be justified where the capital involved is sufficiently small for the period of less than full utilisation to be fairly short and where each supplementary unit represents only a fraction of the overall production capacity. These conditions are approximately fulfilled as regards, for instance, railway rolling stock and even the generation of electricity in thermal power stations; they are not fulfilled in the case of transport infrastructure (4).

362

For infrastructures with a fairly long life, whether motorways or tunnels in the case of transport, or dams in the case of electricity generation, there is no economic advantage in stipulating a constant charge for the life of the infrastructure; as soon as it exists it should be used in the best manner possible, i.e. only the cost charge should be charged and no additional charge until demand at a price equal to the cost charge exceeds the capacity of the infrastructure.

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The development cost theory may look like a dynamic one which tends to facilitate development. But in reality it is based on a static assumption, and its application can only hinder development by artificially and uneconomically limiting the use of infrastructures when they are not fully utilized.

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The theory of development cost does not find its justification in the economic theory of optimum management. It rests on a pure convention whose economic soundness in the case of transport infrastructures is debatable, to say the least.

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In practice, application of this theory would entail very many calculations, one for each transport infrastructure, and these calculations would be useless in determining an optimum management policy for existing infrastructures; this must be based on

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(1) See Subsection 13.20.

(2) The resulting equation is written:

$$\int_{t_0}^{t_1} \varphi(\tau) e^{-\int_{t_0}^{\tau} i(u)du} d\tau = \frac{d}{d\Theta} [\bar{C}_0 + \bar{D}_0 + \bar{F}_0]$$

where (t) is the marginal benefit in relation to capacity, i the rate of interest, and Θ the capacity, and C_0, D_0, F_0 represent respectively the discounted cost of construction, operation costs depending on traffic, and operation costs independent of traffic. If $\varphi(t)$ is considered as a constant, we can deduce for the charge which is equal to it the value

$$p = \frac{\frac{d}{d\Theta} [\bar{C}_0 + \bar{D}_0 + \bar{F}_0]}{\int_{t_0}^{t_1} e^{-\int_{t_0}^{\tau} i(u)du} d\tau}$$

a relation which can again be written

$$p = \frac{\Delta [\bar{C}_0 + \bar{D}_0 + \bar{F}_0]}{\int_{t_0}^{t_1} \Delta \Theta\, e^{-\int_{t_0}^{\tau} i(u)du} d\tau}$$

in which $\Delta\ \Theta$ represents the variation of the capacity and $\Delta\ [C_0 + D_0 + F_0]$ represents the total additional costs.

(3) Some authors admittedly use the development cost terminology in quite a different way, excluding any convention of constant charges. In this case what they are actually considering are marginal costs in the usual sense. It would then be preferable to keep to the classic terminology and avoid the development cost terminology. In the most authoritative circles, the development cost terminology is closely linked with a hypothesis of constant charges. We therefore think it preferable to reserve the terminology for this conception, which is, in any case, the one studied here.

other elements. It may be doubted, moreover, whether such calculations can be sufficiently accurate to yield anything more precise than orders of magnitude.

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If it is a question of building a new infrastructure, calculations are obviously necessary, as we have pointed out. But these calculations are very different from those suggested by the development cost theory. They are calculations in terms of discounted time-streams which in no way imply — in fact, exclude — any assumption of constancy for the marginal utility of the infrastructure.

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In any case the development cost theory, as advocated for transport infrastructures, is presented in greatly varying forms. Some of these take account of actual traffic and others of the capacity of the infrastructure. In some the calculations are itemized, in others there are overall calculations by sector. The absence of any common formulation is really only the consequence of the conventional and arbitrary character of the point of departure and of the very obvious difficulties involved in the applications.

368

To sum up purely from the point of view of optimum resource allocation, it can be said that development cost only coincides with the optimum tariff for the use of infrastructure when the congestion charge is constant, which is the case only in very special circumstances — in particular, demand must be stable in time (or increase continuously) and the capital equipment must be perfectly divisible. Since none of these conditions is even anything like fulfilled in the case of infrastructure, development cost is not compatible with the criteria of optimum resource allocation. Of course, this does not mean that the concept cannot have other advantages of a practical nature. The various aspects of the question will be examined and a general assessment submitted in Part III, in which the various possible systems of fixing tariffs for the use of infrastructure will be studied.

13.23 — *The calculated total cost method*

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Like the development cost method, the calculated total cost method is a way of computing the optimum charges from investment costs, but on very different principles.

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The method proceeds from a correct premise but arrives at a wrong conclusion. The correct premise is that competition may be distorted if some modes of transport are relieved of the financial burdens connected with their infrastructures whilst other modes have to carry them. The wrong conclusion is that the values of all existing infrastructures should be recalculated to enable a tariff level for their use to be worked out which allows for the financial charges corresponding to the values thus calculated.

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The theory of calculated total cost ignores the basic economic principle that only the future counts for optimum management of the economy (1). It also ignores the conclusion of economic theory that the optimum charge for an infrastructure is independent of the financial charges of the investments (2).

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For each existing transport infrastructure, application of the calculated total cost method would entail almost as much work as the calculations for a fresh project. Hence the method would be inoperable, because such a task is virtually impossible. Furthermore, it would be based on pure conventions, since no rule of imputation whatever can be justified by the theory of optimum resource allocation. Finally, it would be useless, because the rules of optimum management of an existing infrastructure are independent of any consideration of the past costs necessary to create the infrastructure or of the future costs necessary to replace or extend it.

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The methods proposed under the calculated total cost theory are very varied — because, in actual fact, the problem as posed does not allow of any rational solution.

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Like the development cost theory, the calculated total cost theory implies calculations which are as difficult to perform correctly as they are useless for an optimum management of infrastructures. Moreover, the theory is based on an error, i.e. that the optimum tariff level for a transport infrastructure can be established from past, present or future investment costs.

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Like the development cost method, the calculated total cost method will be subjected to a more comprehensive analysis, from other angles than that of

(1) See Subsection 12.24.

(2) See Subsection 13.20.

optimum resource allocation. As we shall see, the fact that the calculated total cost method cannot be justified from the point of view of optimum resource allocation does not mean that it cannot have certain practical advantages. An analysis and a general appraisal of the method will be presented in Part III.

CHAPTER 14

SUMMARY OF THE FIRST PART

376

Since the propositions we have described are complex, it would perhaps not be out of place to give a brief summary of the main ones here.

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1. Efficiency is only one objective among others; but where it is aimed at, either for its own sake or as a condition for the achievement of other objectives, the theory of optimum resource allocation supplies a framework for thinking and an indispensable guide for practical applications.

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2. The conditions of any situation of maximum efficiency can be defined objectively, either purely from the point of view of efficiency of production, or from the wider point of view of satisfaction of wants.

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From the first point of view, there is maximum efficiency if it is not possible to produce more with the resources used, and from the second if it is not possible to improve the situation of every consumer, whether a given individual or a community, without injuring some other consumer.

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In other words, if we are in a situation of maximum efficiency we are at the borderline between what is possible and what is impossible, which means that we are making the most of the available resources. It is not possible to be in a situation of maximum efficiency from the point of view of satisfaction of wants without being in a similar situation from the point of view of production.

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The concept of optimum resource allocation does not in principle prejudice the distribution of incomes, which in theory can vary very widely without jeopardizing efficiency.

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3. The theory of optimum resource allocation supplies very useful criteria for optimum management of the economy in general and transport in particular. Application of all these criteria can result in the optimum price system corresponding to an optimum allocation of resources.

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4. The indications of the theory differ according to whether the production operations are largely "divisible" or largely "indivisible". From the technical angle we are in the first situation if an optimum allocation of resources implies the use of distinct units of production (differentiated sector), and in the second if use of a single unit of production (non-differentiated sector) is more advantageous.

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In the differentiated sector there is convexity, i.e. non-increasing marginal returns, and in the non-differentiated sector, convexity or concavity, i.e. decreasing or increasing marginal returns.

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5. The structure of inland transport is very complex in that it can be broken down into parts some of which belong to the differentiated sector, others to the non-differentiated sector.

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It would appear useful to distinguish, on the one hand, the infrastructures or fixed installations and the management services associated with them — where these are independent of the volume of traffic — and, on the other hand, the supply of transport services with the help of these infrastructures and the associated services considered as a given quantity. The distinction is clearcut for roads and waterways but more difficult in the case of railways.

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Generally speaking, transport infrastructures belong to the non-differentiated sector and are characterized by increasing returns in relation to capacity.

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However, services rendered belong to the differentiated sector, at any rate in road transport and inland waterways. This is also the case with a large number of rail transport services; but where there are economies of scale in the supply of rail services, such supply comes under the non-differentiated sector. Where they exist, these economies of scale seem to be much less marked than in rail infrastructures.

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On the level of pure as well as applied economic theory, analysis shows that there are fundamental economic reasons for separately considering, on the one hand infrastructure and the associated operating

services independent of the volume of traffic, and on the other supply of transport services. Parts II and III will show that this distinction is even more useful if we consider the practical methods to be applied.

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6. Whether it is a question of infrastructures or of transport services, one of the essential rules for optimum allocation of resources is that costs must be minimum. The cost of a given operation is defined as the discounted sum of all the present and future expenditure it entails.

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The minimization of costs must be understood as applying to outputs regarded as given, and it must be carried out by considering the price system utilized as a given quantity.

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7. Both in the differentiated and non-differentiated sectors, optimum operation implies a free choice by users of the mode of transport and the carrier, and a price which equates demand with capacity.

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This second condition, which is too often neglected, would seem to be essential for an optimum allocation of resources.

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8. The social value of an infrastructure can be defined as the total discounted monetary value it represents for the whole body of final consumers, whether these are individuals or communities. This value depends on the other existing infrastructures. The criterion for investment in an infrastructure is that the social value of the latter should be higher than the sum of the construction cost and the discounted difference must be maximum.

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This criterion implies that at the time of the decision to invest, the marginal social value, calculated in relation to capacity, should be equal to the marginal construction cost, also calculated in relation to capacity, and the subsequent discounted operating costs.

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Any calculation of investment for a new infrastructure must take account of the existing infrastructures complementary to or substitutable for it from the twofold viewpoint of traffic as a whole and of operating costs independent of traffic.

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In general, this calculation can only be performed correctly in the context of a co-ordination of investments.

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Transport infrastructures are generally marked by extensive indivisibilities and increasing average returns. It follows from this that optimum management can give rise to a deficit which would have to be financed by neutral transfers of income. On the other hand, the marginal returns can be increasing. The rule of maximization of the discounted net income at market prices may thus be found inapplicable.

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The second difficulty may be met by applying the criteria we have set out. The first raises serious practical difficulties and will be examined in Parts II and III.

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9. Once an infrastructure has been brought into service, its optimum management is independent of its investment costs.

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The optimum charge consists of two components: a cost charge and a congestion charge. The cost charge is equal to the marginal cost calculated in relation to the traffic. The congestion charge is the excess of the economic charge over the cost charge, and is nil if demand at a tariff equal to the cost charge is lower than capacity. If it is not, the congestion charge must be fixed at such a level that demand shall be equal to capacity. There is then full utilization. When this happens the optimum tariff for use of the infrastructure is not equal to the marginal cost but to the marginal cost plus the congestion charge.

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Full utilization must be understood not in the physical sense but in the economic sense of a probability of congestion of a given value. At any time the economic charge for the use of an infrastructure, i.e. the optimum price from the angle of optimum resource allocation, is quite independent of past investment cost and also of the future investment cost of any other infrastructure.

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Depreciation of the investment cost must result from consideration of the economic charge and not vice versa. In other words, the economic charge cannot result from *a priori* consideration of a pattern of depreciation which is judged to be optimum. Such a calculation would necessarily rest on an arbitrary convention, and would not be in conformity with optimum resource allocation.

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10. For transport services in the differentiated sector, the optimum rule of management (investment and operation) is the maximization, at tariffs considered as given amounts, of the total net revenue, i.e. of the discounted difference between expected future receipts and expenditure.

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11. For transport services in the non-differentiated sector the rules are: minimization of costs in the sense we have mentioned; and expansion of output wherever this expansion gives rise to an overall increase in value of the final consumptions at the final prices.

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12. The application of this body of rules leads to a situation of optimum allocation of resources which effects a stable equilibrium.

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13. In all cases the optimum tariffs for transport services must be the result of equating demand with capacity. In no case can they be calculated simply on the basis of costs.

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From this point of view, the two methods of development cost and total calculated cost appear to be incompatible with an optimum allocation of resources in infrastructure.

PART II

CRITERIA AND OPTIONS IN TRANSPORT POLICY

CHAPTER 20

INTRODUCTION

20.0 — *GENERAL*

409

The present Part of this report deals with the general principles underlying transport policy. Its purpose is not to arrive at any specific conclusions as to the policy to be followed, but simply to lay the foundations for an analysis of specific systems and for the formulation of a policy. The general considerations put forward will enable a number of possible policy alternatives to be examined in Part III.

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We shall consider two different aspects of our subject: criteria and options in transport policy. The criteria correspond to the conditions necessary for the attainment of such of the ultimate objectives of society as have, or may have, a bearing on transport policy. The options are choices which must be made between general principles in the light of these criteria, and which are connected with the organization of the transport sector and the policy of public authorities in this field.

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As was said in the General Introduction, we shall devote particular attention to the implications of the criterion of optimum resource allocation. This criterion is not as narrow as it is often thought to be. In the general form in which we have analysed it in Part I, it means simply that the objectives of society, whatever they may be, must be attained as efficiently as possible.

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The principal options will be introduced in the following section. It should be remembered that our discussion of these options, as of the various systems examined in Part III, proceeds primarily from the assumption of full employment and relatively steady economic growth. Some of the problems raised by this twofold assumption will be discussed later (1).

20.1 — *THE PRINCIPAL OPTIONS*

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At the back of the various options considered in the present Part is a distinction between two main types of organization: the centralized and the decentralized regime. In actual fact, the organization of the economy, or even of a specific sector, will seldom — if ever — correspond exactly to one or other of these two regimes in its pure form, as practically all existing organizations have some features of both. These concepts are nevertheless useful for an analysis of transport policy, because the degree of centralization or decentralization inherent in any particular system is bound to have important implications, not only economic (in the strict sense of the word "economic") but also sociological, political and institutional implications.

414

On a purely formal level, the two regimes are very similar. The criteria that must be satisfied to achieve an optimum allocation of resources comprise certain conditions of operation of the economic system, conditions which could, theoretically, be met equally well by either a centralized or a decentralized regime. Both types of regime inevitably include a system of constraints by which operators are induced to act in accordance with the criteria. In a centralized regime, these constraints take the form of administrative rules and regulations, or of a procedure by which decisions taken at a lower level must be ratified by the central authority. A completely decentralized regime, on the other hand, leaves all authority and powers of independent decision in the hands of the operators, constraint generally being exercized by a system of monetary incentives and deterrents — within an appropriate institutional framework — by which operators are induced to conform to the criteria.

415

Although the purely formal differences between the two regimes may be relatively slight, they are of great importance in practice. With a completely

(1) See Chapter 21.

decentralized regime, it is in principle only possible to attain such objectives as are compatible with the play of monetary incentives and deterrents within an appropriate institutional framework. A completely centralized regime has the advantage of being able, in principle, to permit the pursuit of any objective compatible with the system of deterrents it employs. It has, however, one drawback, in that any type of centralized regime is inevitably characterized by a certain lack of flexibility. Moreover, with centralization there is always a risk of inefficiency and abuse of administrative power. For these reasons, especially the latter, we shall point out repeatedly in the following chapters that in a centralized regime the rules should be simple, clear, and not arbitrary, and their implementation should allow of objective control.

416

In practice, the decentralized regime takes the form of a competitive system. As we have seen in Part I, this system is generally feasible only in sectors where total production can be split up among separate units without impairing efficiency (1) (2). This is an obvious limitation of the system. But where it can function effectively it has the advantage of flexibility, and the pressure exerted by competition (assuming the absence of a recession) strongly stimulates cost minimization and efficiency. We have already pointed out (3) that the condition of convexity cannot be satisfied in the case of infrastructure any more than in that of the provision of transport services by the railways (4). Hence, if each mode of transport is considered separately, the choice between provision of services under a centralized regime and under a decentralized regime will in general arise only in connection with road and inland waterway transport. In the countries of the Community, these two modes of transport are, in fact, decentrally organized. We shall call them the competitive modes (5) (6).

20.2 — *INFRASTRUCTURE AND TRANSPORT SERVICES*

417

We shall make a distinction (as we have already done to some extent in Part I) between two stages of the production process in the internal transport sector, i.e. between infrastructure and transport services. In principle, we shall use the term "infrastructure" to denote all fixed installations used in transport (7).

418

In the case of roads and inland waterways, this distinction largely corresponds to the institutional division that exists in practice between, on the one hand, roads, canals and generally all infrastructures operated by the public authorities (i.e. by the state or by regional and local authorities) and, on the other hand, vehicles and vessels, which in most countries are owned and operated either wholly or partly by private enterprise.

419

In the case of railways the boundary between infrastructure and transport services is more difficult to define, because in practice infrastructure and transport operations are managed as a single administrative unit, owing to the practical impossibility of decentralizing rail transport in the way that transport by road and inland waterway is decentralized.

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When we deal, in subsequent sections, with economic decisions that are important for infrastructure and transport services, and with the organization of these fields and the relevant policy, we shall always treat the activities connected with each of the two fields as an economic whole. Thus, management of infrastructure will be taken as including the construction, renewal, maintenance and operation of fixed assets, as well as imposition of the charges to be made for using them. Similarly, under management of transport services we shall include investment in vehicles or vessels, their current operation and management, and the fixing of transport tariffs.

421

The principal economic characteristics distinguishing infrastructure from transport services will be described in detail later on (8). Here we shall confine ourselves to mentioning certain points, the economic significance and implications of which will also be dealt with later.

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(1) In other words it cannot be adopted, unless special provisions are made, in the sectors where economies of scale are such that production must be concentrated in one or a few units only, to ensure maximum efficiency (i.e. minimization of total cost).

(2) These sectors are the differentiated sectors as defined in Part I.

(3) See Part I.

(4) For the distinction between infrastructure and transport services, see Section 20.2.

(5) They are, at any rate, virtually competitive.

(6) See Section 25.1 for general observations on centralization and decentralization as applied in these modes of transport.

(7) This distinction is often drawn in very different ways. For instance, some transport experts exclude electrification installations from infrastructure, whereas the present report includes them.

(8) See Section 23.0.

422

In the first place, an essential element in the concept of infrastructure is the fact that the activities concerned involve factors of production with an exceptionally long economic life. Secondly, these factors are also largely unique, in that no immediate and perfect substitution is possible between separate elements of infrastructure. Thirdly, the construction of infrastructure is usually subject to economies of scale; and fourthly, the separate parts of a network are highly complementary. These features will be seen to have important consequences, in particular for the prices to be charged for utilization of infrastructure; they do not apply to the production of transport services — at least, not all, or to the same extent.

20.3 — *PLAN OF PART II*

423

In view of the observations made in the previous sections, the present Part will be arranged as follows: Chapter 21 will be devoted to an examination of the objectives of transport policy, and especially to the objective of optimum resource allocation in the sense of this report. The specific criteria for an optimum allocation of resources will be compared with the various objectives that are commonly assigned to transport policy.

424

Chapter 22 will contain a short restatement of the criteria, which we considered in greater detail, but from a purely theoretical point of view, in Part I. Special attention will be paid to a number of questions of particular importance to transport.

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In Chapter 23 a few special problems will be studied with reference to the particular case of infrastructure, because its distinct economic characteristics make separate treatment necessary.

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The real substance of Part II will be found in Chapters 24 and 25. They deal with those options for the organization and management of infrastructure and transport services respectively that we consider to be essential in an economic analysis of transport policy. Certain options will not be examined at all; others will not be examined in detail. We have had to be selective because of the very great number of factors that, rightly or wrongly, influence transport policy as applied in the various countries or proposed by the numerous groups actively interested in the matter. Our selection has been made according to the inherent economic significance of the options in question, and has not been influenced by our agreement or disagreement with the propositions involved. All the options considered will be critically analysed, and the conclusions will, in some cases, be mainly negative.

427

As we have already stated, our aim is not to arrive at definite conclusions — except where these arise naturally from strictly logical considerations — but to analyse the various options and the systems derived from them, to indicate their economic aspects, and to point out the assumptions implicit in them or any inconsistencies there may be. It is in this light that our selection of the options to be dealt with and our analysis of them in the following chapters should be viewed.

CHAPTER 21

THE OBJECTIVES OF TRANSPORT POLICY

21.0 — *GENERAL*

428

We have already emphasized in the General Introduction that the chief criterion of our analysis would be optimum allocation of resources. Before we study the various options for transport and the systems corresponding to them, it would seem useful to examine briefly the relations between the objective of efficiency achieved by optimum allocation of ressources and the numerous other objectives which transport policy helps or could help to achieve.

429

As we also pointed out in the General Introduction, it is often said that the objective of optimum resource allocation would not take account of important general aims of economic and social policy and could even be in conflict with them. It is claimed that an optimum allocation of ressources would merely imply the fixing of certain rules for the organization of the market; these would tend to give preference to the competitive system and to exclude any other policy.

430

This interpretation is incorrect. The objective: optimum resource allocation, as analysed in the preceding Part of this report, is basically no more than the objective : economic efficiency, in the most general sense of that term. The criteria it furnishes and their various implications as to the policy to be followed do not prescribe any specific structure for the economy. Their aim is simply to preclude situations in which the same level of economic welfare could be attained by using fewer resources, or, in other words, situations in which a higher level of welfare could be achieved by more efficient application of the existing resources.

431

When the objective of optimum resource allocation is interpreted in the general sense just mentioned, there can be no intrinsic incompatibility between it and the other objectives of the community. Optimum resource allocation is not an aim in itself. In fact, it simply amounts to the general condition that the community's other aims must be achieved in such a way that it would be impossible to obtain the same results by more efficient means, i.e. by using fewer resources. Moreover, the economic concepts on which the Treaty of Rome is based, and which appear in many of its provisions, seem clearly to postulate the requirement of efficiency.

432

However, the criteria and methods which economic theory suggests to ensure an optimum allocation of resources are strictly valid only on clearly defined hypotheses which may perhaps not be satisfied if objectives other than efficiency are pursued. Thus, although the operation of a free market economy, based on the price system, can lead to an optimum allocation of resources, it could result in a distribution of income which would be considered undesirable if a certain form of income distribution is held to be a primary objective. The extent to which there may be incompatibility between the requirement of efficiency and the other objectives essentially depends on the individual case; conflicts may be of a minor nature, or they may concern vital points.

433

In the case of distribution of income, and irrespective of any ethical conception of an ideal distribution, one fact dominates the whole question. Only that which is produced can be distributed. Consequently, if equity requires a certain distribution of income (1), it also implies a certain concern for efficiency.

434

Of course, the possible conflict between efficiency and the other conceivable objectives is not the only one to be considered. Objectives other than efficiency may not always be compatible with each other; and the community's field of preference may not be perfectly ordered. However, these problems will not be studied here, since they lie outside the specific province of this report.

435

In itself, the objective of optimum resource allocation in no way conflicts with the notion of public intervention — rather the reverse. Whereas a completely centralized regime could satisfy the criteria of optimum resource allocation, a decentralized regime would be incapable of doing so without public intervention.

436

This is not the place to list the many fields in which such intervention is indispensable to achieve an optimum allocation of resources. But such is certainly the case with the objectives of full employ-

(1) The distribution of income will be studied in Section 21.5.

ment and economic growth, which are implied by an optimum allocation of resources and which, as a rule, are not automatically achieved without deliberate action by the public authorities.

437

Similarly, an optimum allocation of resources in no way implies that only individual preferences are taken into consideration. The collective preferences of society for community services can and must be taken into account, exactly like individual preferences, when defining an efficient system.

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These various facts having been brought out, the next step is to analyse the objectives of the policy to be followed in a particular economic sector, such as transport.

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To begin with, it is manifestly impossible to analyse, within the narrow limits of a particular sector, all the aspects of the economic system in general which are likely to have repercussions on that sector but are not specific to it. Such general aspects include the macro-economic policies aimed at ensuring full employment, rapid economic growth and the internal and external balance of the economy. Another aspect is that of fiscal policy, which stems from the public authorities' need to obtain adequate revenue. Although policies of this kind can have a very great impact on the particular sector concerned — in this case transport — there is no reason to include them in a partial analysis, except where they have special implications for that sector.

440

The concrete requirements of an efficient organization of the transport sector based on optimum resource allocation may differ according to whether or not the general macro-economic policy succeeds in establishing and maintaining full employment and relatively steady economic growth. As we pointed out in the General Introduction, our analysis assumes that the policy does in fact succeed in attaining these objectives. The conclusions of our report are therefore valid as a whole only on the twofold premise of full employment and relatively steady economic growth (1). This twofold hypothesis may involve a serious gap which should be bridged as soon as possible by a separate analysis of transport policy, appropriate for a period of general recession or of a notable slowdown in growth.

441

Apart from the objectives of anticyclical and general growth policies, the collective objectives we shall examine are those where transport is considered to play a special role. Understandably, these are primarily objectives whose attainment depends very closely on the existence of infrastructure and rolling stock capacities, e.g. the development of backward regions, town and country planning, the decongestion of urban areas and, also, geographical integration at European level. Then there are objectives which are outside the transport sector, such as support policies for certain special categories of passengers and of goods — policies of which tariff measures are the instrument. In one way or another, most of these objectives concern income distribution. This aspect deserves very special attention, since it is the only possible source of real conflicts between the functioning of a free market economy leading to an optimum allocation of resources and other objectives of society (2).

442

Finally, without discussing the value of the various general objectives as such (since economic analysis cannot judge the aims to be pursued), we will consider whether or not they can be achieved by a free market economy operating in an appropriate institutional framework and, if not, whether they can in fact attained more efficiently by centralized measures in the transport field. Analysis would seem to prove that, in certain cases at least, the conflict between the various conceivable objectives and efficiency is much less pronounced than is generally thought, for the simple reason that attainment of any objective is, at any rate partly, linked with the efficiency of the economic system. To take only one example, no social policy will be able fully to attain its objectives if it is not based on an efficient economy.

21.1 — *ANTICYCLICAL POLICIES*

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Since we have decided not to consider macro-economic objectives in this report, we will make only a few remarks about anticyclical policies.

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It should first be emphasized that the transport sector, and more particularly the infrastructure of transport, has traditionally been a very important instrument of both short-term and long-term macro-economic policy.

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In the field of anticyclical policy a speed-up or slowdown of overall spending has often been brought about by varying public expenditure on infrastruc-

(1) It is well known that simultaneous achievement of these objectives raises different problems, but the study of these problems is outside the scope of the report.

(2) See Section 21.5.

ture. The reason is that in most countries the infrastructure of roads and inland waterways are entirely, or almost entirely, financed via the state budget and thus become a component of total expenditure which can be manipulated fairly easily by the public authorities.

446

It is doubtful whether such discrimination, which is essentially pragmatic, can be justified economically. In fact there is a good case to be made for the argument that expenditure on infrastructure should as far as possible not be used as a special instrument of anticyclical policy. We shall come back to this point in a somewhat broader context (1) further on in this Part, and also at several points in Part III when examining the systems of budgetary equilibrium for infrastructure (2).

21.2 — *GROWTH POLICIES*

447

The existence of appropriate transport capacities, and particularly of adequate infrastructure, is a precondition for the development of industry and trade. Consequently, there are good reasons for paying very special attention to infrastructure. Conversely, the objectives of economic development and growth must be taken into consideration when defining a policy for infrastructure. We shall come back to this point when we study the criteria for investment in infrastructure (3) and the various policies for the transport sector (4). It will be shown then, that the criteria of optimum allocation of resources may be considered to go a long way in the desired direction. The investment criteria take account of all the benefits, including the surpluses, expected to accrue from the infrastructure in question. It is only when the development objectives go further that these criteria no longer appear sufficient (5).

448

In the following chapters we shall show (6) that several arguments can be advanced for imposing more restrictive conditions on investment in infrastructure by stipulating that the expenditure be financed by charges on the users — in other words, that budgetary equilibrium should be assured. But it will be stressed that, whatever may be the advantages and disadvantages of the requirement of budgetary equilibrium, this additional constraint should never be imposed on purely local networks, where social considerations may well have priority (7), or on underdeveloped areas, where the external benefits of infrastructure can be relatively high (8).

449

Growth policies also take into consideration urban decongestion, regional development and industrial decentralization. It is clear that transport policy plays an important part in these fields and that the underlying motives, particularly for the building of infrastructure, are not always purely economic in the strict sense of the term. There is no doubt that transport policy can be used to help the economic development of regions whose standard of living is relatively low and also to promote industrial decentralization. Furthermore, the extremely acute problem of urban congestion is, or should be, a major concern of the public authorities.

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According to the criteria of optimum resource allocation, an infrastructure should be built only if the sum of all discounted future benefits, including the surpluses and the external effects, is expected to cover the sum of investment cost and operating costs (9), the difference being maximum.

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As regards regional economic development and industrial decentralization, it is possible to imagine a policy which would apparently disregard this requirement, particularly if the development of a certain region only reached "take-off" after a certain time.

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During the initial phase, adequate infrastructures must be available, but they will be underutilized and consequently will bring in relatively little direct revenue. However, the apparent conflict between public policy and the investment criteria corresponding to an optimum allocation of resources might be due simply to the fact that the period to which the calculation of costs and benefits is limited is, in fact, too short. If the investment criterion is correctly applied and gives negative results, and it is nevertheless decided to carry out a particular infrastructure project — that is to say, even though

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(1) See particularly Subsection 23.32.

(2) See Sections 31.3 and 31.4.

(3) See Section 24.1.

(4) See Chapters 31 and 32.

(5) Which is conceivable only in the case of a deliberate redistribution of income in favour of certain regions, a situation which we shall examine in Section 21.5.

(6) See especially Section 23.3.

(7) See Subsection 23.31.

(8) See Subsection 31.40.

(9) For the sake of convenience, "operating costs" is interpreted as the discounted value of the future operating and maintenance costs minus the discounted residual value of the equipment at the end of its expected economic life.

the direct and indirect benefits do not appear to justify the investment -- we are faced with a social policy or political objectives which do not come within the scope of our analysis. However, we are inclined to think that such cases are exceptional. It would seem that much greater importance should be attached to projects which do satisfy the investment criteria of optimum resource allocation but do not satisfy the stricter requirement of budgetary equilibrium. We have already noted that there are good reasons for not imposing this further constraint in the context of a development policy. The problem will be examined more closely in Part III (1).

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However, in the field of transport services, arguments can be advanced against a policy of relatively low freight rates for underdeveloped areas — the sort of rates which can result especially from policies of "price alignment" (2). In fact, such policies may retard rather than stimulate the development of these areas, by reducing the geographical protection which their industry is allowed by the costs of transport to and from more advanced industrial centres.

454

As regards the problem of urban congestion, there does not seem to be any contradiction between a policy of reducing the excessive density of traffic in certain built-up areas and the criteria of optimum resource allocation. On the contrary, as we shall endeavour to show in the following chapters, application of these criteria could greatly help to solve this problem. For instance, the necessary funds could be raised by the practical system of economic charges (3).

21.3 — *EUROPEAN INTEGRATION*

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In past centuries the construction of large networks of communication was inspired to a considerable extent by the desire to unify the national territory on the political, cultural and economic planes. This unification was largely attained only through the building of important railway and waterway networks and, more recently, by the rapid development of highway systems.

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Similar problems arise today on a European scale. A great deal remains to be done to achieve European integration in the transport field, the problem at the moment is not so much to remodel the economic face of the national territories by building entirely new networks of communication as to make gradual — albeit extremely important — additions to the existing structure.

457

The transition from national transport policies to a Community policy raises a multitude of important questions which can hardly be studied in this report. We must emphasize, however, that difficult problems of adaptation will arise and will necessitate a certain transitional period. These problems are due especially to the fact that the public authorities intervene on the transport market in most Member States of the Community, whereas at the same time the policies pursued is different in almost all these countries. If it is desired to avoid the introduction or consolidation of policies whose aim is national protection or the protection of particular industries, the problems of transition will have to be resolved by Community action.

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Generally speaking, however, there is hardly any conflict in principle between the objective of European integration and that of efficiency. A major aim of European integration is increased efficiency; and this is the primary condition for implementation of any policy whatsoever.

21.4 — *TARIFF SUPPORT*

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Transport policy can also be used to achieve specific objectives in other sectors. Examples are the public service obligations to which the railways have often been subjected: reduced rates for certain classes of freight (in particular agricultural produce) or categories of passengers (aged people or disabled ex-servicemen; season tickets which will inevitably be used at rush hours, etc.). Other examples are: uniformity of tariffs, although optimum economic rates (4) are different in various places and at various times; policies for protecting a country's ports etc.

460

Whatever the merits or demerits of these objectives in themselves, one may doubt the effectiveness of a policy which tries to achieve them by imposing obligations on the transport sector. As a rule, indirect measures of this type impair an optimum allocation of resources. In other words, they reduce the efficiency of the economic system (i.e. the standard of living obtainable with the given resources

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(1) See especially Section 31.4.

(2) Of the type mentioned in the ECSC Treaty.

(3) See Section 24.2 and Subsection 24.45, where we propose that tariffs for the use of infrastructures and in particular road infrastructures be differentiated according to at least three principal catagories of network: main, urban and suburban, and local.

(4) See Subsection 22.11.

of the community) by comparison with a situation where the same objectives would be attained by direct methods. A further disadvantage is that they entail all sorts of compensatory measures which can result in cumulating rather than correcting distortions, mainly because they lead to an intractable situation, with all its concomitant risks of errors of economic and political judgment (1). For this reason we are inclined to advise against these indirect methods, unless more direct ones are manifestly impossible or impractical.

21.5 — *DISTRIBUTION OF INCOME*

461

Policies connected with income distribution may either directly concern the transport sector itself or make use of transport policy to bring about a redistribution of income in other sectors. As regards the latter case, the above remarks concerning public service obligations are highly relevant. However, there are special reasons for analysing this problem separately, since the objectives of income distribution may conflict with the working of a decentralized economy.

462

On the strictly theoretical plane there is no conflict between the criteria of optimum resource allocation and whatever norms society accepts as regards the distribution of income. But the same can only be true in practice if any given redistribution of income can be achieved by methods which do not affect the conditions of an optimum allocation of resources. That is to say, it must be possible to carry out transfers of rents in a neutral manner, i.e. so as not to affect the economic alternatives available to operators under a price system which satisfies the criteria of optimum resource allocation.

463

This condition is not fulfilled in practice. Almost all the practical measures of income redistribution (2) distort various conditions of economic choice and can clash with the criteria of optimum resource allocation. But this does not mean that the choice of what method is to be used to bring about a specific redistribution of incomes is immaterial from the angle of economic efficiency. In attaining the ends concerned, some methods cause very much greater distortions than are strictly necessary.

464

The same conclusion applies to the measures frequently advocated as methods of supporting carriers' incomes in certain situations such as excessive competition, general recession or structural change. We shall come back to these questions in the following chapters. In particular, we shall briefly examine the social problems caused by recession and adaptation to structural changes (3). We shall suggest that it is preferable to adopt those measures which least distort the optimum allocation of resources and which, when there are structural changes, facilitate and, if possible, stimulate rather than impede the necessary adaptation.

465

These considerations also apply both to the serious problems of adaptation which may be involved in the transition from national transport policies as practised at present to a common transport policy at European level, and to the resulting social problems for various sections of society, either directly within transport or indirectly in regions affected by the changed transport system.

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(1) See Section 22.4.

(2) Taxes or subsidies on income, on special categories of expenditure, on property, etc.

(3) See Section 25.4.

CHAPTER 22

THE CRITERIA OF OPTIMUM RESOURCE ALLOCATION

22.0 — *PLAN OF THE CHAPTER*

466

The present chapter will deal only with the criteria for an optimum allocation of resources and the problems that arise when they are applied to the transport sector. We shall not consider here the other criteria that may be relevant to transport policy (1).

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The criteria for an optimum allocation of ressources have been worked out in some detail in Part I. It will therefore be sufficient if, before going further, we give here a short recapitulation of these criteria, on which our study is based. They may be divided into two main groups: those concerning investments in capital equipment, and those concerning current operations (2). In the present chapter we shall not make any explicit reference to the analysis given in Part I, because the whole of the discussion that follows constitutes a general commentary on the conclusions reached in that Part.

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In view of the confusion surrounding the concepts of the surpluses and external effects, two short sections will be devoted to a definition of these terms and to a general analysis of their implications for an optimum allocation of resources (3).

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A final section will deal with points connected with the "relative optimum" or "second-best". The aim will be to define the optimum conditions when certain constraints are imposed upon transport and/or when other sectors of the economy do not observe the rules for an optimum allocation of resources.

22.1 — *INVESTMENT CRITERIA AND CRITERIA FOR CURRENT OPERATIONS*

22.10 — *Investment criteria*

470

The basic principle of optimum resource allocation with regard to investment in durable assets (capital equipment) (4), the size of which can be varied continuously, may be summarized as follows: the difference between the discounted future benefits (i.e. of utilities expressed in money terms) expected to arise directly or indirectly from an investment project and the sum of the investment cost and discounted operating costs should be positive and maximum, all prices being considered as given for the purpose of the investment calculations.

471

This general criterion implies in particular that:

i) The sum of the investment cost and discounted operating costs should be minimized;

ii) Investment in capital equipment, the size of which can be varied continuously, should be pushed to a point where the sum of future marginal benefits derived from the investment (expressed in discounted value) is equal to the discounted value of the operating costs that are independent of traffic.

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In addition, capital equipment should at all times satisfy the following criterion concerning the possibility of disinvestment: an item of capital equipment should be maintained in its present employment only if the sum of discounted future benefits from it is at least equal to its opportunity cost (i.e., to its value in its best alternative employment).

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Benefits and costs, in the sense in which these terms are used here in connection with investment criteria, include not only the revenues actually obtained and the charges actually paid, but also all rents, positive as well as negative, that accrue to the final consumers.

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The investment criterion could be reformulated as follows: the net sum of all rents, positive as well as negative, which would vanish if the activity in question did not take place, should be positive and maximum.

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It should be pointed out that, in considering the marginal conditions of optimum investment, there is

(1) See Chapter 21.

(2) See Section 22.1.

(3) See Sections 22.2 and 22.3.

(4) In all that follows, the term "durable" should of course be understood in the economic and not in the physical sense. Factors of production may continue to exist in the physical sense after they have been withdrawn from the production process.

no need to introduce the surpluses, since the actual price paid by the users reflects the full marginal benefit derived from the project.

22.11 — *Criteria for current operations*

476

The basic criterion is similar to that for investment in capital equipment: the difference between the sum of the discounted benefits, derived from any particular output, and the total direct cost of that output (defined as the sum of the values at market prices of the non-durable factors of production actually sacrificed in production, plus the discounted value of the actual deterioration of the durable assets due to their utilization in the production process) should be positive and maximum.

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The following implications may be noted, in particular:

i) Any output should be produced at minimum total direct cost, as just defined;

ii) Output should be equal to demand, at a price equal to the sum of the marginal cost of that output and any marginal rents that may accrue to the durable assets and the indivisible assets employed in the production process.

478

We have shown in Part I that marginal cost is defined as the additional cost occasioned by the production of an additional unit of production. The second component of the optimum price — namely the marginal rent which accrues to the existing durable factors and the indivisible factors — is nil when those factors are not fully utilized; otherwise, it is just high enough to limit demand to the capacity available (1).

479

With regard to infrastructure, the following terminology has been adopted. The two components of the optimum charges to be imposed on the users of infrastructure — the marginal cost utilization and the marginal rent — are termed respectively the "cost charge" and the "congestion charge". The latter is a scarcity price which is nil when the infrastructure is not fully utilized in the economic sense. Otherwise, it is just high enough to prevent congestion. The sum of the cost charge and the congestion charge has been termed the "economic charge".

22.2 — *THE SURPLUSES*

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The prices paid by the users of a certain product generally do not reflect the total benefits (i.e. the money value of the total utility) that they derive from the product. These total benefits can be defined as the maximum sum the users would be willing to pay for the product in question if they were given a choice between getting it at that price or not getting it at all. The difference between the total benefits and the sum actually paid by the users constitutes the consumers' surplus.

481

As we have already mentioned (2), the surpluses may have to be taken into account in applying the investment criteria and the criteria for current operations. This may be the case, in particular, when a project will not produce sufficient revenue to cover the sum of the investment cost and the discounted operating costs, with the output priced according to the criteria of optimum resource allocation. Although such a project would incur a deficit, it may nevertheless be worth undertaking if the surpluses are greater than the deficit (3). This may happen in certain rather special situations (increasing returns) which occur particularly in the field of infrastructure. The question of the surpluses is therefore of some importance to our study.

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However, the definition and evaluation of the surpluses raise a number of highly complex problems, both theoretical and practical.

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In the first place, there is the risk of underestimating or overestimating (4) the value of the surpluses. Underestimation may occur if the surplus is simply taken as being the additional net revenue that would be obtained by a monopolist pursuing a policy of perfect discrimination. This method would inevitably leave out of account all the surpluses created at earlier and later stages of the total production process, of which the sector concerned is a part. Such underestimation only occurs, however, when the surpluses in question have not already been taken into account in calculating the monopolist's surplus. On the other hand, if the total psychological surplus is calculated as the sum of the additional revenues obtained by perfect discrimination at each of the successive stages of the total production process (i.e. the process that begins with the original factors of production and ends when the product reaches the final consumers), there will be a lot of double-counting. The correct solution is to consider only

(1) The concepts of "full utilization" and "congestion" must always be interpreted in the economic and not in the physical sense (see Part I).

(2) See Section 22.1.

(3) For a definition of deficit, see Subsection 24.40.

(4) In particular by double-counting.

the sum of all the benefits accruing to the final consumers (i.e. the final utilities expressed in money terms), which would vanish if the economic activity in question were eliminated.

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The correct solution thus defined obviously presents a great number of practical difficulties. For one thing, it makes it necessary to define the best possible alternative situation for all the sectors of the economy that are directly or indirectly affected by the existence (or the elimination) of the sector in question; and it is also necessary to assess the difference between the welfare of the final consumers in the two situations under consideration.

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It is quite obvious that this concept of total benefit cannot possibly be applied in practice without some rather drastic simplifications and approximations (1). In this report we shall not go into the problems involved in finding practical methods of assessing the surpluses. Certain aspects of this question will, however, be dealt with in the following chapters (2). Actually, where transport policy is concerned, the surpluses need only be considered explicitly with regard to infrastructure.

22.3 — *EXTERNAL EFFECTS*

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A sector of the economy such as internal transport generates what may be called external effects if, besides its main output, it produces other goods or services (external benefits) or if it occasions costs in another sector (external costs).

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A classic example of external costs is that of the damage and nuisance caused by smoke and noise. With regard to external benefits, one may cite the case of canals, which are usually constructed primarily for shipping purposes but may also perform irrigation or other functions. Conversely, a dyke constructed primarily for protection against floods could also serve as the foundation for a road. These illustrations show that external benefits are usually associated with cases of joint production (3): the factors of production employed in transport have a secondary function which leads to the creation of benefits outside the sphere of transport.

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A special problem arises here with regard to distribution of the total cost of a sector among the joint services it produces. An example of this is the distribution of the investment cost of a canal among its various functions. This problem will be considered briefly at a later stage (4).

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In principle, if an optimum allocation of resources is to be achieved, external effects must be taken into account in exactly the same way as the costs and benefits connected with the sector itself. A full discussion of the practical difficulties involved would be outside the scope of this report. Some aspects of the question will, however, be considered in a later section (5).

22.4 — *PROBLEMS OF THE "SECOND-BEST"*

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Apart from the difficulties encountered on the practical level, the criteria of optimum resource allocation may have to be reformulated to some extent in the following cases:

i) If other sectors of the economy, outside internal transport, do not conform to these criteria;

ii) If internal transport is subject to certain constraints, such as the requirement of budgetary equilibrium (6).

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In the first case, that of the "imperfect environment", the criteria of optimum resource allocation are not necessarily valid without modification for internal transport because, if the other sectors of the economy do not apply those criteria, prices will no longer correctly reflect the cost and scarcity relationships between transport and other goods and services. The actual importance of the distortions that may result in the sector which applies these criteria is a question of fact that cannot be evaluated objectively without a mass of information that is not available. In the second case, that of constraints imposed upon internal transport, the optimum criteria may be impossible to satisfy completely.

492

Determination of the optimum criteria to be applied in these cases is usually referred to as the problem of the "relative optimum" or "second-best". Second-best solutions are in most cases extremely complex. Even if they can be defined in theory, in practice they are generally much too complicated to

(1) It would appear that a reasonably approximate calculation of part of the benefits is often possible — especially of the part that takes the form of a saving in the users' time or money resulting from the construction of infrastructure.

(2) See particularly Sections 23.1, 24.1 and 24.4.

(3) For a definition of joint production, see Part I.

(4) See Subsection 24.43.

(5) See Section 24.1.

(6) See Section 24.4.

be adopted without modification. Because of this complexity, the problem of the second-best is often put forward as an argument against any policy based on the criteria of optimum resource allocation.

493

This point of view is highly debatable. In the first place, it ignores the fact that some of the optimum conditions may not be affected at all; this may be the case, for example, with cost minimization. Secondly, the second-best solution can often be achieved reasonably satisfactorily, and in some cases it may be best to apply the criteria of optimum resource allocation without any modification at all.

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The problems posed by the relative optimum, assuming the existence of constraints, will be studied later with reference to the particular cases of stabilization and budgetary equilibrium (1). These are the most important examples of constraints that may be imposed on internal transport.

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As for the problem of the imperfect environment, a good case can be made for disregarding this when the optimum transport policy has to be worked out (provided that all modes of transport are included in the transport sector, so that no means of transport form part of the imperfect environment). Two arguments can be advanced in favour of this proposition. The first is a general consideration. If deviations from the optimum rules in other sectors are considered as an accepted fact, and if policy is directed towards mitigating the consequences of this situation by introducing compensatory distortions in the transport sector, we run the risk of becoming involved in a vicious circle of measures designed to provide compensation in one sector for distortions that exist in other sectors or are created by the very process that is intended to correct them. The second objection results from the fact that, as far as one can judge, the price elasticity of the total demand for transport is relatively weak in the short and medium term (again, if one considers all modes of transport). The elasticities of substitution are much higher within the transport sector. Consequently, it is as a rule far more important to ensure optimum price relationships within the transport sector than it is to secure an "optimum", which is bound to be only a second-best, with respect to other sectors of the economy.

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However important these arguments may be, the problem of the imperfect environment, in so far as it concerns the relations between the transport sector as a whole and the other sectors of the economy, will be disregarded in the subsequent sections of this report. Nevertheless, we shall briefly discuss (2) the serious problems that may arise if some modes of transport are considered while others, such as pipelines, coastal shipping, etc., are left out of account.

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(1) See Sections 24.3 and 24.4.

(2) See Subsection 25.32.

CHAPTER 23

THE SPECIAL PROBLEMS OF INFRASTRUCTURE

23.0 — *GENERAL*

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Application of the criteria of economic efficiency to transport raises many questions of a practical nature. Outside the field of infrastructure, these mainly concern the institutional means of ensuring application of the criteria, the constraints imposed on this by reality, and, where other criteria are explicitly considered, the possible conflicts between efficiency and other objectives such as equity. All these questions, in so far as they concern general policy options for transport, will be studied in this Part [1]. Some specific policies will be examined in Part III.

498

However, certain aspects of infrastructure call for a special analysis of the repercussions of the criteria of optimum resource allocation themselves. Infrastructure has at least two features which justify examination: it consists mainly of highly durable assets, and it is subject to important indivisibilities — both terms being understood in the economic sense. Questions relating to the durability of infrastructure, and to the connection between indivisibility and increasing returns (economies of scale), are briefly summarized in the following two sections [2].

499

A third aspect still remains to be studied in detail. If the charges to be paid by the users of infrastructure correspond only to the economic charges [3], infrastructure could operate at a deficit in the sense that the sum of investment cost and discounted operating costs will not be covered by total revenue, i.e. by the sum of all discounted economic charges levied throughout the whole economic life of the equipment. The question of whether there will in practice be a deficit or not largely depends on the investment policy followed. If the expansion of infrastructure is slow it may reach or approach economic saturation, and revenue from the congestion charges will be relatively high. If, on the other hand, investment expands sufficiently to satisfy the criteria of optimum resource allocation, the corresponding prices will be relatively low and there may be a deficit. We have shown that, because of increasing returns to investment in infrastructure, a policy of optimum investment would in fact lead to such a deficit. The various problems connected with the deficit will be studied later [4].

23.1 — *ECONOMIC DURABILITY OF INFRASTRUCTURE*

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The exceptionally long economic life of a large part of the assets considered as constituting the infrastructure of internal transport is one of its most striking features.

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This is the reason for certain special difficulties. To apply the investment criteria, an estimate of future demand and costs is needed, and this will obviously be the more difficult, the longer the economic life of the equipment considered. Moreover, the long life of infrastructure implies that only a small part needs replacing each year. Consequently, the available capacity is very largely a datum from the past which can be influenced by present decisions only in the direction of expansion. Disinvestment by taking infrastructure out of service before the end of its technical life will occur relatively rarely.

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There is one last point which will play an important role in the study of the deficit and of the various interpretations of the notion of budgetary equilibrium. The older an element of infrastructure is, the more the price which would have to be paid at the present time to build equal or equivalent capacity can diverge from the initial investment cost. This may be due to inflation, technical progress, or any other cause of changes in money costs [5].

23.2 — *ECONOMIC INDIVISIBILITY OF INFRASTRUCTURE*

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Indivisibility in the physical sense occurs when a factor of production is available only in units of a specific discrete size. The total production capacity of such a factor can vary only by discrete quantities and not continuously. Indivisibilities can occur

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(1) See Chapter 24 for infrastructure and Chapter 25 for transport services.

(2) For the question of economies of scale see Part I.

(3) See Subsection 22.11.

(4) See Section 23.3.

(5) See Section 24.4.

both for durable factors, such as rolling stock, and for factors which are not durable, such as a General Manager, if his services can be dispensed with at short notice, in which case he is not durable in the economic sense of the term. But it should be noted that indivisibilities are important from the point of view of policy only if they are considerable in relation to total demand. It follows that in transport services — where indivisibilities of rolling stock are obviously very low in relation to total demand — the problem can be ignored, but that it may play a role in infrastructure.

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Indivisibilities in the physical sense of the term do exist in infrastructure. Most projects have a specific minimum size: a two-lane highway, a single-track railway, a canal of specific depth and width, a minimum electrification project, etc. Even if demand is weak, it may be justified on the basis of the investment criteria [1] to construct infrastructure which will operate at a deficit, if the prices paid by users are equal to the economic charges.

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If the minimum size of the infrastructure has already been attained, the problem of physical indivisibility no longer seems to be serious. In many cases, the capacity to be built may vary almost continuously for any dimensions above the minimum. But there remains another form of discontinuity in infrastructure capacity which also comes under the concept of economic indivisibility.

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This second form of discontinuity results from the economies of scale in the construction of infrastructure: a large capacity is often relatively cheaper to build than a smaller one. It is important to note that the more important economies of scale occur when the infrastructure is being built. Once a certain infrastructure exists, extensions of capacity can no longer be provided at a marginal cost of construction as low as would have been possible if the same additional capacity had been built at the same time as the existing infrastructure. Economies of scale in the building of infrastructure are of a special kind: they reflect the savings resulting from building a particular capacity in one operation rather than gradually as demand increases. For instance, it is cheaper to build one four-lane highway than two two-lane highways, but a four-lane highway built in two stages could cost as much as, or even more [2] than, two separate two-lane highways. A rational policy for investment in infrastructure in an expanding economy might therefore be to push extension of capacity to the point where there would be some surplus capacity during the initial period, rather than to adapt capacity gradually to increasing demand. Economies of scale in the building of infrastructures thus give rise to a form of indivisibility whose effects are very like those of physical indivisibility [3].

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What are the consequences of economic indivisibility? In the first place, the congestion charges may show a rather special pattern in time. In an expanding economy, congestion charges will be nil during the period following expansion of capacity and for as long as the infrastructure is not yet fully utilized [4]. As soon as capacity is being fully utilized in the economic sense, congestion charges will begin to increase, and they will go on increasing until capacity is again expanded, when they will fall back to a lower value, perhaps to zero. This aspect of economic indivisibility will be examined later [5]

508

The second possible consequence of economic indivisibility is that operation of the infrastructure concerned is likely to produce a deficit in the sense defined above if the charges paid by the users are equal to the economic charges. In the case of physical indivisibility, a deficit will occur in a situation of stable demand if the indivisible infrastructure is not fully used. The congestion charges, determined in conformity with the criteria of optimum resource allocation, will then be nil, so that the optimum prices paid by users will consist solely of cost charges. It is evident that the total discounted revenue obtained by making users pay only the cost charges (corresponding to the marginal cost of utilization) will be inadequate to cover the cost of the initial investment plus the discounted cost of operation and maintenance, revenue as well as costs being calculated over the whole life of the infrastructure. A road, a canal and, in general, all durable assets, deteriorate as a function of their economic age as well as from wear and tear. Consequently, if users are only charged the direct cost they cause, the investment cost plus the discounted operating expenditure will not be covered. Hence, there will be a deficit in the sense defined above. At the same time, if the investment criteria are followed, we shall be led to build the infrastructure in question provided the discounted benefits from its use, including the surpluses created, exceed

[1] That is to say if the sum of the discounted benefits including the surpluses, is greater than the sum of the investment cost and discounted operating costs, the difference being at its maximum.

[2] Because of the increase in ground rents resulting from the first investment.

[3] It may usefully be pointed out that economies of scale in infrastructures are the more marked, the lower the rate of discount and the higher the rate of growth of traffic.

[4] See Part I.

[5] See Section 24.3.

its total discounted cost, the difference being maximum. Even if the infrastructure considered is not fully utilized and the optimum price for its use is consequently very low, the surpluses may be high enough to justify the investment. The existence of such over-capacity can be considered as the price of progress, since any bottlenecks in infrastructure are likely to strongly impede the advance of the economy as a whole.

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The same phenomenon, i.e. that the sum of discounted economic charges is not sufficient to cover the sum of the investment cost and operating expenditure, occurs in the other case of economic indivisibility, which is linked with the existence of economies of scale in the construction of infrastructure. The criteria of optimum resource allocation imply that investment would have to be continued up to the point where its marginal cost is equal to the sum of discounted future revenue from the marginal investment (1). However, because of economies of scale, the marginal cost of investment is lower than its average cost, so that a policy of investment and prices based on the criteria of optimum resource allocation will generally lead to a financial deficit (2).

23.3 — *THE PROBLEM OF THE DEFICIT*

23.30 — *General*

510

We have shown in the preceding sections that the infrastructure of transport, if managed according to the investment and pricing rules corresponding to an optimum allocation of resources, may incur a deficit. This deficit raises various problems, which will be discussed briefly in this section. Their implications as to the policy to be followed will be analysed in the following chapter, which deals with options for infrastructure.

511

One preliminary comment is required. The total deficit to be expected when a specific infrastructure investment is made and users are charged prices equal to the economic charges can be clearly defined. It is quite simply the difference between the discounted value of the investment cost plus operating expenditure and the discounted value of the revenue from all future economic charges. However, this definition is insufficient to determine the deficit to be covered each year, and it does not give any indication how the total deficit should be apportioned among the various categories of users. These questions will be examined in connection with the option of budgetary equilibrium (3). In the present section, the annual deficit is assumed to be completely defined (4).

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The first problem which arises in connection with the deficit is that it must be covered in one way or another. It follows from the theory of optimum resource allocation (5) that the deficit as just defined should be covered by means of taxes which do not distort economic decisions, for instance a fixed poll tax or a tax differentiated according to the age or height of the taxpayer. Such taxes, which do not affect optimum resource allocation, may be quite unacceptable from the point of view of equity. In other words, considerations of equity cannot be left out of account in examining ways of covering the deficit on infrastructure (6).

513

It is sometimes claimed that considerations of optimum resource allocation would favour the deficit's being borne by the users of infrastructure rather than financed out of the budget, i.e. from general taxation. The argument runs as follows: taxes which are neutral from the economic point of view may be unacceptable from the point of view of equity, but all other methods of financing the deficit lead to distortions of the conditions of optimum resource allocation. According to this argument the distortions caused by financing the deficit from public funds ("external distortions") would be more serious than those caused by imposing adequate charges on the users of infrastructure ("internal distortions").

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As a general proposition, the argument is difficult to sustain. In the present state of our knowledge it hardly seems possible to prove that, of all practicable methods of raising the required funds, the least inefficient one would be to impose the charges on the users of the infrastructure. This does not mean that such charges should not be imposed, but simply that they could not be justified by the reasoning we have just given.

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The second problem concerning the deficit is mainly of a political and sociological nature, although it can have considerable consequences on the practical economic plane, particularly as regards investments

(1) See Subsection 22.10.
(2) See Part I and Subsection 24.40.
(3) See Section 24.4.
(4) See Part I and Subsection 24.40.
(5) See Part I.
(6) See Subsection 23.31.

in infrastructure. The essential point is the following. Financing the deficit out of funds other than those obtained from charges on the users of infrastructure — which in practice means the State budget — implies that investment decisions in the area of infrastructure are subject to the limitations of the public budget and could be misdirected through the action of pressure groups (1).

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The third aspect of the deficit which must be examined concerns the railways, where infrastructure and transport services are managed as one unit. Since it is difficult in practice to separate the deficit attributable to infrastructure from a possible deficit in other fields of railway operation, covering the deficit from public funds is likely to weaken the incentive towards efficient management (2).

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It may be superfluous to emphasize once again that our analysis is essentially limited to determining the conditions and consequences of applying the rules of optimum resource allocation in the strict economic sense of the term. If the investment in infrastructure can depend on other considerations, the problem of the deficit as set out below appears in a very different light (3).

23.31 — *The deficit in relation to problems of equity*

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We may begin our analysis by considering the argument that an economic activity which does not produce external effects of production or consumption should cover its "total costs" (4) from revenue. This well worn thesis seems to follow from the idea — a rather tempting one, at least in a general way — that each individual consumer and each group of consumers collectively should bear the cost of everything they consume (5).

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Even if this proposition is accepted, certain questions remain open as to what it signifies in practice. In particular, what does it imply with regard to the allocation of costs which can undoubtedly be imputed to a certain collectivity — for instance, all the users of infrastructure — but which cannot be imputed directly to its individual members or to homogeneous groups within that collectivity? This question is of fundamental importance for the problem of the deficit. On the basis of the conditions of optimum resource allocation, the deficit cannot be imputed to the individual users of infrastructure for the simple reason that all costs which can be imputed directly have already been eliminated. After all, the deficit is defined as the difference between the investment cost plus the discounted future operating expenditure and the discounted revenue derived from the economic charges during the entire economic life of the infrastructure. These revenues include the directly imputable costs, i.e. the marginal costs of using the infrastructure.

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This problem can be solved in various ways, which will be analysed later (6). The deficit has to be apportioned between transport and the other uses of infrastructure, between the three modes of inland transport, between the regional components of the infrastructures, and between the various categories of users. Furthermore, it must be apportioned in time between the users.

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We have hardly any exact information as to which criteria are generally accepted for apportionment of the deficit or which would be the most appropriate from the equity angle. In this field our thinking would seem to be largely conditioned by practical possibilities and the requirements of economic efficiency. This reduces the question to one of economic and institutional efficiency, which we shall examine in the next chapter.

522

But one final comment may be made. However vague may be the consequences of the proposition that all consumption should be paid for by those who benefit from it, it does seem to imply as complete as possible an imputation of costs: to the transport sector as a whole, to each mode of transport separately, to each part of the infrastructure network, and to each type of service provided. If it is considered fair that every economic operator and every group of such operators should be charged all the costs which can be imputed directly to them, a maximum imputation of the deficit would also be necessary (7). However, we shall see below (8) that

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(1) See Subsection 23.32.

(2) See Subsection 23.33.

(3) See Subsection 23.34.

(4) See Subsection 24.41.

(5) This view is, of course, acceptable only if the distribution of income can be regarded as corresponding to the ethical ideals of the society considered; this obviously raises a host of problems which cannot be examined in this report.

(6) See Subsection 24.42.

(7) The term maximum is used intentionally to indicate that total apportionment to the individual user is impossible, by definition of the deficit. But this does not preclude certain elements of costs being imputed to specific categories of users, for example the costs of a mode of transport to all the users of it.

(8) See Subsections 24.42 to 24.46.

the possibilities of imputing costs are very limited, particularly when different types of services are produced on the same network. For this reason especially, the apportionment between users of the infrastructure of investment cost and management expenditure independent of traffic will always be largely arbitrary.

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On the other hand, it is generally possible without being arbitrary to apportion such costs between the regional components of infrastructure. But does the principle of maximum imputation imply that spatially these costs must be apportioned on a completely unequal basis? This is very doubtful, because the benefits from the various elements of an infrastructure network can be interdependent (1). Where the economic links between various parts of a region are so close that the division of its infrastructure into several networks would be meaningless — these regions can be very vast and can even extend beyond national frontiers — it would seem that equity demands not a maximum degree of inequality but rather the establishment of uniform charges giving the right to utilize the infrastructure at any point on the network. However, as we shall see below, there are good reasons for classifying networks in at least three general types, possessing specific economic characteristics which can justifiably be recognized from the point of view of equity, as well as from other points of view. These are main (national) networks, urban and suburban networks, and local networks. This form of inequality will be examined in the following chapter (2).

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We shall show that such "differentiation" of charges for the use of infrastructure is certainly possible in practice, but that it may be doubted whether the deficit on infrastructures of local networks should be met by the users, since this type presents fairly marked features which are not specifically economic. Similar considerations also apply to underdeveloped regions (3) (4).

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It would seem that the following — quite provisional — conclusion could be drawn from the above remarks. Considerations of equity appear to favour imposing on the transport sector — and in particular upon infrastructure, where the problem of the deficit arises — the rule of budgetary equilibrium, whose exact content, which will be examined later, is in any case not clearly determined by the idea of equity itself. This general principle is compatible with broad equalization in space of the deficits appertaining to the different parts of the infrastructure network within each mode of internal transport, inequality subsisting only between the three sub-networks which we distinguished above. However, considerations of both equity and economics prescribe that local networks — and all networks in underdeveloped regions — shoud be exempt from the rule of budgetary equilibrium, and that the deficit on them should be met from public funds.

23.32 — *The deficit and investment decisions*

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Infrastructure investment decisions are largely a matter for the public sector. The infrastructures of road transport and inland waterways come directly under the public authorities, either central or local; and, to achieve the necessary co-ordination (5), investments in railway infrastructure should also be subject to some public control. We have already pointed out (6) that the rules to be applied by the authorities should be practical, relatively simple, non-arbitrary and susceptible of objective control. Do the criteria mentioned in the preceding sections fulfil these conditions ?

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The investment criteria to be applied by the public authorities, as resulting from optimum resource allocation, are unambiguous and give rise to no difficulty in theory. However, if the system of charges for the use of infrastructure leads to a deficit which must be covered from public funds, there may be a danger of these criteria not being correctly and consistently applied. This danger, the result of several causes which will now be examined, would not exist if the criteria of optimum resource allocation in the matter of infrastructure investment were easy to apply and perfectly objective, i.e. not subject to individual judgment. But such is not the case. The criteria are not easy to apply and cannot be checked objectively, because they call for estimates of benefits and future costs over very long periods.

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(1) See Section 24.1.

(2) See Subsection 24.45.

(3) From the angle of political equity, each region of a country may be held to have a right to a minimum of transport facilities in the same way as rural communities are entitled to have schools. Since there is a minimum limit to the dimensions of infrastructures (see Subsec. 23.02), the infrastructures of thinly populated regions may be permanently underutilized. Imposition of budgetary equilibrium in these cases would result both in waste of economic resources — since the consequent tolls would hinder good utilization of the infrastructure — and a financial burden for the inhabitants of the regions concerned which would doubtless be excessive.

(4) A detailed study of underdevelopment is naturally outside the province of this report.

(5) See Section 24.1.

(6) See Section 20.1.

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Hence, the process of making decisions on investment in infrastructure can be influenced by political and social pressures and institutional factors. Certain pressures are bound to be exerted in this field, where private interests have much to gain and much to lose. But a tariff policy which implies subsidies from the government is likely to strengthen these pressures. Users of infrastructures, knowing that any expansion of them brings down the level of the congestion charges and also that any deficit will be covered otherwise than by charges upon themselves, will fight for the infrastructure investment programme which best serves their interests but does not necessarily conform to the criteria of optimum resource allocation. On the other hand, there is a danger of the expansion of infrastructure being unduly hampered by the limitations of the national budget.

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This last point, which is of an institutional nature, may well be the most important one in practice. Unjustified investment in infrastructure may well occur, but underinvestment, particularly in roads, would seem to be the most serious danger in the present situation. Great progress would therefore be made towards optimum resource allocation if roads were freed from national budget constraints by "defiscalizing" the charges which weigh on infrastructure users, i.e. by financing highway expenditure — however defined — from taxes which would no longer have a fiscal character but would be considered as prices (1).

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These considerations all argue in favour of clear and objective rules, "transparent" institutional procedures, and some autonomy for the decision-making authorities in their relations with the governments. In practice, the investment criteria of optimum resource allocation do not satisfy these conditions, notably because their application produces a deficit, which must be covered, and requires an evaluation of the benefits. This is why all the operational rules which we examine in the following chapter are necessarily compromises between the desire to satisfy the correct economic criteria of optimum resource allocation as fully as possible and the need for practical procedures which may depart from the optimum but not too widely. It should be pointed out here that very great losses of social returns can result from insufficient, excessive or badly directed investment in the infrastructure of land transport.

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A possible compromise could be found along the following lines. Apart from cases where social considerations are dominant (2), infrastructure investments would be made only if the relevant investment and operating expenditures could be covered by actual revenue from the charges on users. This rule deviates from the investment criteria of optimum resource allocation chiefly in disregarding all the surpluses which cannot be collected through charges. Admittedly, as an operational criterion for investment it is far from complete (3), but it has the advantage that direct revenue is a more objective and in practice less arbitrary measure than total benefit which includes the surpluses that are difficult to evaluate with accuracy.

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Imposition of the rule of budgetary equilibrium on infrastructure enables investment to be freed from national budget constraints — which is economically desirable — and frustrates, at least to some extent, the action of pressure groups.

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The requirement of budgetary equilibrium can cause particularly serious distortions to optimum utilization of infrastructure if the forecasts on which the original investment decision was based prove to have been incorrect, and especially if they were over-optimistic. In this case the need to balance the budget would mean imposing prices much higher than the economic charge, and this would lead to a particularly serious waste of available capacities. Two solutions are possible here: the first is to open the way to exceptional and specific government aids in all such cases; the second is to apply the rule of budgetary equilibrium only to infrastructure networks as a whole and not to their separate parts. In this case inaccurate forecasts would be likely to cancel each other out. The various aspects of these two

(1) Irrespective of where it is used in this report, the term "defiscalization" should not necessarily be equated with a reduction of the charges on infrastructure users. Moreover, it goes without saying that, under any "defiscalization", transport would continue to be as liable to general taxation as any other sector of the economy. "Defiscalization" of the charges on road users, and the freeing of investments in roads from national budget restrictions, should be interpreted in a limited sense. Such measures in no way reduce the importance of the investment criteria resulting from optimum resource allocation or of the co-ordination of investments. These requirements always remain wholly valid for roads and for the other modes of inland transport. Any anticyclical measures which might be taken by governments will apply to roads as well as to other investments; but, under the "defiscalization" envisaged here, infrastructure investment would no longer have to bear almost the whole burden of such anti-inflationary measures, as is now the case in certain countries. Investment in infrastructure would be placed on the same footing as the other sectors of the economy, instead of being considered as the instrument and object par excellence of anticyclical policy.

(2) Such as local networks and the entire infrastructure of underdeveloped regions.

(3) See Section 24.4.

solutions will be examined in the following chapter (1).

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One last point should be mentioned here. There is an alleged further argument in favour of the budgetary equilibrium rule, based on faulty economic reasoning. It is often claimed that a policy of financing the deficit of infrastructure from public funds would lead to a division of traffic among the three modes of transport which would be contrary to optimum resource allocation. This contention is based on the following reasoning. Since none of the competing modes of inland transport can cover the investment costs plus the discounted operating expenditure for its infrastructure from charges on users, and since the deficits have not the same relative importance within each mode of transport, a system of economic charges would lead to a distribution of traffic not consonant with the "relative costs" of the competing services. Consequently there would be no "equality of conditions of competition", and hence no optimum distribution of traffic (2)

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This argument is based on an incorrect interpretation of the criteria of optimum resource allocation. These criteria include certain rules for investment in infrastructure. Once an infrastructure exists — and whether the original investment decision was or was not in conformity with optimum resource allocation — the optimum charges for using it are those we have called "economic charges". Consequently, it cannot reasonably be claimed that this system of charges — whether it leads to a deficit or a surplus, or just manages to achieve budgetary equilibrium — would create a distortion in the sense that there would be deviations from the optimum distribution of traffic between the competing modes of transport.

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However, those who allege that the system of economic charges engenders a distortion because of the deficits it implies may, in the last analysis, be justified from another angle. Given the difficulties involved in applying the criteria of optimum resource allocation to infrastructure investments, particularly as regards the assessment of benefits, the authorities might well accept, as an approximate solution, an investment policy aimed simply at avoiding economic congestion. Actually, such a policy could have unwelcome consequences because of the resulting investment decisions by users.

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Fixing charges at the relatively low level corresponding to optimum resource allocation without the deficit being covered by the users is, in fact, likely to provoke demand for transport which would not have arisen if the level of charges had been sufficient to cover the investment cost plus discounted operating expenditure of the infrastructure. In particular, users of the infrastructure may be led to base their investment decisions, especially those concerning the location of industry, on the hypothesis that there will always be sufficient infrastructure at charges which are low in relation to these costs. Consequently, if the authorities pursued an investment policy aimed simply at avoiding economic congestion, while exempting users from covering the deficit, infrastructure investment could result which would not be justified by the criteria of optimum resource allocation.

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It is clear that this line of reasoning brings us back to considerations of an economic, institutional and sociological nature similar to those which, as we have already pointed out, argue for imposing the rule of budgetary equilibrium on the infrastructure of inland transport.

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Consequently, we may conclude by saying that certain economic, political, social and institutional factors seem to favour the imposition on infrastructure of the rule of budgetary equilibrium (the content of which we will define more precisely below), except in those cases where social considerations argue against it (3).

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Regional equalization of charges within each great sub-network would not conflict with these economic, political and institutional arguments. It would in fact serve to mitigate some of the harmful economic consequences of too strict an application of the requirement of budgetary equilibrium.

23.33 — *Special problems of the deficit in the case of railways*

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The deficit brings up a number of special problems in the case of the railways, where, for valid technical and economic reasons, infrastructure and transport

(1) See Ssection 24.4.

(2) Of course, the question of equality of treatment may present itself very differently from the angle of distribution of income than from that of institutional conditions of competition. We are only dealing here with equality of treatment in relation to optimum resource allocation.

(3) Especially local networks and all communications in underdeveloped regions.

services are administered as one unit. If the deficit of infrastructure were to be financed from public funds rather than from charges on users, some separation between infrastructure and the other railway operations might seem inevitable, at least at the level of investment decisions and financial administration. Such a separation would, moreover, be necessary to some extent even if the infrastructure deficit were eliminated by the requirement of budgetary equilibrium. We shall show in the following chapter that co-ordination of infrastructure investments appears generally to be a necessary condition of a rational transport policy (1). However, if the deficit were financed by subsidies, central co-ordination of the infrastructure investment of the railways or the other modes of transport would not be enough. Financing of the infrastructure deficit from public funds would entail both a more strict public control over investment decisions and a complete separation of infrastructure from transport services in the railway accounts.

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If we do assume that the deficit is financed from public funds, decisions on investment in infrastructure can hardly be left entirely to those who are already responsible for actually running the railways. Such a mixture of responsibilities — towards the railways on the one hand and the taxpayers on the other — is hardly likely to be conducive to optimal decisions. Extensive public control might therefore be necessary to counter any tendency on the part of the railways to make excessive claims in the matter of infrastructure investments. Moreover, the fact of combining under the same administration and the same system of accounting one component which would be subsidized infrastructure, and one which would be expected to be self-sufficient — the transport services — certainly does not meet the essential requirement of any centralized regime, i.e. that its functioning should be "transparent" and in conformity with criteria, the content and consequences of which can be easily and objectively checked. In the situation envisaged here, the main risk inherent in insufficiently transparent procedures would be that of confusion between two possible causes of the railways' deficit: on the one hand the consequences of optimum resource allocation as regards infrastructure, and on the other inefficient management. It would seem essential that these two sources of deficit should be rigidly separated if the infrastructure is partly financed by subsidies.

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However, the separation of infrastructure from other operations, even if it is only done at the accounting level, raises certain problems. This comes out very clearly in the numerous studies on this matter. These propose conventional solutions for separating the two accounts relating respectively to infrastructures and to transport services. The solutions not only differ greatly in detail but often also diverge on important points, such as whether electrification should be included under infrastructure or under services. We have already mentioned the problem in the introduction to the present Part (2), where we defined infrastructure as denoting all fixed installations used in transport. This definition is of course a convention. The problem is of no great importance for most practical issues, but it does raise some serious questions when the infrastructure is financed to any extent by the State while other expenditure remains in principle a charge on the railways and thus ultimately on transport users. Under these circumstances, and taking into account the risk of distortion of conditions of competition, the separation which would be necessary in the financial administration of the railways between infrastructure and transport services appears to constitute a serious problem in connection with the deficit.

23.34 — *Summary*

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The summary of this section can be brief. The deficit occurring through the application to infrastructure of the criteria of optimum resource allocation raises certain basic problems which cannot be resolved in practice except by methods to some extent inconsistent with those criteria.

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The method examined consists in imposing the rule of budgetary equilibrium on all infrastructure, except local networks and all infrastructure in underdeveloped regions.

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In theory, budgetary equilibrium is compatible with optimum charges if it is achieved by imposing on users lump-sum charges which do not distort marginal conditions. In practice, however, this method can be applied only within narrow limits, particularly because of the problems of equity it poses — as also does the financing of the deficit from public funds. This conflict, and the compromise it necessitates between requirements which are partly incompatible, is at the very root of the economic problems of infrastructure which will be examined in the following chapter.

(1) See Section 24.1.
(2) See Section 20.2.

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The problems connected with the deficit and the suggested solutions have been examined primarily from the angle of optimum resource allocation. However, as indicated in the Introduction to this Part (1), infrastructure policy may well be considered to be essentially a matter of public concern, in which objectives other than efficiency may play a role, and sometimes even a predominant one (2). In this context the problems of the deficit as analysed above would hardly arise at all.

(1) See especially Section 20.0, also Chapter 21.

(2) In particular the political and economic unity of the nation, regional policy objectives, etc.

CHAPTER 24

OPTIONS FOR INFRASTRUCTURE

24.0 — *PLAN OF THE CHAPTER*

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In the Introduction to this Part (1), we saw that there are considerable economic differences between infrastructure and transport services. Similar differences exist in the way production is organized. Transport operations — at least in road haulage and inland waterway transport — can generally be organized without centralization; but where infrastructure is concerned the possibilities, as well as the economic advantages, of decentralization are limited. Moreover, as we shall see in the following section, the economic nature of infrastructure renders a high degree of centralization desirable.

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In our study of the options for infrastructure, it is useful once again to distinguish between investment policy and charging policy. The options for investment will be discussed in Section 24.1 on "The co-ordination of investments in infrastructure". This heading anticipates the conclusion of our analysis, which is that investments in infrastructure must necessarily be co-ordinated in the interests of economic efficiency. The question of the best way of arriving at decisions regarding investment in infrastructure presents many difficulties, especially on a practical level, but neither the principle of co-ordination nor the economic criteria to be adopted can be seriously disputed.

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Charging policy, on the other hand, is a more controversial matter because of the conflicting demands outlined in the preceding chapter (2). A logical examination of the various policy options should start with the system of economic charges that is derived from the criteria of optimum resource allocation. The principal advantages and disadvantages of this option will be discussed in Section 24.2, in which we shall consider various practical points, such as the limited possibilities of differentiating such charges.

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We have seen (3) that economic charges do not remain constant. Since the congestion charge is a function of the degree of utilization of infrastructure, the optimum charges vary with demand. Moreover, economic charges fluctuate even in the long term, owing to economic indivisibilities. It has been suggested that such fluctuations could be eliminated or reduced if the charges for the use of infrastructure were stabilized. This possibility will be examined in Section 24.3.

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The option of budgetary equilibrium will be considered in Section 24.4, where we shall show that it covers a great many possible systems, depending on the interpretation given to the concept of the "total cost" to be met out of revenue and on the method by which the "total cost" of infrastructure is apportioned among the various categories of users.

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In this chapter we shall not deal with the rules that should apply to prices and investment if infrastructure is governed by criteria other than those necessary to ensure an optimum allocation of resources. A discussion of these other criteria will be found in Chapter 21.

24.1 — *THE CO-ORDINATION OF INVESTMENTS IN INFRASTRUCTURE*

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Decisions concerning investments in infrastructure are, of necessity, centralized. In all the countries of the Community, the public authorities themselves are usually directly responsible for constructing and operating the infrastructure in two of the three modes of inland transport, while in the third (railways) a measure of public control is exercised over investments in infrastructure.

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This situation is no mere institutional peculiarity due to historical developments alone. On the contrary, there are strong economic arguments for a high degree of centralization where investment decisions regarding infrastructure are concerned. In the first place, the fact that infrastructure is subject to economic indivisibilities makes large-scale investments necessary. Secondly, the fact that the separate parts of an infrastructure network are closely interrelated in each mode of transport makes it necessary to centralize investment decisions to some extent. Thirdly, the benefits derived from competing infrastructures (for example, a road and a railway line

(1) See Section 20.2.
(2) See Section 23.3.
(3) See Section 23.2.

running parallel to each other) are not independent, and therefore investment decisions concerning the infrastructures of competing modes of transport should even be co-ordinated with each other.

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What rules ought to be observed when decisions are taken about investment in infrastructure? The investment criteria derived from the theory of optimum resource allocation have been summarized in previous chapters (1). The practical difficulties in applying these criteria are well known. It is necessary to estimate future demand, future costs and, above all, benefits; to determine the external effects of the infrastructure and its probable economic life (for which technical progress must first be assessed); and to choose an appropriate rate of interest for use in discounting future costs and benefits.

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These are exceedingly complex problems which cannot be dealt with in this report. They are to a large extent inherent in the nature of investment, and arise regardless of the policy pursued. Institutional rules may, of course, act as incentives, but the fundamental problems remain and there is no institutional procedure by which they can be eliminated.

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The main point to be considered here is the connection between different investment projects. Investments in infrastructure obviously cannot take place independently in separate parts of a single network. The very fact that the infrastructure forms a technical and economic unit means that it is vital for the investments within each mode of transport to be co-ordinated. In economic terms, one may say that the services performed by the separate parts of a network are highly complementary, and that the benefits derived from the different parts of a network are therefore interdependent. Hence it is clear that, even if it were technically possible to decentralize investment decisions, and even if the adoption of different charges for separate elements of infrastructure were not bound to lead to prohibitively high collecting costs, such decentralization would not produce an optimum pattern of investment. This conclusion does not depend on the problem of surpluses (2); it remains valid even if the latter are entirely disregarded.

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Similar arguments may be put forward when the investments concern the infrastructure of different modes of transport. In the first place, the services provided by the various modes are often complementary, in which case the arguments that have just been advanced for co-ordinating all the investments within a single network are equally valid for co-ordinating investments between different networks. Secondly, the investments in infrastructure also need to be co-ordinated if the services provided by the different modes of transport are interchangeable, as is very often the case. This can be seen from the example of two competing projects, either of which might create future benefits sufficient to justify the investment. However, once one of the projects has been started the other may perhaps no longer satisfy the investment criteria: the expected volume of traffic will in fact be shared between the two competing infrastructures. Consequently, the infrastructure that is built first may cause the competing project to be cancelled, even though the latter might have been able to produce a greater total benefit, had it been carried out before the other. This argument again demonstrates the need for infrastructure investments to be co-ordinated, not only within each of the modes of inland transport but also between competing modes.

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This general conclusion holds good, whatever charging system for the use of infrastructure may be adopted. Centralized co-ordination of investments follows inevitably from the special economic features of infrastructure, i.e. the complementary nature of the components of infrastructure within each network and, to some extent, between different networks, and the interdependence of the total benefits derived from competing projects. There is no policy governing charges for the use of infrastructure, and no "rule" such as that of budgetary equilibrium, that can take the place of investment co-ordination, which alone enables the indirect effects of a specific project to be taken into account.

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The institutional implications of this situation will be analysed more fully in Part III.

24.2 — *THE OPTION OF ECONOMIC CHARGES*

24.20 — *General*

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The option that consists in imposing only the economic charges on the users of infrastructure, in contrast to a policy that would also impose the constraint of budgetary equilibrium, springs directly

(1) See particularly Subsection 22.10.

(2) See Section 22.2.

from the criteria that must be observed if an optimum allocation of resources is to be achieved (1). Since these criteria comprise not only rules governing charges but also rules for investments, the charging system corresponding to the option of economic charges must be accompanied by a separate procedure for making decisions on investment in infrastructure (2).

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In our analysis of the option of economic charges, existing infrastructure and the pattern of new investments will be taken as given. Whether the infrastructure is optimal or whether it is ill-adapted to present and future demand, the option of economic charges presupposes that in any case the best possible use must be made of the infrastructure as it stands. This objective cannot be attained unless the charges for its use are equal to the economic charges.

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There are two questions that should now be considered: how far can the system of economic charges be applied in practice, and what are its advantages and disadvantages?

24.21 — *Application*

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It may be recalled that the economic charge consists of two components: the cost charge, which is equal to the marginal cost of utilization, and the congestion charge, which is nil when the existing infrastructure is not fully utilized (in the economic sense) at a charge equal to the cost charge, and is otherwise just high enough to limit demand to the capacity available.

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In practice it would not be impossible to levy charges corresponding fairly closely to the cost charges. The marginal cost of utilization of the infrastructure is probably to some extent independent of the degree of utilization. Presumably it is also more or less uniform for large classes of infrastructure items within each mode of transport. At least as a first approximation, we may therefore assume that the cost charges do not differ appreciably in time and space, which simplifies their practical application. In a single network they are not necessarily identical for the different categories of traffic, but it should not be impossible to devise a system of charges that would allow for the differences. In the case of the railways and inland waterways, this would not present any problems. In the case of the roads, the taxes on motor fuels, together with those on vehicles, could probably be manipulated in such a way as to achieve a reasonably good approximation of the cost charges.

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The congestion charges present more difficulties. They are, after all, pure scarcity rents varying with fluctuations of traffic whenever a particular infrastructure is fully utilized in the economic sense (3). Charges for the use of infrastructure based on the pure charges (as defined by economic theory) would have to be highly differentiated both in time and space, and it is obviously impossible in practice to differentiate the actual charges made on the users of infrastructure in exactly the same way as the congestion charges. There are, however, a number of ways in which a solution can be found that comes close to the theoretical ideal (4).

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It might in the first place be possible to levy specific charges for using individual infrastructures or road networks where economic congestion tends to be particularly great. Such congestion may occur either because the investment in infrastructure is less than optimum, or because additional investment is exceptionally expensive per unit of capacity.

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An example of such an approximate solution would be a specific charge on urban road traffic. Another might be to levy specific charges at those times — hours, days or seasons — when infrastructure is used most intensively.

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In both these cases the specific charges (5) would have to be fixed in such a way as to regularize demand while at the same time ensuring that the traffic peaks are not simply transferred from one time to another or from one infrastructure to another. This could be done by adopting a system of charges that would allow for the various elasticities of substitution and be based on reasonably reliable estimates of the pattern of demand over a period of time.

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A special case of this is the possible distortion of the optimum division of traffic among competing modes of transport, resulting from the imposition of specific charges (6) on the infrastructure of one mode of internal transport but not on that of its direct com-

(1) As summarized in Subsection 22.11.

(2) So, for that matter, must all the other charging systems.

(3) See Part I.

(4) Generally speaking, in choosing a solution it is of course advisable to take costs of collection into account, as regards both cost charges and congestion charges.

(5) As referred to in the preceding paragraphs.

(6) As set out in the preceding paragraphs.

petitors. This is particularly important when one of the modes of transport can differentiate its charges to a greater extent than its competitors. A certain distortion may occur if the differentiation of the charges is not limited to the level that can be practised by the mode of transport that is the "weakest" in this respect, i.e. the roads [1].

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For obvious reasons, the roads are faced with the most difficult problem in applying congestion charges in practice. If the railways are not subjected to public service obligations — in which case their freedom to differentiate charges according to the degree of economic congestion will be restricted — and especially if they are not subsidized, they will in any case tend to operate their infrastructure as if economic charges were imposed on them for its use. For inland waterways, the practical problems connected with differentiation of charges are not very serious. On the other hand, where the roads are concerned, the possibilities of differentiation appear to be limited to a relatively rough subdivision [2] of the total network. In Part III [3] we shall consider briefly the effects on competition of this limited possibility of differentiating the charges for the roads.

24.22 — *Advantages and disadvantages*

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The advantages of the option of economic charges are quite clear. They can be summed up by saying that the economic charges ensure an optimum utilization of the existing infrastructure. In cases where the infrastructure is not fully utilized in the economic sense, the absence of any charge except the cost component leads to maximum economic utilization of a factor of production which does not occasion any economic costs other than the marginal use costs. Imposing congestion charges on infrastructures that are fully utilized in the economic sense is an effective way of rationing demand and reducing it to the level of the available capacity. The congestion charge does not in itself constitute a real obstacle to the utilization of infrastructure if traffic is considered as a whole, and in that sense it cannot be regarded as a burden on all the users collectively. In fact without the charge demand would fall spontaneously owing to the congestion, which would confront all users with costs similar to, perhaps much higher than, the congestion charge (through waiting, etc.); such congestion is a much less beneficial and efficient way of limiting overall demand at any one moment [4]. The system of economic charges may also have advantages where certain conceptions of equity are concerned.

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The disadvantages of the option of economic charges were mentioned above in dealing with the deficit [5]. If investment policy is carried out in accordance with the criteria of optimum resource allocation, the fact that the users of infrastructures are only charged the economic charges may bring about a deficit. In view of the present inadequacy of the infrastructure it is, however, not at all certain that imposing the economic charges alone would actually cause a deficit in every case. Where the roads are concerned, particularly, there is no doubt that investment, both in urban areas and in main networks, is far below the level that would be required if the criteria of optimum resource allocation were applied. The congestion charges may therefore well be high and, if they were actually imposed, the revenue from them might well be sufficient to eliminate the deficit, however defined.

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However, deficits can occur in other modes of transport. There may in any case be a deficit if investment in infrastructure comes close to the economically optimum level. Such deficits have three major drawbacks:

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i) If they are financed from public funds, this may conflict with certain conceptions of equity;

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ii) If investment is divorced from the revenue it is intended to produce, the sector becomes dependent on the national budget, and there is therefore a risk that investments in infrastructure may be inadequate owing to restrictions imposed by the budget, or ill-directed owing to political decisions taken under the influence of pressure groups;

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iii) In the case of the railways, the fact that the deficit is financed from public funds may impair economic efficiency in so far as the real infrastructure deficit cannot in practice be distinguished sufficiently clearly from a deficit attributable to inefficient operation.

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(1) Problems connected with the differentiation of charges will be discussed in Section 32.4.

(2) Of the type mentioned previously: main networks, urban and suburban networks, local networks. In present conditions, the highest congestion charges would probably be those for the second class of roads, and the lowest those for the last class, which might even be nil.

(3) See Chapter 31.

(4) The two systems are, however, not equivalent in the eyes of the actual users of the infrastructure.

(5) See Section 23.3.

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In certain cases, however, these disadvantages lose much of their force and there can be undeniable advantages in adopting the system of economic charges. This applies particularly to local networks and to all infrastructure in underdeveloped regions. In the latter case, the system of economic charges appears to be the only one compatible with a development policy.

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One final drawback which is sometimes advanced as an argument against this option is the fact that the charges would rise progressively from the relatively low level equal to the cost charge alone, which would prevail as long as the infrastructure were not fully utilized in the economic sense, to levels that might perhaps be very high, as economic congestion was approached. We shall show that this objection is not justified, particularly if investment is carried out in accordance with the criteria necessary to ensure an optimum allocation of resources and if, therefore, the danger of congestion is never very great. But even if these two conditions are not fulfilled, stabilization of charges does not seem particularly useful — as we shall see in the following section. Stable charges would hinder the optimum uilization of infrastructure when demand at a price equal to the cost charge is less than capacity, whereas if the infrastructure were fully utilized stable charges would be unable to prevent congestion and the burdens this would lay upon users.

24.23 — *The practical need for equalization of charges, and its consequences*

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In practice, however, a certain stabilization of charges must take place, since the charges cannot be fully differentiated for each individual element of infrastructure — especially where the roads are concerned — and must be equalized to some extent. Such equalization then raises another problem: at what level should the uniform charges within a broad division of infrastructure be fixed? For example, for all main arterial roads within one country or region? These large divisions — the only ones eligible for consideration in practice — are bound to include roads that are used to very different extents. It does not seem possible to calculate an "average" congestion charge without introducing many arbitrary elements, and the results of such calculations do not make much economic sense. Therefore, both on institutional grounds (the lack of criteria that are simple, not arbitrary and susceptible of objective checking) and for economic reasons (the fact that a system of "average" congestion charges is not economically justifiable), the system of economic charges would seem in practice to offer one or other of the following options.

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The first option would consist in imposing no charge for the use of infrastructure, except:

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i) Cost charges wherever these can be imposed without prohibitive collection costs;

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ii) Congestion charges only for categories of infrastructure for the use of which specific charges can be levied, in so far as these categories are in fact seriously congested in the economic sense of the term, for instance the roads in most urban and suburban areas.

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This option, which will be referred to as the "practical system of economic charges" and which follows directly (1) from economic theory, is consistent with the view that investment in infrastructure should be a public responsibility and can largely be justified by considerations other than economic efficiency (2).

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The second option includes all systems that add another constraint to the charges for the use of infrastructure in stipulating that a balanced budget must be achieved by means of these charges. Since this option is not as clearly defined as the first, a preliminary study of its principal variants will be made in the last section of the present chapter, when we shall also discuss the problems connected with regional equalization of the charges to be paid by the users of infrastructure (3).

24.3 — *THE OPTION OF STABILIZATION*

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We have already shown how economic charges develop over a period of time when, in an expanding economy, capacity is increased by discontinuous steps (4). We saw that, whereas the cost charge probably does not usually vary very much with the total volume of traffic, the congestion charge, which is a price that reflects the scarcity of available capacity, may tend to fluctuate. We have shown that the congestion charge is nil as long as capacity is not

(1) See Section 31.0.
(2) See Chapter 21.
(3) See Subsection 24.45.
(4) See Section 23.2.

fully utilized in the economic sense, and that it then rises progressively as traffic expands and as the existing capacity becomes fully utilized in the economic sense, falling sharply back to a lower level as soon as capacity is increased. In reality, of course, the time-pattern curve is far more complex than this. The expansion of demand is not simply reflected in a gradual rise in the level of the congestion charges as soon as full economic utilization of existing capacity has been attained. Seasonal and other short-term variations are superimposed upon long-term development, the trend in demand will show certain fluctuations, and technical progress may change the entire picture. Nevertheless, the yearly average level of the charges for any particular infrastructure will tend to be noticeably higher just before capacity is increased than immediately after.

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It has often been argued that it is economically undesirable that the charges should develop on this pattern, because the result is instability. This argument can have two very different implications. It might mean that the volume of invesments in capacity should be such that the average level of the congestion charges does not change perceptibly from one year to another. Bearing in mind economic indivisibilities, this objective could generally only be attained in an expanding economy if capacity were increased as soon as it was fully utilized in the economic sense, which would imply that the effective level of the congestion charges was nil. But the argument might equally well mean that charges ought to be stabilized, regardless of the volume of investments in capacity. Only the second interpretation will be considered here, because the first appears unrealistic.

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Is it advisable to stabilize the congestion charges for a given available capacity? Stabilization should be taken to mean that the charges would have to be fixed at a certain average level, the high charges existing at times of intense traffic being reduced to the average level and the low charges prevailing at times of surplus capacity being raised to that same level.

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Limitation of the charges at times of intense traffic would not seem to be very desirable. Since the intensity of demand must be taken as given, the cost of congestion will be borne by the users anyway, either in the form of congestion charges which limit demand to the capacity available, or in the form of delays, etc. In any case, the inadequate capacity will have to be rationed somehow; if the authorities are reluctant to impose charges high enough to do this, other methods will have to be employed — and these will generally be less efficient economically and also largely arbitrary. For example, congestion may simply be allowed to get worse, and the policy of "first come, first served", the policy of the queue, will be adopted, even though it makes no economic sense.

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The case for raising the nil congestion charges to an average level at times when there is a surplus of capacity may seem, at first sight, rather more convincing. It is sometimes argued that the existence of nil congestion charges is likely to induce the users to take investment decisions — particularly with regard to the siting of enterprises — based on the unjustified expectation that the congestion charges will remain nil. When the charges rise, such investment decisions will turn out to have been incorrect. This argument for some stabilization of charges may not always be entirely invalid, but it undoubtedly has its limitations. In cases where the congestion charges will remain nil for longer than the economic life of the users' investment, there is no reason to levy charges that might prevent better use being made of the existing infrastructure. Moreover, there is in any case no point in correcting the users' mistaken extrapolations of existing conditions (1) by uneconomic means such as the levying of charges when the infrastructure concerned is not yet fully utilized; it would be better to avoid such errors of extrapolation by improving the information available to the users (2). Since the site of an enterprise cannot be decided without serious consideration, the latter method cannot be rejected *a priori* as unrealistic, at least in so far as the congestion charges can be held to exert an important influence on decisions of industrial location.

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The relevance of the above considerations might be questioned on the ground that in practice charges for the utilization of infrastructure cannot be precisely adapted to the relation existing between demand and available capacity at any one moment and for any one object of infrastructure. A high degree of equalization of charges, both in time and space, may therefore be a practical necessity. Even so, some differentiation will still always be possible. Since such practical possibilities do exist, it is important to realize that the stabilization of charges — unlike the variation of economic tolls over a period of time — cannot be deduced from considerations relating to an optimum allocation of resources.

(1) Viz., due to the fact that the users expect the charges to remain nil.

(2) For possible ways of improving the flow of information, see Subsections 33.10 and 33.20.

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The conclusion is purposely stated in this negative fashion. Stabilization does not appear to be desirable in itself, and it therefore seems unreasonable to depart from the system of economic charges in order to achieve it. But other constraints may have to be imposed on the charging system, so that a certain deviation from the economic charges may be necessary in any case. An important example of such constraints is the requirement of budgetary equilibrium, which we shall discuss in the next section.

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Of course, some of the above considerations may no longer be wholly valid if the two general conditions assumed in the present report — full employment and relatively steady economic growth — are not fulfilled.

24.4 — *THE OPTION OF BUDGETARY EQUILIBRIUM*

24.40 — *General*

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The deficit that will be incurred in the operation of infrastructure when the users pay charges equal to the economic charges gives rise to a number of problems which have already been discussed in some detail. The option we shall now consider aims at avoiding these disadvantages by imposing the general requirement of budgetary equilibrium. The main reasons for which it may be desirable to impose this constraint have been examined in the preceding chapter (1).

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For a proper understanding of the option under review, it is essential to realize that the concept of budgetary equilibrium is extremely ambiguous (2). It may be interpreted in different ways, depending on the reason for which it is imposed; moreover, even consideration of the various objectives that can be pursued under the constraint of budgetary equilibrium does not always result in a single, unambiguous definition of this concept as it affects each of them. Budgetary equilibrium must therefore be regarded as a generic term covering a large number of different systems which may have very dissimilar economic characteristics and effects. Some of these systems will be analysed in more detail in Part III. In the present section we propose to study the most important questions posed by the principle of budgetary equilibrium, and to indicate the main ways in which this principle can be applied in practice.

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Practically speaking, budgetary equilibrium entails determination of the total sum that must be provided in any one year by the total revenue from the charges paid by the users in that same year. In what follows, this total sum will be termed the "total cost". To determine the total cost, it is usually necessary (3) to adopt an amortization convention with a view to distributing over a period of time the cost both of the initial investments and of renewal and maintenance operations that may take several years (4).

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It might be thought that reducing the problem of defining budgetary equilibrium to that of defining the "total cost" is a mere semantic substitution. But this question is in fact highly relevant to discussions as to the policy to be pursued, because the concept of "total cost", especially with regard to the methods of amortization it generally involves, is often approached from a point of view that leaves little room for discussion or even for objective analysis.

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The main aim of the present section is to show that the idea of "total cost" can be interpreted in many different ways, and that many of these interpre-

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(1) See Section 23.3.

(2) On the purely formal level, the definition of budgetary equilibrium does not present any difficulty. The most general definition is the following: budgetary equilibrium is attained when at any moment the sum of discounted future revenues (excluding subsidies), plus the assets or minus the liabilities at that moment, is at least equal to the sum of all discounted future expenditure. Budgetary equilibrium is thus perfectly defined, since, at the moment when it is first imposed, the value of the assets or liabilities is known. But the interpretation to be given to the concept thus depends on the definition of a constant, which is essentially arbitrary. In fact, at the initial moment, this constant may be regarded in different ways according to the point of view adopted — as the "market value" of the existing infrastructure, the unamortized value of the capital, the replacement value, etc. In Part III we shall analyse some specific versions of budgetary equilibrium, notably budgetary equilibrium with the possibility of borrowing and budgetary equilibrium without the possibility of borrowing.

(3) Except in the case of the system of budgetary equilibrium without the possibility of borrowing, which will be dealt with in Chapter 31 (Section 31.4).

(4) The overall deficit is the difference, at any particular moment, between all discounted future expenditure and all discounted future revenue (excluding subsidies), account being taken of a constant representing the value of the assets or liabilities at that moment. The annual deficit is the difference between the "total cost", determined conventionally as indicated in the text, and the revenue from the economic charges in a particular year. For the sake of simplicity, the adjectives "overall" or "annual" are not used in the report unless their omission might lead to confusion. It should generally be clear from the context which deficit is meant; whenever this may not be clear, a special indication is given.

tations may be acceptable in view of the particular purpose for which the concept is then to be used, but that they are all fundamentally arbitrary. There is no one concept of "total cost" which can meet all demands and solve all problems.

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No solution can be obtained by seeking to define the "true economic cost" of using infrastructure, taking investment expenditure into account, for the simple reason that no such cost exists. The only cost that can justly be imputed to the users of infrastructure in any particular period is the marginal cost of utilization.

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The problem of defining budgetary equilibrium is largely a practical, institutional and political one, because the purposes budgetary equilibrium is intended to serve are themselves practical, institutional and political (1). The purely economic aspect of the problem simply consists in looking for the best ways of avoiding the disadvantages associated with the system of economic charges while at the same time minimizing the distortion of optimum allocation of resources that may result when the condition of budgetary equilibrium is imposed.

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Since the various objectives for which this constraint is imposed may be inconsistent with one another or not always clearly defined, many alternative interpretations are possible, but none of them can claim to be the only correct one. The aim is not, and cannot be, to find a definition that is scientifically exact, because all propositions derived from the idea of budgetary equilibrium are practical compromises and all the methods of amortization are conventional in character.

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The charging system consistent with an optimum allocation of resources is perfectly clear: it does not in any way imply that budgetary equilibrium must be assured. Budgetary equilibrium is thought necessary because the existence of a deficit poses certain problems. It may be considered unfair to put all or any of the burden of infrastructure upon the taxpayers as a whole. Moreover, incorrect investments in infrastructure may be made, as a result of the political pressures that are brought to bear where any sort of public expenditure is concerned; and, in the case of the railways, the subsidies intended to finance the deficit of infrastructure may also be used to cover inefficient operation, and may therefore, perhaps, enable such inefficiency to continue. These are political, institutional and social realities which economic theory must accept and which cannot be judged solely from the point of view of optimum resource allocation. All that economic theory can do is analyse the various policies put forward, see whether they are reasonable and likely to have the desired results, and find out how they will affect economic efficiency.

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One last preliminary comment concerns the relationship between the system of charges and the criteria of investment. It is clear that these, taken together, must be consistent. If budgetary equilibrium is imposed, it must be assured by keeping investments in infrastructure within certain limits. This necessitates keeping the volume of investment below the level that would be achieved if the investment criteria corresponding to an optimum allocation of ressources were adopted. For these criteria take into account not only the revenue that can actually be obtained from charges paid by the users, but also the surpluses, which are generally not completely recoverable. In practice, surpluses can only be converted into actual revenue to a very limited extent. If budgetary equilibrium is to be ensured, the charges made for the use of infrastructure could obviously not be such as to enable such surpluses to be recovered, except very generally, and in any case only partially. The option of budgetary equilibrium must therefore be judged not only in the light of the repercussions it would have on the use of existing infrastructures, but also by its effects on the volume and direction of investment in infrastructure.

24.41 — *Definition of "total cost"*

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In studying the effects of budgetary equilibrium on investment in infrastructure, it is logical to start with a definition of "total cost" that would be in keeping with the investment criteria attendant on an optimum allocation of resources. In this sense, "total cost" can be defined as the initial cost of investment, minus the discounted residual value of the infrastructure at the end of its economic life, plus all discounted future operating costs. Budgetary equilibrium could then be said to imply that the charges made for the use of infrastructure are such that the total discounted revenue obtained from these charges, calculated over the entire economic life of the infrastructure, is at least equal to the cost thus defined. This definition involves certain more or less subjective judgments, particularly as regards future operating costs, the length of the asset's economic life, and its residual value at the end of its economic life. But this is unavoidable.

(1) See Section 23.3.

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Apart from requiring these judgments, the above definition of budgetary equilibrium leaves two important groups of problems unsolved. In the first place, it is obvious that if budgetary equilibrium is defined in this way, the future charging pattern remains indeterminate. Except in the limiting case of a permanent regime, there is an infinite number of charging systems that may satisfy the condition of budgetary equilibrium. This is true both for the distribution of costs over a period of time (the problem of amortization) and for the distribution of costs among the various categories of users (the problem of "imputation"). Additional conditions must therefore be imposed in order to determine the charging system (1).

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Secondly, although budgetary equilibrium can be precisely defined at the moment the investment is made (2), it is not at all clear how it should be defined when it is introduced during the economic life of the infrastructure. As we have already shown, this would involve an indeterminate component, i.e. the value — positive or negative — that should be set upon the infrastructure at that particular moment. When the infrastructure is being built, this constant is equal to the capital invested, but it is no longer precisely defined if the constraint of budgetary equilibrium is introduced subsequently. Thus, when budgetary equilibrium is accepted, it is necessary to define the constant which is inevitably involved as soon as the system is introduced. This is a problem of transition. Even if the condition of budgetary equilibrium has been imposed at the outset, a similar problem may also arise if demand and cost conditions become so different from what was foreseen that it may be thought desirable to adjust the charging system originally envisaged, i.e. to cease to regard budgetary equilibrium as a condition to be applied rigorously.

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The different ways of determining the value of the existing durable assets, such as the methods involving historic cost or replacement cost, correspond to a number of possible policies that will be discussed in Part III. We shall see there that most of them involve some process of amortization. This is why the problem of distribution of costs over a period of time — the problem of amortization — will also be considered in Part III. In the following subsections this distribution will be assumed to have been decided, which means that the "total cost" for any particular year, and consequently the deficit for that year, are taken as given. We shall therefore only consider the problems raised by the "imputation" of the deficit to the various categories of infrastructure users.

24.42 — *Apportionment of the deficit on infrastructure*

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When budgetary equilibrium is required, the deficit must be covered by charges paid by the users, who can be divided into several distinct categories. The question therefore arises as to how the deficit should be apportioned among these categories. In the usual terminology, the problem is that of "imputation of the total cost of infrastructure" to the various categories of users. The term "imputation" is, however, rather unfortunate here, since it suggests that there can be objective economic criteria for apportioning the "total cost" among the categories. In fact such criteria only exist when the "total cost" is covered by the revenue from the economic charges, but these criteria are not relevant to the deficit. Any rule concerning the way in which the deficit is to be apportioned — however necessary it may be in order to define the system of budgetary equilibrium — is adequate from the point of view of optimum resource allocation; the latter requires only that the method of apportionment, whatever it may be, must avoid distorting the conditions of competition, i.e. it must be "neutral" (3). This basic property will be extremely important in the analysis of the various systems in Part III.

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The problem of apportioning the deficit can generally be broken down as follows:

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i) Apportionment of the deficit among transport and the other functions of infrastructure, which can be called its "external effects" (4);

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ii) Apportionment of the deficit incurred by the transport function among the users of the three modes of inland transport. Should there be budgetary equilibrium for the inland transport sector as a whole, or for each mode separately (5)?

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(1) These problems will be examined in Subsection 24.42 sqq. (imputation) and Section 31.2 amortization).

(2) The definition is then as follows: budgetary equilibrium exists when the sum of all discounted future revenue arising from use of the infrastructure is equal to the sum of the initial investment cost, minus the discounted residual value of the infrastructure at the end of its economic life, and discounted future management costs.

(3) This does not, of course, imply that all the rules are equally desirable when considered from other points of view, such as that of distribution of income. But these other considerations are disregarded in the present chapter.

(4) See Subsection 24.43.

(5) See Subsection 24.44.

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iii) Apportionment of the deficit of a given mode of transport among the regional components of infrastructure: how much equalization or differentiation should there be [1]?

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iv) Apportionment of the deficit of one particular mode of transport among the various categories of users, the users being grouped according to the type of transport service performed (passengers and freight, different types of freight, traffic in different directions, etc.) [2].

24.43 — *Apportionment of the deficit between transport and the other functions of infrastructure*

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The functions of infrastructure that cannot be called transport functions in the true sense of the term are particularly important in urban and suburban areas; roads, especially, perform a great many other services [3]. Canals and other waterways can also serve various purposes; for example, in addition to shipping, they may be used for irrigation or the production of hydroelectric power.

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When the infrastructure has such multiple functions, we have a case of joint production. Apart from the marginal use costs, which can be imputed precisely to each separate function, the investment cost and such operating costs as are independent of traffic are joint costs.

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It is commonly argued that joint costs cannot be apportioned among services produced simultaneously on the basis of economic criteria alone. This is quite correct, but it is not relevant here. The cost charges to be levied for each service, as also the congestion charges, if any, are perfectly defined [4]. Hence it is only the deficit — should there be one — that must be apportioned on the basis of economically arbitrary conventions [5].

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These conventions, however arbitrary they may be, are of particular importance in the case of the option of budgetary equilibrium, since the total sum to be covered by transport remains indeterminate as long as it is not known what part of the infrastructure deficit — however that deficit may be calculated — should be imputed to the other functions. If the rule of budgetary equilibrium is to be applied to these categories of infrastructure, a reasonable convention for apportioning the relevant costs will have to be adopted. Such a convention should above all be simple and clear, and should avoid complicated calculations.

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It is often pointed out that roads and railways fulfil external functions of another sort; for example, they are of special importance in wartime or other times of national emergency, and are used in preserving law and order. For practical purposes it would seem reasonable to disregard this aspect, because there is usually no sound and objective method for making calculations in such matters. Perhaps much the best convention therefore consists in disregarding these functions completely.

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In conclusion, we may say that the external effects pose certain problems which are in principle completely insoluble, and which, precisely because they are economically arbitrary, should not be made the object of complicated technical calculations. The specific objectives to which budgetary equilibrium is applied do not require very precise definition, because extensive equalization of charges is necessary anyway. Consequently, the conventions to be adopted should be reasonable and, above all, simple, clear and objective. Also, the different situations of the competing modes of transport should be taken into account, and the conventions for them should be equivalent, in order to avoid distortion of the conditions of competition. The conventions should also be formulated in such a way that the external effects do not give the various pressure groups — which the rule of budgetary equilibrium is expressly designed to neutralize — an excuse for becoming influential again in the field of infrastructure.

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It would be beyond the scope of this report to analyse the numerous solutions that are practised or have been proposed. Our problem is one of practical policy and also, to some extent, of political judgment, since economic considerations alone cannot

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(1) See Subsection 24.45.

(2) See Subsection 24.46.

(3) Urban roads serve numerous purposes in addition to transport in the strict sense. For example, they are used for the movement of pedestrians, for postal services, and public events. Moreover, it is obvious that, even if there were no motorized traffic, there would have to be clear spaces between buildings.

(4) The congestion charges are in fact nil when the available capacity is not fully utilized in the economic sense, and otherwise they are just high enough to avoid congestion.

(5) We are only concerned here with conventions that satisfy the condition of economic neutrality; such conventions can be perfectly determined from considerations other than the optimum allocation of resources (see footnote (3), p. 84).

provide a precise answer. The choice of a suitable convention is a political choice which must be made in the full knowledge that it is economically arbitrary.

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Nevertheless, it may be possible in a few words to indicate the type of solution that would be compatible both with the criteria of optimum resource allocation and with the various practical considerations we have mentioned. Such remarks must not be taken as recommending any specific, detailed system, but simply as suggesting a possible approach to the problem.

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1. The charges to be made for the different functions of infrastructure should be at least equal to the corresponding economic charges. If the total sum of the discounted economic charges covers the sum of the initial investment and discounted operating costs, there is no problem of cost allocation. This may be the case with urban and suburban road networks. In view of the present congestion, the economic charges on urban transport should doubtless make it possible to cover most of the "total cost" of these roads without taking their other functions into account (i.e. their non-transport functions) (1).

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2. If the economic charges leave a deficit, the latter can be allocated in a way that will take account of the total benefits.

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For example, in the case of a canal that is used both for the production of hydroelectric power and for irrigation, without a charge being made on the users, the "total cost" of the canal, however defined, should be apportioned in such a way that none of its functions has to bear an amount greater than the sum of the rents created by that function (2). If the investment decision has been correct, the sum of the rents created is greater than the "total cost" of the canal. In that case, allocation of the "total cost" in proportion to the rents created would be an acceptable conventional solution.

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Such a solution cannot be applied rigorously, for generally the rents created cannot be assessed objectively, at least not as a whole. However, it is usually possible to find approximate solutions. Thus the rents created by the irrigation function of a canal could be evaluated approximately by considering the interest rate and the increase in the value of land resulting from construction of the canal.

24.44 — *Apportionment of the deficit among the three modes of inland transport*

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In reviewing the various arguments for budgetary equilibrium (3), one can only conclude that they all support the view that it should be applied to each mode of transport separately. If the principle of equity is accepted for the transport sector as a whole, it can be logically extended to each of the separate modes of transport. The political and social factors that might lead to a misdirection of investment in infrastructure would also seem to support application of this rule to each separate mode. But the strongest argument for such an application arises from the special problems inherent in the railways' deficit (4).

628

Separate application would only cease to be indicated if the sole aim of budgetary equilibrium were to provide the resources necessary for investments in infrastructure and for its maintenance and thus avoid putting the burden of these on the national budget. But other arguments have been put forward which would also seem to plead for covering the various deficits separately (5).

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The demand for budgetary equilibrium for each mode of transport is often declared to be a logical consequence of the principle of equality of treatment: the competing modes of inland transport should be given equal starting-conditions. This formula gives rise to numerous difficulties of interpretation. For example, equality of treatment is used as an argument both in favour of the demand for budgetary equilibrium for each mode of transport and also in favour of the idea of equal charges. Each of these systems bases itself on the principle of equality of treatment, but interprets it differently. The principle itself cannot tell us which interpretation should be adopted; the answer can only be found within a particular legal system.

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One final problem may be mentioned in connection with apportioning costs of infrastructures that are common to two or more modes of transport, such as subways, bridges, level crossings, etc. This problem is similar to that of the external effects (6). Here, too, certain conventions of an essentially arbitrary nature must be adopted, which should

(1) Mentioned in footnote (3) on p. 85.

(2) In that case the rents are equal to the total benefits, since the charges imposed are nil (see Part I, Sec. 11.5).

(3) See Section 23.3.

(4) See Subsection 23.33.

(5) See Section 23.3.

(6) See Subsection 24.43.

follow the principle mentioned in the preceding subsection, i.e. that they should be simple ones that can be applied objectively in all cases. For the reasons stated above (1), we shall not discuss the various conventions which have been proposed.

24.45 — *Apportionment of the deficit of one particular mode of transport among the regional components of infrastructure. Regional inequality of charges*

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Regional inequality of charges within one mode of transport is a much more controversial issue than the view that the rule of budgetary equilibrium should be applied to each mode of internal transport separately. Leaving aside the practical problems involved, complete regional inequality is entirely justified where cost charges and congestion charges are concerned. But this is not true of the separate deficits of the individual parts of a network, i.e. the difference between the investment cost plus the discounted operating cost and the discounted revenue from the economic charges (2). In dealing with the co-ordination of investments in infrastructure (3) we have shown that the benefits derived from the different parts of a single network are highly interdependent, so that the imposition of budgetary equilibrium on each part separately can hardly mean much anyway. Moreover, most of the arguments advanced in favour of budgetary equilibrium do not require it to be applied separately to each of the parts of a network (4).

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At this point in our study, it may suffice to repeat the conclusions already stated (5). Regional equalization of the deficit is compatible with the various objectives of budgetary equilibrium, and serves also to mitigate some of the harmful economic consequences of applying this requirement too narrowly. It seems, however, appropriate to make a distinction at least between the three categories of infrastructure we have already mentioned, namely main networks, urban and suburban networks, and local networks. The condition of budgetary equilibrium could be applied to the first two categories separately, while the third could be exempted from this requirement altogether (6). This would mean that within a certain region the charges imposed on one particular category of infrastructure users, such as private cars, would be the same throughout the region, but there might be some differentiation according to where the vehicles were used: low charges, or none at all, for local roads, normal charges for main highways, and higher charges in towns.

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These schemes could not be carried out without first solving two difficult problems. The first concerns the practical possibility of differentiating the charges to be paid by users, which is a problem that is only important for the roads. The second concerns the size and delimitation of the regions within which charges should be equalized.

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The first problem does not appear to be insoluble. It would not be impossible, for example, to differentiate charges by imposing different licence rates for urban and suburban traffic, traffic on main highways, and local traffic respectively. It is not the aim of this report to offer detailed practical solutions, but it is worth pointing out that considerable research has been done in this field and several proposals have been put forward by which the charges paid by road users could be differentiated along the broad lines envisaged above (7).

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The second problem, which concerns the delimitation of the regions within which charges are to be equalized, is much more fundamental and, in various respects, more difficult. Without claiming to deal exhaustively with the matter, we should like to mention a few important points. The size of the area within which charges are to be equalized must depend primarily on the degree of economic interdependence of the various parts of a network. If the services performed by these parts are highly complementary, it is economically pointless, and perhaps inequitable, to apply the condition of budgetary equilibrium to each part separately. Moreover, the area within which charges are to be equalized should be large enough to eliminate, or at least to mitigate, the economically harmful effects of applying budgetary equilibrium on too small a scale (8). It is also clear that equalization must not

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(1) See Subsection 24.43.

(2) See Section 24.2.

(3) See Section 24.1.

(4) The argument envisaging the curbing of pressure groups is an exception.

(5) See Section 23.3.

(6) See footnote (3), p. 71.

(7) It has, for example, been suggested that vehicles travelling in areas of dense traffic might be fitted with meters, which would work on magnetic impulses emitted by wires in or on the road; the impulses could be varied according to the route taken and the density of traffic.

(8) See Subsection 24.45. Obviously the extent to which the rule of budgetary equilibrium, if applied in a highly "non-equalized" manner, would lead to economic distortions depends upon the particular version of budgetary equilibrium considered; if it is based on historic cost, quite different distortions may occur than if it is based on replacement cost, while the system of budgetary equilibrium without possibility of borrowing may give rise to other distortions again (see Ch. 31).

be pushed so far that the constraint of budgetary equilibrium can no longer constitute an effective barrier against activities by pressure groups which might result in misdirection of investments in infrastructure.

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For the railways and roads, the existing national networks — possibly subdivided into a number of large regions in the case of the bigger countries — might be taken as suitable starting-points. When regional economic interdependence and the corresponding traffic flows extend beyond national boundaries — a development that is not unlikely in view of European economic integration — rearrangement of the regions may be advisable. It does not necessarily follow from what has been said that the boundaries of the regions, or the subdivisions of regions within the bigger countries, should be the same for all three modes of transport (1).

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In the case of inland waterways, some national networks might prove to be too small to permit of the minimum degree of charge equalization necessary to avoid serious economic distortions. In that case, budgetary equilibrium could be applied to larger units comprising several networks or parts of networks.

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Similar observations can also be made with regard to special infrastructures such as transalpine tunnels.

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In any case, the precise boundaries of the different areas within which charges are to be equalized can only be defined if specific cases are first examined in the light of all the basic facts of the problem.

24.46 — *Apportionment of the deficit among the various categories of users*

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It is often maintained that the "total cost" (2) of infrastructure which is to be covered by the charges paid by the users could be precisely imputed to the different services by the following method: each category of users would have to bear the marginal use costs that are directly imputable to it, the remainder being distributed in proportion to the utilization of capacity, which is a function of the average distance travelled, the size of the vehicle, its average speed, etc.

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But this is merely a convention which, whatever its merits, cannot be deduced from the criteria for an optimum allocation of resources. These criteria imply no more than that each category of users should pay an economic charge made up of the cost charge and the congestion charge; the relative value of the latter varies for the different categories of users in strict proportion to the extent to which the capacity is utilized by each of them, and its absolute value depends solely upon the extent to which the capacity is utilized by all the users together. In other words, this absolute value is nil when the capacity is not fully utilized in the economic sense of the term, and otherwise is just high enough to prevent economic congestion. If the total discounted revenue, derived from the economic charges thus determined, is less than the "total cost" to be charged to the users, there is a deficit. The apportionment of the deficit is economically arbitrary.

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It is thus not possible to deduce any particular rule for apportioning the deficit from considerations of cost or from relationships of cause and effect where costs are concerned, nor to work out a method of apportionment from the criteria of optimum resource allocation; these criteria imply only that the system of charges must avoid distorting the conditions of competition between the users of infrastructure.

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The principle of equality of treatment is also often invoked in this connection. But this concept, as we have shown (3), poses many problems. For instance, it is sometimes said that, if there is to be equality of treatment, the charges for transport services performed in opposite directions or at different times must be identical. It is clear that such equality is not implicit in an optimum allocation of resources, and that this view is incorrect whenever the traffic flows — and therefore the pure tolls — are not equal. This example serves again to demonstrate the dangers of misinterpretation inherent in the concept of "equality of treatment".

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Various other methods have been suggested for apportioning the infrastructure deficit among the different categories of users. For instance, it has been suggested that the deficit should be apportioned according to the elasticity of demand. This method, it is claimed, would make it possible to minimize distortions of an optimum allocation of ressources; but this is disputable. In any case, although it might theoretically be possible to define an optimum

(1) In certain cases the competitive position of the three modes of transport might indicate that their regional boundaries should be the same.

(2) See Subsection 24.40.

(3) See Subsection 24.44.

tariff system that would amount to a "second-best" if budgetary equilibrium were required, it has not proved possible to give it a practical form. Also, to differentiate charges may be inequitable in certain cases. Irrespective of the many difficulties that can arise, this method could in practice only be employed where operation of the infrastructure and production of transport services are in the same hands, as in the case of the railways. We shall see (1) that, in the present circumstances, the railways will probably only be able to achieve budgetary equilibrium if they are authorized to differentiate their freight rates to some extent. But such differentiation may have obvious disadvantages, which we shall consider later when dealing with the abuse of dominant positions and with dumping based on domestic subsidies. In any case, a method that involves taking the elasticities of demand into account generally cannot provide a satisfactory solution for roads and inland waterways.

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Several other proposals have been made. It has been suggested, for instance, that the deficit should be apportioned on the principle of equal charges for substitutable services (2). Another solution would be to apportion the costs that cannot be directly imputed to the individual user in proportion to the marginal use costs.

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The first method obviously does not provide a complete solution. It requires only that the charges for the use of infrastructure should be the same for all types of transport that can be substituted for each other. This applies particularly to the charges for competing services provided by different modes of transport. But the method cannot tell us in what proportions the charges should be distributed among the different categories of users within one particular mode of transport. It has other drawbacks too. However conceived, the principle of equality of charges will usually conflict with the principle of budgetary equilibrium for each mode of transport separately (2). Also, the adoption of such a method itself poses other problems, for it means that the concept of substitutable types of transport must first be defined and transport divided into categories according to this definition.

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The other proposal, that the total sum to be borne by the users of one particular mode of transport should be distributed in proportion to the cost charges, may provide a solution. According to this proposal, the various categories of traffic would be reduced to a common denominator by conversion factors based on the relative importance of the marginal use costs occasioned by each category. The total sum to be borne by the users of the infrastructure would then be apportioned according to these conversion factors.

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This system would, however, have one serious disadvantage, in that it would make the charges entirely dependent on the cost charge. This is only one component of the optimum charge for the use of infrastructure derived from the criteria of optimum resource allocation; moreover, in some cases it is of very little importance (3). It would seem more logical and more in keeping with the requirements of optimum resource allocation if the congestion charge (i.e. the contribution to economic saturation) was also taken into account when the total sum to be borne by the infrastructure users is apportioned among them.

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This question is of fundamental importance. According to certain studies that have been made with regard to the roads, if the infrastructure charges were simply distributed in proportion to the marginal use costs, they would be borne almost entirely by trucks. If, on the other hand, the infrastructure charges were distributed in proportion to the congestion caused by each category of traffic, a substantial amount would have to be borne by private cars.

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A difficulty that arises if both components of the optimum charges are taken into account, i.e. cost charge and congestion charge, concerns the relative weight to be given to each of them in fixing the conversion factors for the various categories of traffic. The congestion charge varies with the degree of utilization of the existing capacity, being nil for all types of traffic when capacity is not fully utilized, and otherwise just high enough to prevent economic congestion. If the conversion factors were to be based on the economic charges, they would vary with the degree of utilization of the existing capacity of the infrastructure (4). Such a solution would hardly be feasible, since it necessitates a high degree of differentiation of charges both in time and space.

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A more practical solution would be to group together all transport effected during a specified period (one

(1) See Section 32.4.

(2) See Subsection 24.44.

(3) For instance, when capacity is fully utilized.

(4) This is because, as we pointed out earlier, the relationship between cost charge and congestion charge is not the same for all categories of traffic.

year) on a given network (for example, a network of main highways or an urban and suburban network). The total amount to be charged to the users of the roads in question would then be apportioned by assessing the volume of traffic for each category of users. There would be no difficulty in apportioning the part of this total sum that represented the marginal use costs. The remainder could be distributed in proportion to the use made of the capacity by each category of traffic, this being calculated from various technical factors (density, average speed of the various classes of vehicles, etc.). The charges for the different categories of users would thus be made up of two components: one would be the marginal use cost, and the other would be a function of an appropriate congestion index (1).

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We are fully aware of the arbitrary nature of this convention. But it has at least the advantage of being clear and feasible; it also seems to be quite acceptable.

24.47 — *The policy of budgetary equilibrium and the importance of the deficit*

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In the preceding subsections we have tried to indicate the reasons for a policy of budgetary equilibrium, and the various forms such a policy may take. In practice, this policy can appear in a very different light depending on the size of the deficit that would result from a system of charges corresponding to an optimum allocation of resources. The smaller the deficit, the smaller will be the disadvantages of a policy of budgetary equilibrium (2).

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Two considerations of great practical importance should be mentioned here. Firstly, the deficit to be expected for the existing infrastructures is comparatively small or even non-existent when the installations have already been depreciated, either in the normal way or owing to the effects of inflation, or when the investments have been financed by public funds (3). This is the case with most of the existing installations. Where the roads are concerned, the inadequacy of some of the main road networks and of most urban and suburban networks even prompts the conclusion that the optimum policy at the present time would lead not to a deficit but to a relatively large rent, on account of the high value of the economic charges (4). For all such installations it would therefore seem that, in practice, the principle of budgetary equilibrium can be combined with an optimum allocation of resources.

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Secondly, where the installations to be constructed are concerned, the information currently available is completely inadequate for the purpose of estimating the size of the probable deficit. Two points should in any case be made here. Firstly, the deficit (5) may be much smaller than is generally thought (6). Secondly, application of the principle of budgetary equilibrium to each mode of transport separately may lead to a considerable distortion of competition between them if the deficit is relatively much greater for one of them. This would no doubt be the case with the railways and the roads if the roads were developed, as seems desirable, in accordance with the investment criteria we have mentioned. If this were done, the conditions of competition would certainly not be distorted to the detriment of the roads (7).

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(1) It should be noted that these charges may be similar to the economic charges, particularly if the infrastructure is fully utilized. The economic charges then consist of two components, cost charge and congestion charge, the latter being a function of the traffic congestion caused by each of the various categories of traffic.

(2) There are various ways of applying a policy of budgetary equilibrium; we shall consider these in Chapter 31, together with the influence of various factors such as the rate at which the infrastructure is being developed, the rate of interest, the rate of inflation, technical progress, etc.

(3) By definition, there can be no deficit in the system of budgetary equilibrium without the possibility of borrowing which is discussed in Chapter 31 (Sec. 31.4).

(4) The economic charges do not simply consist of the cost charges — a common misapprehension — but include also the congestion charges. The latter are in fact a very important component of the charges for the use of infrastructure corresponding to an optimum allocation of resources. This is particularly true of any infrastructure that is being fully utilized.

(5) The discounted value of the revenue expected from the congestion charges must be equal to the marginal investment cost. Consequently, the size of the total discounted deficit for the whole economic life of the infrastructure is determined solely by the difference between the average and the marginal investment cost, i.e. by the extent to which the construction of the infrastructure shows increasing returns.

(6) This may be the case with the railways when the network is relatively dense. It may also be the case with motorways in level country. One may also add that, for the whole of a vast region, the overall cost of the total transport capacity of the infrastructure of one particular mode of transport may be subject to the law of diminishing returns, since the more the network expands the less favourable will be the sites that have to be used.

(7) Generally speaking, in the case of two modes of transport with different growth rates, the greater the difference in growth rates the greater would be the distortions in the conditions of competition and in the optimum conditions resulting from the constraint of budgetary equilibrium.

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It follows clearly from all this that the choice of the policy to be adopted depends to a great extent on the size of the deficits that would occur with optimum management of the three main modes of transport: roads, railways and inland waterways. If the deficit is very high, and if it is very different in size for the three modes, the practical system of economic charges may seem preferable. If the deficit is relatively small or about the same for the three modes of transport, budgetary equilibrium may seem the best solution.

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Unfortunately, the data at present available are comparatively incomplete, and special studies would be required. The importance of such studies cannot be over-estimated, where the conclusions to be drawn from the present report are concerned. We think, however, that there would be no difficulty in obtaining fairly quickly such rough data as would be needed before the essential decisions could be taken.

24.48 — *Summary*

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The option of budgetary equilibrium can be interpreted in many different ways. There are a great number of different versions, depending on the conventions adopted with regard to the "total cost" of the infrastructure that should be covered each year, and on the way the "total cost" is apportioned among the various types of services performed by the infrastructure.

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It has been shown in the preceding subsections that these conventions are to a great extent arbitrary as far as optimum allocation of resources is concerned; they are essentially political choices, and depend partly upon the general objectives pursued. This statement could be taken as our final conclusion regarding the option of budgetary equilibrium, since the choice of the objectives of transport policy is clearly outside the scope of this report.

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In Part III we shall nevertheless consider a number of particular systems of budgetary equilibrium. There are two reasons for approaching the subject in this way. The first is that, rightly or wrongly, economic arguments have been put forward in support of certain systems, and these arguments deserve serious study. The second reason is that, in the absence of precise economic criteria, one could adopt the following general principles: technical and institutional simplicity, clarity in the solutions proposed, and a minimum of arbitrary elements. The various systems of budgetary equilibrium will also be examined from this angle [1].

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In examining these various systems in Part III we shall deal particularly with one point that appears fundamental: the definition of the "total cost" of infrastructure to be covered each year by means of charges paid by the users. On the other hand, the problem already discussed in this chapter, that of apportioning this "total cost" among the various types of services performed by the infrastructure of each mode of inland transport, will not be studied specially with respect to each of the systems discussed. On this point, we shall simply refer to the general analysis given in the present chapter.

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Finally, the size of the deficit accompanying an optimum allocation of resources will have to be regarded as an essential factor influencing the decisions to be taken. The practical conclusions will vary according as the deficit is large or small.

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[1] Naturally, these general principles are equally valid for the other systems for operating infrastructure.

CHAPTER 25

OPTIONS FOR TRANSPORT SERVICES

25.0 — *GENERAL*

25.00 — *General features of transport services in contrast to infrastructure*

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We have already pointed out on several occasions (1) that infrastructure and transport services are two very distinct fields of transport policy, both because of existing institutional differences and for reasons inherent in their respective economic natures. This difference appears especially on a fundamental point, namely the extent to which decentralization is possible and desirable in each of the two fields.

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In the previous chapter we saw that infrastructure must necessarily be highly centralized. In fact, in all Community countries road and inland waterway infrastructure is provided for users by the public authorities, while investment in railway infrastructure is subject to more or less extensive government control. This is justified by economic considerations: infrastructure investment shows very marked indivisibilities and the total benefits attaching to different parts of the networks are in general closely interdependent. From this arises the need for some central co-ordination of investments. Moreover, the prices to be paid for the use of infrastructure, where this is made available to users by the public authorities, must be determined on the basis of explicit rules.

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The economic structure and the present institutional system are quite different for transport services. There is no technical need for completely centralized operation in road transport or inland waterways. For these two modes of transport investments in equipment are divisible and, above certain dimensions, concentration of operations does not result in any notable economies of scale (2). The operation of rail services is centralized, but at present, in contrast to what used to happen before road haulage became a serious competitor, these services are exposed, at least potentially and often in actual fact, to direct competition from one or both of the other two modes of internal transport.

25.01 — *Plan of the chapter*

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These few remarks suffice to show that in transport services it is not possible to rule out *a priori* either of the two extreme options as to organization of the sectors concerned, i.e. the centralized and the decentralized regimes. However, apart from a few general comments intended only to show their essential features, we shall not examine or compare these two extreme options as such, simply because this would have hardly any practical significance. Neither regime is acceptable in the pure state nor are they actually applied as such in any country. All actual policies are mixed.

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The practical problem is therefore not one of choosing between a completely centralized and completely decentralized organization but of finding an appropriate intermediate regime by weighing the advantages and disadvantages of the two extreme options. The purpose of this chapter is to indicate some major aspects which are relevant to an analysis of the practical systems we shall examine in Part III, first as regards investment in rolling stock and barges (3), and then as regards the fixing of tariffs for transport services (4).

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The following section will briefly recapitulate the criteria. In this chapter, as in the preceding one, we shall confine ourselves mainly to the criteria of optimum resource allocation. But the choice of a specific set of criteria does not imply the choice of a regime, although one regime may be better fitted than another to meet a certain set of criteria. From the angle of the basic economic criteria, and even of the formulation of the direct conditions for optimum resource allocation, the two extreme regimes strongly resemble each other. The difference between them lies in their approach to the attainment of optimum conditions. Both must rely on certain rules for the guidance of decision-makers; but in a decentralized regime these rules are supposed to be enforced primarily by the working of the market, while the centralized regime operates mainly with the aid of administrative rules. The optimum "mix" of centralized and decentralized procedures can be

(1) See Part I and Chapter 20.

(2) If such economies existed, a constant and irresistible trend towards concentration would be noted wherever it was not checked by public measures. Of course, even in the absence of economies of scale, concentration may occur for other reasons; for instance, it could result from endeavours to achieve dominant positions on the market.

(3) See Section 25.2.

(4) See Section 25.3.

determined by considering the advantages and disadvantages of the two systems in meeting the various conditions of optimum resource allocation.

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The case of a general recession and its consequences for transport policy merits separate attention, both because it is of fundamental importance and because it presents certain very distinct features which may require a different policy from the one most appropriate when there is no recession. Today, when all our countries are firmly committed to full employment and economic growth, the transport policy should in principle be based on the assumption of a steadily expanding economy. The fact that this report concentrates chiefly on questions of transport policy in the context of a steadily expanding economy does not mean that the implications of a recession should be neglected but only that such a situation must be considered as a fundamentally different one, for which special remedial measures may be necessary. Although the report is thus generally limited to an examination of transport policy in a situation of full employment and steady growth, a few remarks will be made on the cases of recession and marked slowdown in growth (1). In addition, the problems of adaptation to structural changes will be tackled. In many respects these have consequences similar to those of a general recession.

25.02 — *The criteria*

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The fact that we shall mainly confine ourselves here to problems concerning strictly economic criteria, i.e. those of optimum resource allocation, in no way implies that we contest the importance or justification of other objectives, or consider them of little relevance. It means simply that our analysis is limited to the study of transport policy as related to optimum resource allocation (2).

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In discussing infrastructure we have pointed out often, and very explicitly, with regard to all the proposals formulated, that consideration of other objectives of national policy could lead to a different view of things. We must make similar reservations in discussing transport services, but they will be less important, at least as regards the transport of freight, which is more particularly the subject of this report. In the case of infrastructure the strictly economic considerations arising from the criteria of optimum resource allocation are somewhat restricted in scope. In various ways the deficit and the related questions of the surpluses, as well as the practical need for spatial equalization of charges, preclude strict application of the criteria in practice. These special aspects of infrastructure and the possible conflict between optimum resource allocation and institutional considerations, particularly as regards the deficit, leave a certain margin for political choices in which other objectives of general policy are bound to play a part.

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These problems are much less important in the case of transport services. The criteria of optimum resource allocation can in principle be applied in a straightforward fashion. If other objectives prevail over the purely economic criteria, this is because the responsible authorities have implicitly judged that the pursuit of these other objectives via transport policy is more important than the distortions likely to arise in the transport sector as a result. The justification of such requirements certainly cannot be disputed *a priori,* since they derive from criteria other than those of optimum resource allocation. In particular, considerations of regional policy and income distribution — and more generally the social consequences of a transport policy based on the criteria of optimum resource allocation — may supply valid reasons for adopting a policy calculated to modify the conditions of an optimum allocation of resources. But these considerations need not necessarily lead to such a policy. We have already pointed out that all transfers of rents are in principle perfectly consistent with optimum resource allocation, provided the method of transfer does not affect the economic optimum conditions.

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It may be difficult to make transfers which are economically neutral. But every reasonable effort should be made to minimize economic distortions. This means that any measures taken should be as direct as possible. To clarify the point we may quote an example in connection with the objectives of regional development. To promote the economic development of a region, adequate infrastructure must first be provided. The building of this infrastructure may well be justified for reasons of regional policy even if not on strictly economic grounds. This point was explicitly made in the preceding chapter. But it is generally more difficult to see why special measures should also be taken as regards transport services. If adequate infrastructure is already available, it would be preferable to stimulate the economic development of the region concerned by directly subsidizing the establishment of industries rather than by subsidizing transport or imposing on it "public service obligations" — all measures which

(1) See Section 25.4.

(2) For the motivation of this approach see Chapter 20 (in particular Sec. 20.0).

are likely to lead to unnecessary distortions in the transport sector. Similar considerations apply to the use of transport tariffs as an instrument of agricultural policy or of any other policy designed to protect certain industries, such as coalmining, or certain classes of people.

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The same conclusion holds good for an incomes policy in the transport sector itself. If the incomes of certain categories of carriers, as derived from an optimum allocation of resources, are considered unfair, the desired adjustments should not be made by restrictive and/or protective measures which are likely to hinder optimum utilization of existing capacities and impair economic progress and, consequently, the general standard of living. Such adjustments should be made as far as possible by means of direct subsidies, which would avoid creating undesirable economic stimuli (1).

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These considerations lead to doubts as to the wisdom, purely from the point of view of the efficacy of intervention technique, of applying criteria other than those of optimum resource allocation to the operation of transport services. Of course, final judgment should be reserved, since it largely depends on the practical possibility of attainning the other objectives by measures which are neutral in their effect on transport. But it would indeed seem that the above considerations make it possible to lay the chief accent on the purely economic aspects.

25.03 — *Optimum allocation of resources in transport services*

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We have already shown (2) that an optimum allocation of resources postulates certain criteria for investments and others for current operations, all of which can be formulated as the condition that the difference between total benefits and cost must be maximum at final prices considered as fixed. In the sectors with a competitive system where there are no important economies of scale in production, application of these criteria to transport services does not involve any deficit. Hence the problems connected with the deficit, which were examined in detail apropos of infrastructure, no longer arise. Nor is it necessary to take account of surpluses otherwise than as regards their marginal values equal to the prices when decisions are to be taken on investments in road vehicles, rolling stock and barges. An estimate of the actual discounted future revenue, to be compared with the cost of this type of investment, provides the correct investment criterion here.

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The difference between the benefits and the costs is at a maximum if two distinct conditions are fulfilled. One is that the total cost must be minimized, the other that output must be equal to demand at a price equal to the sum of the marginal cost of production in the strict sense of this term and all the rents accruing to the existing durable factors when these are fully utilized (3). In the case of production which employs only divisible assets such as rolling stock, these two components of the optimum price are usually lumped together as "marginal cost". This terminology is somewhat unfortunate and gives rise to abundant confusion and errors because it suggests that the optimum price is a cost which can be determined, independently of the market situation, by pure cost calculations. Such a conclusion would be quite incorrect, because the rent element, a component of the optimum price which, at any given moment reflects the optimum use of the durable factors, is a scarcity price and consequently depends on the degree of utilization, i.e. the intensity of demand. The other component is the cost of use, which is in fact a marginal cost.

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Another consideration of the same order concerns the conventional preoccupation with the optimum price almost to the exclusion of a condition which is equally important in theory and more important in practice, i.e., the condition of cost minimization (4). Consequently, the economic merits of a transport system must in general be judged primarily from the stand point of cost minimization in the second place from that of investment criteria, and only in the last instance from that of the optimum pricing rules.

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(1) See Section 25.4.

(2) See Section 22.1.

(3) The rent element in the price of transport services is entirely analogous to what we called the "congestion charge" in the case of infrastructure. It is nil when the existing factors are not fully utilized and otherwise just high enough to restrict demand to the available capacity. The situation is therefore logically the same, but it is somewhat different in degree. In the case of mobile means of transport there is a much closer link between the rent received and the initial investment cost: if for any length of time (i.e. a period sufficient to cover both peaks and troughs) the rents do not meet the investment costs, new means of transport will not be obtained. This is the justification for the common practice of referring to marginal cost in the strict sense plus these rents as the "marginal cost" of providing transport services.

(4) See Part I. Even in theory, cost minimization logically takes priority. Application of the marginal rules for optimum prices hardly makes economic sense if the function to which the rules are applied is not the one that is relevant from the angle of optimum resource allocation, i.e. the minimum cost function. On the other hand, cost minimization is economically rational even if pricing rules are applied which are incorrect from the point of view of optimum resource allocation.

25.04 — *The assumptions concerning infrastructure*

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Before we can discuss the problems connected with the system for transport services one final point must be dealt with. This concerns the general assumption which must be made as regards operation of infrastructure. There is obviously a close connection between policy for transport services and policy for infrastructure. If, for example, carriers in competing modes of transport are charged on a different basis for the use of their infrastructure, this might provide an economic justification for correcting the resulting distortions by appropriate measures in the pricing of transport services. This interdependence of the systems for infrastructure and for services may complicate the analysis considerably, since, as we have shown in the previous chapter, many solutions are possible and acceptable in the matter of infrastructure. However, it is neither practicable nor necessary to consider, for every possible system of tariffs for transport services, the implications of all possible policies for infrastructure. In order to evaluate the various policies for transport services it is sufficient first to consider the case where the system for infrastructure does not falsify conditions of competition between the various modes of inland transport by distorting optimum resource allocation, and secondly to give some indication of the problems which arise with systems that do not satisfy this condition.

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Failing evidence to the contrary we shall always start from the assumption that problems concerning infrastructure have already been resolved in such a way that there is no distortion of optimum allocation of resources in transport services. This will enable us to judge the policy for transport services on its own merits. We shall examine in a separate subsection (1) the problems which would arise if a charging system for the use of infrastructure did not fulfil this condition.

25.1 — *SOME GENERAL COMMENTS ON COMPETITION AND CENTRALIZATION IN INLAND TRANSPORT*

25.10 — *Competition*

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Complete freedom of competition in inland transport would imply: freedom for all carriers to fix their prices as they think fit; no restrictions on capacity; and freedom of access to inland waterway and road transport (free access to the railways sector being, of course, without practical significance in view of the concession system to which railways are subject). This option is not entirely equivalent to a decentralized regime, since the economic structure of the national railway companies necessitates operating them as a single administrative unit, which can practise internal economic and technical decentralization only to a limited extent. In the other modes of inland transport, decentralization and competition are technically possible, and are actually the rule in certain markets. However, their working is often inhibited by restrictive government measures and by private monopolistic concentrations, so that even in the "competitive sectors" there is at present only limited decentralization. The option of completely free competition implies that these restrictions are eliminated.

682

Whatever its basic merits or drawbacks, competition will fail to ensure optimum resource allocation if competitive relations are falsified by artificial disparities in production costs or by other influences distorting prices. The most important potential sources of distortion in inland transport are the unequal incidence of the charging systems for the use of infrastructure and the existence of different fiscal and social systems (2).

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In strict theory, competition can potentially produce optimum resource allocation on the three conditions that charges for the use of infrastructure and other important cost components are determined on the same basic principles; that there are no increasing returns; and that all the other prices in the economy are optimum. As regards this last point, the present report, when discussing the problems of the relative optimum (3), considers only cases where prices outside the inland transport sector have a direct impact on competition in this sector, in particular prices of services produced by modes of transport which are not part of the sector in the strict sense, such as oil pipelines, coastal shipping, etc. The relations between these modes of transport and the inland sector will be considered briefly below (4).

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Apart from the complications just mentioned, competition will in practice assure optimum resource allocation if all operators follow the rules of the free market economy, i.e. if they endeavour to maximize their net income, treating market prices

(1) See Subsection 25.30.
(2) See Subsections 25.30 and 25.31.
(3) See Section 22.4.
(4) See Subsection 25.32.

as given. This condition is achieved if the share of each operator in the total market for a specific service is sufficiently small, or if actual or potential competition obliges the operator to behave as though his share were small. Under these circumstances there are powerful arguments in favour of competition, which ensures decentralization of decisions without the cost and imperfections of control. There are no institutional limitations to the application of economic criteria which are complicated or whose functioning is difficult to verify objectively; equality of treatment is ensured because free access to the industry is guaranteed; and, last but not least, the pressure of competition itself provides a powerful incentive to cost minimization. As we have already shown (1), this last point is of particular importance. The fact therefore that the pressure of competition is one of the most powerful and effective means of reducing production costs to the lowest possible level is a considerable advantage of the competitive system.

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Are the conditions just mentioned fulfilled in the various modes of inland transport or, if they are not, could they be fulfilled by an appropriate change in the institutional framework? Effective competition in conformity with the general principles of optimum resource allocation is technically possible in road and inland waterway transport, since economies of scale are not so considerable that concentration of each of these modes into a single production unit would be advantageous. On the other hand, practical reasons preclude decentralization of the management of railways, which therefore enjoy a "natural monopoly" in their own field. Although the absence of internal competition on the railways may be largely offset by actual or potential competition from the other modes of internal transport, the railways undoubtedly occupy a dominant position — albeit a limited one — for certain services and in certain regions. The problems of the abuse of such dominant positions by the railways will be examined below (2).

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It is often maintained that truly free competition in road haulage and inland waterways would have many undesirable consequences, usually described as arising from "ruinous" or "excessive" competition. However, it would seem preferable to avoid these vague, ill-defined and emotionally charged terms, which, moreover, are particularly ambiguous since they bring into play two very different ideas regarding the effects of competition, on the optimum allocation of resources on the one hand, and on the distribution of incomes on the other. We shall therefore avoid the expressions "ruinous competition" and "excessive competition", and use "uneconomic competition" to designate any form of competition producing results incompatible with optimum resource allocation. The social aspects of the question will be examined separately (3).

687

The causes of uneconomic competition may be classed under three heads. One relates to the operation of competition in road haulage and inland waterway transport. It is said that here there is a tendency to overinvestment which is economically undesirable and leads, moreover, to socially unacceptable consequences. This question will be taken up below (4). The second case of uneconomic competition is said to derive from the unequal competitive relations between the railways and the other modes of inland transport. For certain services the railways are, in fact, in a position to practise a policy of dumping by "internal subsidy" (charging low prices for competing services and offsetting the loss by higher prices for those where they hold a dominant position). This problem is related on the one hand to the question of the actual extent of the railways' monopoly position (5) and on the other to infrastructure policy, for it is often considered that internal subsidization is mainly intended to meet infrastructure charges (6). The third case of uneconomic competition is in a way the opposite of the previous one. It concerns the situation in which railways, under competition from road transport in particular, suffer, on some or all lines, from a cumulative loss of traffic that may be designated "traffic leakage". The initial loss of traffic is said to increase cost per unit of service produced; prices must therefore be raised, provoking a further fall in traffic, and so on. This problem will be considered below (7).

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One final point is worth emphasizing. Competitive prices may vary quite markedly with the trend in transport demand and variations in supply (8), for the twofold reason that the elasticity of total demand in relation to prices is relatively low and transport services cannot be stored. These fluctuations are often considered a disadvantage of competitive pricing in transport, with the implication that a price stabilization policy would be expedient. The stabilization option has already been examined at some length in the case of infrastructure, and we have shown that in general price stabilization is uneconomic. Most

(1) See Subsection 25.03.
(2) See Subsection 25.33.
(3) See Section 25.4.
(4) See Subsection 25.21.
(5) See Subsection 25.33.
(6) See Subsection 25.30.
(7) See Subsection 25.34.
(8) For instance in winter.

of the points raised in connection with infrastructure apply equally to transport services. Reference should therefore be made to those arguments (1) for a general appraisal of the view that full price flexibility as implied by the system of competition would be a disadvantage. It stands to reason that fluctuations in transport prices can sometimes be disadvantageous for users, but the latter could do something to mitigate the harmful consequences of such fluctuations by concluding long-term contracts.

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Two specific arguments have been advanced in favour of price stabilization in the field of transport services. First, it is said that fully flexible prices may lead carriers to take faulty investment or disinvestment decisions. This aspect will be examined when we discuss the subject of investment decisions (2). The second argument is one of equity. Even if investment decisions were correctly taken, cyclical variations in demand or a structural decline in particular subsectors of inland transport could bring prices down to an abnormally low level, and this situation would last all the longer the more durable the equipment. The combination of a fairly high income elasticity and a low price elasticity in demand for transport services would lead to a serious drop in the income of carriers, which could be considered unfair. This question will be dealt with below in connection with the problems of recession and adaptation to structural change (3).

25.11 — *Centralization*

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From a general point of view the idea of a centralized organization of inland transport services, which would be practically equivalent to a public transport monopoly, is very attractive. The structure of such a system has none of the shortcomings which may occur in a competitive system and on which a few remarks were made in the previous section. Centralization implies a unity of conception which essentially rules out any distortions due to unequal starting-conditions or unequal market power. Investments can be co-ordinated in the light of forecasts of the future. Finally, links between prices and incomes are severed, so that considerations of equity need no longer interfere with economic efficiency.

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However, closer examination reveals that centralization resembles the competitive system in more than one respect We have already pointed out (4) that the two regimes imply certain rules to guide those responsible for taking the decisions, and that both types of rules have their limitations. The rules of the game as implied by the competitive system can effectively serve to bring about optimum resource allocation wherever competition is possible and efficient, but they do not lend themselves to the pursuit of social objectives (5). The administrative rules inherent in a regime of centralized control can perhaps not be limited to considerations of efficiency, but they are probably limited both as to flexibility and the degree of complexity they can assume without infringing the basic principle we have already enunciated so often, i.e. that such rules must be simple, clear, non-arbitrary and allow of objective verification in practice (6). Moreover, it can hardly be doubted that competition is both an efficient and a real incentive to cost minimization, and it is difficult to conceive of comparable incentives in a regime of centralized decisions.

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It follows from this that the competitive regime would in general be more appropriate if optimum resource allocation were the chief objective but that a centralized regime may be considered preferable when other objectives are predominant. The structure of the actual systems — which will be studied in Part III — must be determined largely in the light of the importance attached to optimum resource allocation in comparison with other objectives and of the specific shortcomings of each system in achieving the objectives it is supposed to achieve. The optimum resource allocation aspect has been considered the most important in drawing up this report, but the choice of the ultimate criteria is outside its domain. Consideration of optimum resource allocation will form the basis of the following two sections, which will deal with a number of problems raised by the application of the competitive and of the centralized regimes with respect both to investment in transport capacity and to the pricing of transport services.

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(1) See Section 24.3.

(2) See Subsection 25.21.

(3) See Section 25.4.

(4) See Subsection 25.01.

(5) Even through optimum resource allocation, by conditioning the general efficiency of the economic system, conditions the actual possibilities of any social policy.

(6) In this respect too there is a certain similarity between the two regimes. In the case of competition we have mentioned that the railways could abuse their dominant positions on some markets. A centralized regime raises similar problems, although at a different level. Like market power, administrative authority can be abused, and in a much more dangerous way. This is a drawback inherent in the centralized regime, and strong safeguards must be provided against it. The prime need is that the rules applied should satisfy the basic principle mentioned.

25.2 — *INVESTMENT IN TRANSPORT CAPACITY*

25.20 — *Preliminary considerations*

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As in the case of infrastructure, it is logical to start with the investment decisions. The optimum price of transport services depends not only on the costs which can be directly imputed to the services supplied, but also on the marginal rent earned by the durable factors (road vehicles, railway rolling stock and vessels). Like the congestion charges in the case of infrastructure, the rent component of the optimum price of transport services is a function of the existing capacity of durable factors and of the intensity of transport demand at the time considered. It is therefore logical to begin by examining the determination of the existing capacity and the related question of investment.

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We shall first discuss some points regarding investment decisions in the modes of transport with a competitive system — road haulage and inland waterways. Our analysis will start by assuming free competition in them and it will thus be possible to examine the problems that are said to arise in the absence of any central control either over capacity or over access to these modes. In the second place we will deal with some aspects of central control over investment and access to the market.

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It should be remembered that throughout this section the term "investment" means investment in means of transport (road vehicles, railway rolling stock, vessels) (1). As we shall deal only with transport services, infrastructure capacity will be considered as given.

25.21 — *Investment decisions in the modes of transport with a competitive system*

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According to the theory of optimum resource allocation, investment should be undertaken if the sum of the discounted future benefits expected from a durable asset is at least equal to the investment cost plus the discounted future costs of operation and upkeep, the difference being maximum. Since in practice we can consider vehicles and vessels as fully divisible factors, the marginal benefits are equal to the prices. Under conditions of effective competition investment will continue up to the point when the revenue expected and the costs are approximately equal, market prices being considered as given. It follows from this that the investment decisions will satisfy the criteria of optimum resource allocation provided carriers do not systematically overestimate or underestimate future demand.

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However, it is sometimes claimed that in inland waterway and road transport, competition in fact operates in such a way as to cause a systematic tendency towards overinvestment and corresponding excessively low prices. Discussion of this question will be the main object of the present subsection.

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Before we go into the various arguments advanced in support of this overinvestment thesis, a few general comments may not be out of place. The risk of overinvestment is a source of frequent criticism of the competitive system, but doubts may be expressed as to its real importance. It is largely a bad memory from periods of depression, when inadequate demand created the impression of excessive supply. This wrong impression has crystallized into an overinvestment thesis which has little basis in fact except for the incidental errors which are unavoidable in any dynamic economy and except also, of course, for overinvestment resulting from protective measures. Moreover, the overinvestment argument is often advanced by people who have a vested interest in restricting access to the market in which they offer their services, and who are only too ready to suggest the existence of a structural tendency towards overinvestment and overcapacity and a resulting waste of available resources. Their competitors sometimes adopt the same point of view. In actual fact, some overcapacity is a normal and necessary concomitant of a dynamic and expanding economy, and as such it is certainly not an aspect of the competitive system which should be corrected *a priori* by restrictive measures.

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In the specific case of transport services, three major arguments — not counting the numerous variants which add nothing essential to the general picture — have been adduced to support the thesis that overinvestment is in fact very widespread in the modes of transport with a competitive system.

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The first argument is as follows: in an expanding economy, demand for transport does not grow in continuous fashion but irregularly around an ascending curve. When demand is expanding rapidly, carriers will all tend to invest in additional capacity, expecting that the current conditions will

(1) This, of course, excludes infrastructure investments, which have already been studied separately (see Sec. 24.1).

continue to prevail in the future, or at least not taking sufficient account of the fact that their competitors are also stepping up capacity. Since there is a time-lag between the moment at which investments in capacity are decided on and that at which supply actually increases, the mistake is not corrected in time by the rules of a free market economy. Thus errors pile up, and substantial overcapacity appears. The result is abnormally low prices and low degrees of utilization of capacity, until natural deterioration of capacity and long-term expansion of demand provide a tardy corrective, which in turn will soon be cancelled out by a fresh upsurge of overinvestment.

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The second argument is based on the claim that the modes of transport with a competitive system show a permanent and systematic trend towards overinvestment because small carriers are often content with an income considered to be abnormally low.

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The third argument is more complex. Professional carriers are said to be obliged to have high reserve capacity available in order to handle peak traffic, since transport services cannot be supplied from stocks. By this reasoning, the reserve capacity would not bring in sufficient revenue to cover its total cost, and would also exert a downward pressure on prices at all times except during peak periods. In support of this argument it is often asserted that the problem of reserve capacity is rendered even more acute by the existence of transport on own account which is said to cover only the base load of each firm's transport requirements, leaving the peak to the professional carriers. The problem of return loads is a variant of this argument. Some people claim that carriers engaged in transport from A to B tend to accept return loads at marginal cost from B to A, and that this spoils the market for those carriers for whom transport from B to A is their main source of revenue. Since the carriers are spoiling each other's markets, transport prices would be too low to cover costs. This is not usually considered to constitute a case of overinvestment. However, from the economic point of view it must be regarded as such, for if the sum of the transport prices charged in the two directions A to B and B to A is inadequate to cover normal operating costs there is actually overinvestment.

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All these arguments lead to the conclusion that there is a structural tendency towards overinvestment in road and inland waterway transport. If no restriction were imposed on these two modes the result would be a waste of available economic resources and inadequate average income for the carriers concerned. The question is obviously important enough to be examined in some detail. Each of the three arguments which we have just presented is therefore discussed separately in the following pages.

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The first argument, regarding the overinvestment cycle, is valid only in those sectors where the time-lag between the moment at which the incentive to investment arises and that at which capacity actually expands is relatively great, and where the equipment concerned has a very long life. This is the case in particular with inland waterway transport. In road transport, on the other hand, the time needed to expand capacity and the span of life of the vehicles are relatively short. Obvious cases of overinvestment do indeed present themselves in inland waterways, where fluctuations of activity seem to have given rise to relatively marked investment cycles. We shall devote attention later [1] to the problems raised by these fluctuations — which occur when there is a speed-up or slowdown of economic growth as well as in times of inflation or recession.

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However, the most frequently cited examples of excess capacity relate to the depression of the thirties. This was a situation which should not be considered relevant to the definition of a transport policy in a period of full employment — or practically full employment — as is the case in the Community today. Moreover, all the Member States, individually as well as by common agreement under the Rome Treaty, have unequivocally declared full employment to be one of the major aims of their economic policy and are endeavouring to act accordingly. This does not, of course, imply that recessions or cyclical fluctuations are ruled out, or that no account should be taken of their consequences for transport policy. On the contrary, as we shall point out [1], a timely analysis of those problems is extremely important. But the fact remains that such questions have no relevance to situations of steady economic expansion and full employment.

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With full employment it may be asked whether the danger of an overinvestment cycle really is a serious problem, which could not be solved by improving the flow of information to carriers, particularly as regards the trend of demand and current investment programmes [2]. Of course, many countries apply restrictive measures to prevent over-

[1] See Section 25.4.

[2] In Chapter 33, which deals with institutional aspects, we shall examine the problems involved in making adequate projections of the trend of demand and costs and in the distribution of information to carriers.

investment, particularly in road transport; but it is significant that these measures all date from the great pre-war depression and that they are often applied in a way which makes one think that the aim is more to protect the railways than prevent overinvestment in the modes of transport under a competitive system. It is understandable that such a restrictive policy should generally be supported by the carriers concerned, for it protects them against potential competition.

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It is more evident still that the second factor which is said to cause overinvestment in the modes of transport with a competitive system, i.e. that small carriers may be content with an abnormally low income and thus would spoil the market, can normally only stem from a situation of general recession. It is hard to see why, with full employment, anybody should be prevented from choosing a particular occupation to practise which he is prepared to renounce the higher income he might have earned in another job (1). Admittedly, certain guarantees may be considered essential to ensure that the prospective carrier is in a position, both technically and financially, to discharge his professional obligations. There may be good reasons for demanding that he shall have some knowledge of the costs of operating a vehicle or boat, in order to preclude errors of judgment. But apart from this, still assuming that the situation is one of full employment, there does not seem to be any valid economic reason for protecting existing firms against competition from those prepared to supply the services in question at a lower price, even if it is beyond doubt that the small and large firms, and also the firms whose various activities qualify them for inclusion in both these categories, may all invest on the basis of different criteria (2).

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The third case of uneconomic competition, which is claimed to be linked with a certain type of overcapacity, would arise from the existence of reserve capacity and the problem of return loads. It is quite clear that since transport services cannot be stored, and mobile means of transport must return to its point of departure before it can be used again in a given direction, excess capacity can exist at certain times and on certain routes. But it is not at all clear why peak traffic, whether predictable or not, and unequal traffic flows, should cause any particular problems in a free market. To be sure, optimum transport prices will be different at different times and for different directions. Such differences are implicit in an optimum allocation of resources. But they could only create real problems for carriers if the carriers tended to extrapolate peak period prices and to base investment decisions on the erroneous assumption that these peak prices will persist. Such an investment pattern would lead to genuine overcapacity; but ill-advised behaviour of this sort is hardly likely among carriers in a competitive market, who are constantly confronted with the facts of peak periods and unequal traffic flows — facts which are known to everybody, even the outsider.

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Carriers will tend to keep capacity at such a level that discounted future revenue from any new capacity will be at least equal to the sum of the investment costs and the discounted costs of operation and maintenance. This naturally presupposes that the carriers are adequately informed concerning the trend of demand and its fluctuations in time (3). If the flexibility of transport prices is not limited in any way, future revenue will fluctuate from one period to another (even if regulations are introduced to limit price fluctuations, because utilization of capacity will vary in any case). However, this in no way affects a correct implementation of the investment criteria in keeping with optimum resource allocation.

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Nor does transport on own account present difficulties in this respect. In fact, although such transport can safely leave peak period traffic to professional carriers, the latter would normally only be prepared to go on supplying these services at prices covering the cost of the additional capacity required (4).

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A further problem is conceivable in that demand, particularly outside peak periods and on secondary routes, may be distributed unequally among the various carriers. Such distribution could lead to inefficient situations in which new investment would be made by one group of carriers while others still had excess capacity. Inequities could also result

(1) Naturally, certain regulations concerning safety (such as limitations of working hours) must be imposed on all workers, both self-employed and wage-earners, but this does not contradict the argument above. Furthermore, the general labour regulations must be applied in the same way to all wage-earners, whether employed in small or large transport enterprises. This aspect will be examined in Subsection 25.31.

(2) The social problems which could result from this are similar to those arising when there are structural changes. A fall in incomes in the sectors which are subject to such changes may lead to serious injustice particularly when, for some reason or other, the workers affected are insufficiently mobile. Appropriate measures must certainly be taken to remedy social inequities. But they should do as little as possible to distort the conditions implied by optimum resource allocation (see Section 25.4).

(3) See Subsection 33.20.

(4) See Subsection 25.32.

from this. A situation of the kind could arise notably in connection with return freight in road transport, where insufficient market transparency can lead to empty return trips in both directions. This is an obvious case of inefficiency which should be remedied. The solution cannot consist in fixing prices arbitrarily, because such a procedure would still further obscure the real situation. It appears that the problem can be solved either by improving market transparency, for example by appropriately organizing freighting or through specialized intermediaries, or by certain centralized procedures in the markets concerned.

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Like that of traffic peaks, the problem of return freight can therefore be eliminated as a true cause of overinvestment and excessively low prices, unless carriers are extremely misinformed.

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There are two possibilities: either the main traffic flow will be in only one of the two directions, or the two flows will be approximately equal. In the first case the market prices for transport in the principal direction A - B will tend to find a level sufficient to cover the total cost of the outward and return journeys together, except as regards the marginal cost in the opposite direction B - A, where they will tend towards the level of marginal cost. In other words the "costs" of the means of transport will be entirely borne by the traffic in the principal direction (1), and this is in exact conformity with the principles of optimum resource allocation. If the two traffic flows are approximately equal, the "costs" of the means of transport will tend to be shared about equally between the two types of services. It is not clear why the play of the free market economy should lead to mutual disturbance of markets unless overcapacity already exists for other reasons or lack of information prevents the free market economy from functioning properly.

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Although there is no question of adopting a final position on the facts themselves (which in any case call for more detailed study), this analysis would seem to justify the following tentative conclusions. We have examined the various arguments invoked to support the fairly widespread thesis that modes of transport with a competitive system show a structural trend towards overinvestment. The analysis suggests that this traditional thesis may be unsound when applied to a situation of full employment and steady economic growth and when no restrictive measures such as minimum prices exist. The implication is that, under such conditions, a non-restrictive policy on transport capacity, combined with adequate information for carriers, does not run counter to an optimum allocation of resources (2).

25.22 — *Some aspects of centralized control over investment in means of transport and over access to the market*

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The investment rules which derive from the criteria of optimum resource allocation could in principle be applied without difficulty by a central authority. This authority could lay down the optimum investment pattern on the basis of projections of demand and costs in the light of the estimated growth of the entire economy, expected shifts in the composition of the national product, probable technical progress and, in particular, developments expected in the sectors closely linked with inland transport (3).

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Naturally, the provision of suitable information is especially important in those sectors of the economy where the durable factors have a long economic life and where demand is subject to relatively strong fluctuations. This applies to inland transport services, and particularly to investment in means of transport for inland waterways and railways.

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In certain respects a central authority has easier access to essential information. We shall see below (4) how far such information could be disseminated among decentralized investors so as to assure them the same advantages on this head as a central authority. We shall show that it is in fact possible to work out appropriate procedures for ensuring the dissemination of this information in an easily accessible form, and to encourage investors to take account of it. In any case decentralized investors are generally better able to judge the most probable trend in the particular division of the market they serve, the less this trend depends on public decisions. Consequently, any central control of investments must rely on a flow of information in the reverse direction to the decisions, i.e. from those who supply the

(1) More precisely: the rents accruing to these fixed factors and corresponding only to direction A - B, calculated for the whole economic life of the means of transport, will be sufficient to cover their investment cost.

(2) It should be noted that a non-restrictive policy does not necessarily imply the absence of all control on access to the industry or on transport capacity. A non-restrictive policy is compatible with the imposition of personal conditions on the prospective carrier as regards his ability to meet the obligations of his occupation, both technical and financial.

(3) See Subsection 25.32.

(4) See Chapter 33.

transport services to the central authority making the investment decisions (1).

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Central control of investment in transport capacity generally takes the form of licensing systems. Such systems are effective instruments in preventing over-investment, but they are clearly onesided. In so far as their aim is essentially to limit investment, they can hardly serve to induce additional investment. This is one reason why a licensing system may introduce a certain bias towards unjustified restriction. In addition there are institutional, sociological and economic forces which may also exert pressure towards an excessively restrictive application of the investment criteria. A large section of public opinion will naturally tend to judge the policy of the licensing authorities primarily by its success or failure in preventing overcapacity from developing. This introduces a bias into the system which is further aggravated by the fact that all carriers are interested in restricting the admission of new firms and in limiting expansion of the capacity of those already in the market.

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Under these circumstances there is a very real risk that centralized control of investment in means of transport might tend to be too restrictive compared with the optimum. This seems to be confirmed by the facts in various countries which apply a licensing system for road haulage. Licences are bought and sold at a high price (2), which represents the difference between the discounted value of all expected future revenues on the one hand, and on the other the sum of the investment cost and the discounted future costs of operation and maintenance plus a remuneration for the entrepreneur which the buyer of the licence apparently considers satisfactory. In fact, according to the theory of optimum resource allocation, capacity should be expanded until these two terms are equal. The difference between them is an indication of underinvestment in means of transport.

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Some people might maintain that firms' extrapolations overestimate the real value of future revenues, so that the price paid for the licences is no measure of the underinvestment. But the contrary could also be claimed, i.e. that the licences are issued at prices below those which would prevail in a free market, since, in most countries, it is officially forbidden to sell or hire licences. However this may be, and admitting that the price of the licence is at best only an approximate yardstick of underinvestment, it can hardly be gainsaid that the high values of the licences are obvious proof that the quota systems, as at present applied in certain countries, tend to be over-restrictive.

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In conclusion, it should be noted that a licensing system will always contain arbitrary elements. Such a system limits new investments on the basis of general considerations which might well be put in the form of objective and verifiable rules. But the total volume of additional capacity authorized must be allocated among applicants whose total claims are, by definition, greater than can be covered by the number of licences to be issued. The criteria for the issue of licences can hardly avoid raising genuine problems of equity. The licences are issued gratis, whereas they constitute for their holders a source of income, which is sometimes very substantial, as their value shows. It is not necessary to go into the risks and considerable drawbacks of such a situation.

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Of course, it should be stressed once more that the above remarks are not to be interpreted as a final judgment on centralized control of investment in transport capacity as such. They are intended merely to set out certain aspects of this system which are of some relevance to the analysis of the various policy alternatives made in Part III.

25.3 — *PRICING POLICY FOR TRANSPORT SERVICES*

25.30 — *Distortions caused by different systems for infrastructure*

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In general, no system of rates for transport services will produce results conforming to the economic optimum if charges for the use of infrastructure are determined on different bases for the competing modes of internal transport. From a general economic point of view, the obvious remedy lies in a system of charging for the use of infrastructure based on concordant principles for the three modes of inland transport. On this head reference should be made to the preceding chapter, and to Part III, in

(1) It should be remembered that this means investment in vehicles, railway rolling stock and vessels.

(2) It is often claimed that the value of the licences is not purely a scarcity price but includes goodwill elements. This argument can obviously apply only when, as actually happens, the licences are sold independently of any abandonment of clientele or transfer of the property of the firm.

which various policies relating to infrastructure will be discussed (1).

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The chief practical difficulty is the existence of institutional differences between the railways, which manage their own infrastructure, and the other modes of transport, whose infrastructure is provided by the public authorities (2). If this institutional pattern were retained, there would be two possible sources of distortions. First, differences in the system of infrastructure management applied in each of the competing modes of transport may cause disparities between the modes of transport. Secondly, the different modes of transport may apply different systems for the apportionment of total infrastructure charges in time and between the various categories of users (3).

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The first source of distortions raises no great economic problem. The authorities responsible for infrastructure will have to ensure that the systems applied have equivalent effects in each of the three modes of transport. This may, of course, be difficult to achieve in practice, but it is in any case better to eliminate directly this source of distortions of competition than to impose restrictions on transport rates. If they are to provide a solution, such restrictions (for instance, fixed tariffs or minimum rates) would have to take into account charges for the use of infrastructure, which would therefore have to be determined first anyway. This being so, there does not seem to be any valid economic reason for using this cumbersome method, which hardly makes it possible to avoir other distortions, in preference to the economically correct one of harmonizing systems of charges for the use of infrastructure (4).

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The fact that the railways enjoy greater freedom to apportion their total infrastructure burden than the modes of transport with a competitive system raises more difficult problems. Obviously these problems present themselves only when the rule of budgetary equilibrium is imposed on infrastructure. Under this rule, the modes of transport with a competitive system, in particular road haulage, are subject to a charging system which necessarily has a simpler, i.e. more highly equalized structure, than a charging system resulting from the method of apportioning the total burden which can be applied by the railways. This difference between railways and roads could be reduced to some extent by introducing a charging system for the roads based on an appropriate combination of fixed charges (licence fees) and taxes on fuels, with limited regional inequality of charges (5). It would further be possible to differentiate charges for the various categories of road users. However, two major difficulties would remain. First, possibilities of regional inequality of charges would, after all, be more limited for roads than for railways. Secondly, price differentiation between categories of users as practised by the railways is impossible for the other two modes of transport because of "internal" competition in them.

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On balance, these differences in the practical possibilities of apportioning total infrastructure charges to the best advantage give railways a competitive edge which could lead to uneconomic competition in the sense described above (6). But the extent of the resulting distortions may be limited for two reasons.

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First, if the railways are obliged to balance their budgets and therefore encouraged to maximize their revenues, it is not worth their while to offer permanent services over a sizeable part of their network at such prices that total discounted revenue over the whole economic life of the infrastructure concerned is below the sum of the investment and discounted operating costs which can be imputed to it (7). Nor does a temporary policy of dumping on particular markets appear to be economically advantageous for the railways, for it is hardly possible to destroy competition permanently since access to the market is easy enough, both in inland waterways and road haulage.

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Secondly, the railways' chances of engaging in uneconomic competition would be limited if, on the one hand, the abuse of dominant positions was made impossible by competition and, on the other, maximum tariffs were imposed wherever necessary (8). There would then be no source of surplus income which could be used for "internal subsidies", i.e. for a dumping policy.

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(1) See Chapter 31.

(2) But see Section 24.1, where we have shown that a coordination of infrastructure investments is in any case necessary between all modes of inland transport.

(3) See Subsections 24.42 to 24.46.

(4) Of course this means, not that minimum tariffs must be rejected as such, but simply that in general they are not an effective means of equalizing such external conditions of competition as charges for the use of infrastructure. The minimum tariffs for transport services will be examined in detail in Part III (see Chapter 32).

(5) See Subsection 24.45.

(6) See Subsection 25.10.

(7) If at any given time, present and fture discounted revenues do not cover all present and future costs, it might be preferable from the angle of optimum resource allocation to close down this part of the network as soon as large replacements are called for.

(8) See Subsection 25.33.

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It would therefore seem that a policy of charges for the use of infrastructure which left roads and waterways all possible freedom to differentiate the prices [1], combined with the imposition of budgetary equilibrium on the railways (as on the other modes of transport) and with effective action against the abuse of dominant positions, could be sufficient to eliminate a great part of the distortions which may result from the unequal opportunities available to the three modes of transport in apportioning their total infrastructure burden. Nevertheless, some cases of distortion might remain. The implications of this for policy will be examined in Part III.

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Finally, there is an undoubted inequality between the railways and the other modes of inland transport as regards the influence they can exert on the provision of their own infrastructures. The railways have much more control over their infrastructure — an essential factor of production — than the other modes of inland transport have. This is an institutional problem, to be considered in the context of investment in infrastructure [2]. From this angle it would be preferable to adopt solutions for infrastructure which tended to free investments in it from external influences — in particular from restrictions which might result from national budget policy — while at the same time associating all interested parties in the decision-making.

25.31 — *Other causes of distortion of the external condition of competition*

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Besides charges for the use of infrastructure, there are obviously many other factors which may distort competition between the three modes of inland transport, i.e. hinder the optimum allocation of resources. In the context of this report, it is impossible to analyse all the actual and potential causes of distortion. Moreover, such an analysis would not have much bearing on the problems of transport policy considered from the angle of optimum resource allocation. We have shown repeatedly that direct measures are in general preferable to indirect ones. This holds especially for distortions stemming from external factors, which as far as possible should be eliminated rather than neutralized by corrective measures restricting competition. A particular instance is government intervention in the interest of regional policy. Such measures should as far as possible be neutral with respect to competition between the various modes of inland transport.

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As further examples of such distortions we may mention the effects of unequal taxation, different social security systems, public service obligations imposed on the railways, etc. The remedy is obvious. The causes of distortions must be eliminated; it is not sufficient merely to combat their effects.

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More complex are the problems which can arise through legislation which is not discriminatory in itself but has a different incidence on the different competing modes of transport. This may be the case with regulations on working conditions, which are more difficult to enforce in the case of the small firms found in road and inland waterway transport than in the case of the railways. The proper solution consists in more effective direct control of working conditions, not in indirect measures and new restrictions on traffic.

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Strictly speaking, these problems of applying and supervising regulations do not come within the province of the present report; but this does not mean they are unimportant. On the contrary, many systems may be perfectly illusory if they cannot be effectively enforced. Moreover, if enforcement is discriminatory and thus distorts the conditions of competition, regulations and control measures can do more harm than good. These facts once again support the view which we have already emphasized in connection with infrastructure but which applies just as much to transport services, i.e. that any regulations imposed by the public authorities should be simple and clear, their implementation should allow of objective control and their enforcement should involve neither prohibitive cost nor discrimination.

25.32 — *Competition by transport on own account and by other modes of transport [3]*

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The modes of inland transport, as defined for the purposes of this report [4], carry only a part of the total volume of goods transported within the Community. The rest is conveyed by oil pipelines, by coastal shipping, and by air. Moreover, within the

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[1] As we have seen, these possibilities are in any case very limited.

[2] See Sections 24.1 and 33.1.

[3] By "other modes of transport" are meant all those modes which are conventionally considered as outside the inland transport sector comprising rail, road and inland waterways. Transport on own account certainly comes within the inland transport sector thus defined. However, the problem of pricing for services does not arise for this category. On the other hand, all other aspects of transport policy concern it just as much as they do the rest of inland transport.

[4] See general Introduction.

inland transport sector itself, relations between professional carriers and carriers on own account present special problems.

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It follows from this that no inland transport policy can neglect the competitive relationships between inland transport and the other modes any more than it can neglect relations between professional carriers and transport on own account. Any measure dealing with professional inland transport must take account of the situation in the competing modes, or be complemented by regulations in them if such action is necessary to prevent distortions. But since this problem arises especially in relation to transport on own account, the remarks below will be confined to that field.

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To begin with, the economic importance of transport on own account cannot be evaluated simply by comparing its cost with that of professional transport, because it provides for the firm concerned some indirect advantages over professional transport. Direct control over a certain transport capacity may have special advantages, such as security of supply, better adaptation to special requirements, etc. Furthermore, the fact that transport on own account creates a direct link between producer and customer may lead to economies if the transport function can be combined with others such as advertising, administrative tasks, etc. It is clear that only producing firms themselves are in a position to judge where and when own-account transport is preferable to professional transport. This would seem to imply that the choice should be regulated by the price system. The relation between the price of professional transport and the cost of transport on own account should be such as to prevent distortion of the optimum allocation of resources.

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This last condition signifies in any case that own-account transport should be subject to the same or equivalent charges for the use of infrastructure, and to the same taxes and social charges, as professional transport. But it is often argued that additional charges or restrictions should be imposed on it, so as to equalize conditions of competition. Those who call for a more restrictive policy towards such transport apparently take their stand on three main arguments.

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Firstly, producing firms are thought to be inclined to underestimate the cost of own-account transport. Secondly, it is claimed that firms which engage in such transport are in unfair competition with professional carriers because they use their own resources to carry only the low-cost normal traffic while leaving the high-cost peak flows to the professionals. Thirdly, if own-account firms were to be authorized to transport for other parties, they could handle return loads and work for such parties outside their own peak periods at marginal cost, thus competing unfairly with the professionals in another way.

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The first argument seems very debatable. Even if the facts were true — and this is not at all certain — they would at most argue for improving the flow of information to firms transporting on own account. But they are not a sufficient reason for restricting such transport. The degree of misjudgment could vary greatly between one firm and another, so that any uniform "correction" might well create new distortions.

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The second argument seems equally doubtful. If prices in the professional sector are not subject to restrictions, they will be sufficiently high at peak periods to cover the total cost of peak capacity. Users will thus be encouraged to make the necessary choice between having their own peak capacity available and paying high prices at peak periods for using the peak capacity of the professionals.

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The third argument for imposing restrictions on own-account transport concerns the opportunity the firms may have of taking return loads and generally supplying transport services for other parties. In many countries such practices are forbidden, but it is hard to see what valid economic arguments could be advanced to justify the underutilization of capacity and waste of economic resources resulting from these restrictions, except of course where participation in the market [1] is only casual.

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The argument that such prohibition is justified because "own-account transport should meet its requirements without recourse to the professional market" is no more than a dogmatic statement.

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It would seem possible to conclude from the above that when the freedom of professional carriers in the matter of prices is unrestricted there is no valid economic reason to impose limits on own-account transport or to forbid firms to transport for other parties with the equipment they use on own account. The same conclusion holds for vehicles and vessels hired for limited periods for own-account transport.

[1] The point concerning casual participation in the market also applies to professional transport (see Subsection 32.51).

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Of course the conclusion might be different if certain restrictions were imposed on *professional* transport. To ensure equality of the conditions of competition from the economic angle it might then be necessary to impose similar restrictions on own-account transport, including its return loads. But this does not affect the above arguments; it merely raises a point which is not examined here, i.e. whether professional transport should be subjected to quantitative restrictions or to price restrictions (1).

25.33 — *Abuse of dominant positions by the railways*

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All the six Community countries apply in one form or another fixed or maximum rates for goods transport by rail. These rates were originally designed to prevent the railways from taking improper advantage of the dominant positions which they had on almost all markets where there was no real competition from inland waterway transport. However, the situation has changed considerably following the rapid development of road haulage. Since the railways have come to be squeezed between competition from inland waterways in transport of heavy goods, wherever suitable canals exist, and the practically omnipresent competition of road transport for other traffic, many countries have modified their transport policy. The aim is no longer so much to limit the monopoly of the railways as to protect them against competition, in particular from the roads.

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However, the previous tariff systems have remained in force. But it might be asked whether their general maintenance is economically justified, in view of the present situation on the transport market. For the railways no longer occupy a monopoly position with regard to all their transport activities. This trend has been reflected in the structure of rail prices: under the pressure of road competition, the value of the goods transported has become considerably less important as a basis for fixing rates. The process by which the roads skim off the freight that was formerly the most profitable for the railways, thus obliging them to reduce their rates for it, is often quoted in this connection as an instance of uneconomic competition.

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But such an opinion is obviously incompatible with the argument — often propounded at the same time, and with justification — that the abuse of dominant positions should be prevented. The skimming-off of high-priced traffic — the prices for which were only possible because of the dominant position of the railways — is an automatic corrective whose operation there is no reason to prevent and which on the contrary should be encouraged (2).

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However, it is indisputable that more or less important pockets of monopoly power still exist, where abuse may and in fact does occur. This is shortcoming of the system of free pricing, and it could be remedied by imposing maximum rates (3) (4). It should, however, again be emphasized that the railways' monopoly has shrunk considerably because of the growth of road transport. The facts underlying transport policy have changed. Just as a policy for a time of depression is not necessarily the most suitable for a period of expansion, a policy devised to curb a monopoly is no longer appropriate when the monopoly, which had been extensive in the past, has very largely given way to intense competition.

25.34 — *"Traffic leakage"*

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"Traffic leakage" may result not only from skimming but also in the following situation. Let us suppose that a given railway line initially suffers no competition from the roads, or is shielded up to a point against such competition by quantitative restrictions or minimum prices for road haulage. Let us also suppose that the railways are obliged to achieve budgetary equilibrium and that, in the initial situation, the revenue of the line concerned covers "total costs"(5). If a competing road is subsequently built, or if the hauliers are freed from price and/or capacity restrictions, some traffic will desert the railways for the road. Should the railway line be in a situation of increasing returns, this "traffic leakage" will entail highler costs per unit of rail service. To achieve budgetary equilibrium the line would have

(1) For the question of quantitative restrictions, see Subsection 32.51, and for prices of transport see Chapter 32.

(2) It should be recalled here that skimming-off also reduces the railways' opportunities of practising dumping in regard to the other categories of traffic. In certain cases skimming could give rise to social problems, if the services favoured by internal subsidies should enjoy what are essentially support tariffs.

(3) See Chapter 32.

(4) These points refer to skimming which corresponds to *ad valorem* tariff-fixing. On the other hand, the skimming resulting from the regional equalization of charges which might be imposed on the railways can have uneconomic effects.

(5) In the sense that the sum of the discounted revenue during the economic life of the infrastructure is expected to be sufficient to cover the sum of the original investment in the infrastructure, the costs of its operation and maintenance, and the costs of transport services over the same period.

to charge higher prices, thus causing a further loss of traffic. The railway line may therefore find itself progressively forced into a situation where "total costs" could no longer be covered and the only choice remaining would be between a permanent deficit and closure of the line (1).

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There is little doubt that the railways are generally in a situation of increasing returns in the sense that the average cost per ton-kilometre (2) falls as traffic increases. This is certainly the case with infrastructure. Whatever the system of budgetary equilibrium adopted, infrastructure charges per unit of transport service will fall with the increase in traffic. But for the railways there may also be increasing returns in the operation of transport services. Various cost factors increase less than proportionally with traffic and can remain constant up to a certain limit (3), so that the revenue from prices equal to the marginal costs may not be sufficient to cover all expenses.

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How are we to judge traffic leakage, and what are its consequences? Before we answer these questions, two concepts must be defined: the rule of budgetary equilibrium as applied to a given railway line, and the corresponding "total cost". In the previous chapter (4) we showed that imposition of the rule on each distinct part of a network made little economic sense, particularly since the revenues from those different parts are highly interdependent. In addition, only a portion of the total financial burden of the railways can be directly imputed to the individual parts of the network. We therefore concluded that if budgetary equilibrium should be imposed at all, it would have to be imposed on a broad scale, i.e., on relatively large components of the network. This need is particularly obvious in the system of budgetary equilibrium without possibility of borrowing (5), under which infrastructure users are charged each year with the current expenditure on investment, replacements, upkeep and operations.

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It follows from the above that the question of traffic leakage is in fact more complicated than it seems at first sight, because the case of a given railway line cannot be considered in isolation but must be related to the overall situation in the network to which it belongs.

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Let us therefore suppose that the railways are subject to the rule of budgetary equilibrium in a general form and are free to fix their rates as they please. On this assumption, an increase in road competition will probably have the following consequences for the line concerned:

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i) If returns are increasing, the railways can endeavour to maximize their net income either by closing the line (alternative 1 a) or by fixing rates which enable them to meet the increased competition (alternative 1 b).

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ii) In either case, the new situation is likely to threaten the railways' ability to satisfy the rule of budgetary equilibrium for the network as a whole.

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The choice between 1 *a)* and 1 *b)* will only seriously arise in the case of branch lines, because the interdependence of revenues from the various parts of a network obviously rules out the closing of main lines unless a whole subnetwork is to be abandoned. No valid economic reason exists for excluding possibility 1 *a)* for a branch line, on the assumption that the line would be closed only if the revenue imputable to its operation was not even adequate to cover direct operating costs, including operating costs independent of traffic, or — in the event of important replacements being needed — if the future discounted revenue was not expected to cover the operating costs plus the new investment costs. Preservation of such an economically unviable branch line, either by directly obliging the railway to keep it in service or by ensuring its viability through restrictions on road transport, is tantamount to sacrificing technical progress to the supposed advantages of stability and protection of vested interests (6). If alternative means of transport are available at less cost — as is the case in the situation envisaged — such protection would seem to be economically unjustified (7). Various problems of adaptation could

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(1) The same problem can arise in the case of a canal subjected to increased competition, for example from the railways or an oil pipeline. This case is usually not considered because at present canals are not subject to the rule of budgetary equilibrium. Moreover, the individual carriers are not in a situation of increasing returns, because the tariffs for the use of infrastructure are fixed according to a procedure which does not have the effect of bringing down charges per unit of service as traffic increases. This is a case of "institutional convexity" (see Part I).

(2) Including the financial charges.

(3) This applies for instance to labour costs for operating stations, administrative services, etc.

(4) See particularly Section 24 and Subsection 24.45.

(5) See Section 31.4.

(6) Of course, closing a line can also pose serious problems of equity.

(7) The verdict could only be otherwise if the railways were in a situation not only of increasing average returns but also of increasing marginal returns. In such circumstances and in certain cases there could be a situation of unstable equilibrium, and traffic leakage could impair optimum resource allocation. However, as we have already indicated, such situations appear to be relatively exceptional (see Sec. 11.4).

arise, however, and they might be very grave from both the economic and social angles. These problems and their implications for policy will be examined later in connection with adaptation to structural change (1).

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Besides these problems of adaptation, a genuine difficulty arises if minimum tariffs preclude the railways from adopting solution 1 *(b)*, i.e. fixing competitive rates. In this case there will be a real traffic leakage, which would run counter to optimum resource allocation. If the economically rational solution — abolition of the restrictions on the railways — is ruled out for some reason, there may be good grounds for imposing equivalent restrictions on road transport, in order to prevent the uneconomic competition which would result from the combination of restrictions for the railways and complete freedom for the roads.

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The situation envisaged under *ii)* can arise in actual fact, but in itself it has nothing to do with the question of traffic leakage, and it would hardly be reasonable to try to remedy it by such ad hoc measures as the protection of certain railway lines whenever stronger competition threatens to change the present distribution of traffic to the disadvantage of the railways. Such a solution would hinder the adaptation of the transport system to changes in the structure of demand or costs and, particularly, to technical progress.

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If we discard the unrealistic hypothesis of total closure of entire subnetworks, there are only two solutions which are not incompatible with optimum resource allocation. The first is to cover the entire deficit of the railways by subsidies — in other words to disregard the rule of budgetary equilibrium; but this has a number of serious drawbacks which we have already examined (2). In principle, subsidies ought to do no more than remedy the consequences of traffic leakage. To calculate them would require an estimate of the income which traffic on the line in question would have yielded if there had been no leakage. Hence, in practice it would be very difficult to establish objective criteria for granting subsidies and yet avoid losing the institutional advantages of the rule of budgetary equilibrium.

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The second solution is to apply a particular variant of the budgetary equilibrium system which excludes borrowing (3). This implies that the railways' total expenditure on expansion, replacements, maintenance and operation of infrastructure shall be financed from their current revenue. It rules out all possibility of deferring the financial burdens of current investment through loan issues, and it also leaves the financial burdens of past investment out of account. Since, in the matter of traffic leakage examined here, we are considering specific infrastructures whose financial burdens would be nil under the system of budgetary equilibrium without borrowing, budgetary equilibrium would not constitute an effective constraint except perhaps as regards the operating costs of infrastructure independent of traffic. Consequently, in so far as any deficit corresponding to these operating costs can be covered by a certain increase in prices in other parts of the network, the railways will be able to charge prices equal to the economic charges and to face up to competition. Any traffic leakage occurring under these conditions can therefore not be regarded as contrary in itself to optimum resource allocation; but the increase in prices in another part of the network entailed by this price policy may well run counter to such optimum allocation.

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In the case considered, only the marginal costs can be charged and not the financial burdens and the operating costs independent of traffic, and therefore a loss of financial capital ensues for the railways (4) (5). Hence, failing any compensations in the rest of the network, either this loss will be accepted and the principle of budgetary equilibrium in its widest sense abandoned, or budgetary equilibrium will be enforced. In the latter case, either subsidies must be provided or traffic leakage (which would, however, be consonant with optimum resource allocation) must be prevented by arbitrary restrictions of road traffic.

25.35 — *Some aspects of tariff systems fixed or approved by the public authorities*

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Can the optimum prices of transport services corresponding to optimum resource allocation be de-

(1) See Subsection 25.41.

(2) See Section 23.3.

(3) See Section 31.4.

(4) For the question of capital losses, see Section 31.2.

(5) Once the system of budgetary equilibrium without borrowing has been introduced, such a loss does not occur if the line is shut down. In this system, by definition there are no longer any financial charges: operating costs independent of traffic are eliminated by the closing of the line.

termined by a centralized procedure? This is perfectly conceivable in theory; but its practical implementation depends on various conditions such as the actual possibilities of minimizing costs in a centralized system and of keeping prices flexible both in time and for the different types of services, etc. Furthermore, it is difficult if not impossible for a central authority to calculate such prices.

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We have shown that cost minimization should be considered an essential condition of optimum resource allocation ([1]), and that competition is an effective means to this end ([2]). As system of tariffs ([3]) fixed or approved by the authorities has certain drawbacks from this point of view in that it is likely to reduce the pressure of competition.

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Furthermore, a centralized system is necessarily less flexible, particularly as to changes in optimum prices which are not fully predictable. Tariffs fixed or approved by the authorities can, of course, always be changed; but this calls for administrative procedure whose effect is to hold up adaptation to special or new conditions. It can rule out certain short-term changes and obstruct the adoption of special rates for certain types of services. Tariffs fixed or approved by the authorities can certainly be highly differentiated. But the more complex the tariff structure is, the more rigid it tends to be, since a change in one rate will often require complete revision of the whole tariff, both on economic grounds (possibilities of substitution) and for political reasons (opposition of vested interests to partial changes).

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Consequently, the question at the head of this subsection can only be answered affirmatively and unreservedly if the optimum prices are not subject to wide and unpredictable variation. It is often said that this condition is in fact fulfilled. For those who hold this opinion, transport rates corresponding to the optimum prices of economic theory could be established on the objective basis of costs, the only rule to be imposed on the decentralized operators being that of maximizing production (maximum use of existing capacity). The application of such a rule can in fact be fairly easily supervised, but the optimum price hypothesis on which it is based is based is incorrect. As we have shown, the prices corresponding to optimum resource allocation consist of two parts: the marginal cost of production on the one hand, and the marginal rents arising from the durable factors of production, in particular means of transport, on the other. The marginal cost may be roughly constant in time and equal for important groups of services, and may consequently be determined accurately enough by a centralized procedure. But this conclusion does not apply to rents, which are scarcity prices for fixed factors and therefore depend entirely on the intensity of demand. Since demand for transport services is characterized by fairly strong fluctuations in time which cannot be exactly foreseen, and since transport services cannot be stored, the rents included in the optimum prices, and hence the prices themselves, tend to vary strongly.

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Tariffs fixed or approved by the public authorities cannot take full account of these variations, which are not predictable enough to be incorporated in tariff schedules, and cannot be adapted rapidly enough to follow changes in demand. The consequent lack of flexibility is a hindrance to optimum resource allocation. If their level corresponds to the average of the optimum prices, the tariffs will be sometimes too low and sometimes too high in relation to the economic optimum ([4]).

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If the tariffs are too low, the available transport capacity will be insufficient to meet total demand. Capacity will then have to be either rationed or expanded, even if expansion is not economically justified, as will be the case especially if the initial capacity was optimum. As regards rationing, since this cannot be done by prices, other means, such as the establishment of waiting lists, which do not make economic sense, must be resorted to. Moreover, the fact that price increases are impossible or limited will unduly discourage investment in reserve capacity (assuming investment decisions are left to the

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([1]) See Subsection 25.03.

([2]) See Subsection 25.10.

([3]) In the following pages the term "tariffs" will be used to designate transport prices fixed directly or approved by the public authorities. These can be either fixed tariffs, leaving no margin of freedom for the carrier, or bracket rates, i.e. minimum and maximum rates. Transport prices fixed by the carrier and not subject to approval by public authorities are regarded here as forming a "price schedule". They can be either guide prices, if the price actually paid is settled between the carrier and the customer, or fixed prices, if the price actually paid is the same as that of the schedule.

([4]) In principle, some of these difficulties are inherent in every system of prices fixed in advance as opposed to prices fixed by individual contract, but they are less severe in the case of price schedules fixed by the enterprises than in that of tariffs fixed or approved by the public authorities.

carriers), and will thus contribute to an aggravation of traffic peaks (1) (2).

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If official tariffs are too high in relation to the optimum price, existing capacity will be underutilized, and this will lead to manifest waste of economic resources. Such will be the case if tariffs exceed marginal cost at times when capacity is not fully used. This distortion could be prevented by limiting investment in transport equipment so as to reduce the risk of unforeseeable underutilization to a minimum. However, the strongly restrictive policy this would entail is not only undesirable in itself but would also aggravate difficulties where tariffs are too low. Here it should be noted that if, with a system of tariffs fixed or approved by the public authorities, responsibility for decisions to invest in means of transport is left to the carriers, restrictive measures may be necessary in any case. For protection against unforeseen price reductions can increase the private profits but not the general economic profits from investment in means of transport. Furthermore, such measures might have the effect of diverting uneconomic professional haulage towards own-account transport; this diversion would then have to be prevented by restricting the latter form of transport.

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These drawbacks of tariffs fixed or approved by the public authorities could be reduced by detailed differentiation to take maximum account of all factors determining the optimum prices. Even those variations in supply and demand stemming from circumstances (3) whose time of occurrence is unpredictable could be allowed for in such tariffs, provided such circumstances can be defined clearly and objectively. However, the complexity and dynamic nature of transport, and the impossibility of storing transport services, would still leave out of account a very large number of individual cases which could neither be catered for in the tariffs nor dealt with by modifying the rates, because of the delays inevitable in all administrative procedure.

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Finally, it should be pointed out that these drawbacks of tariffs fixed or approved by the authorities need not be considered as decisive if the tariffs are expected to conform to objectives which are other than those of optimum resource allocation and incompatible with such optimum allocation. This fact must be taken into account in analysing the various possible intermediate systems.

25.36 — *The option of stabilization*

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It is often said that a system of fixed tariffs (4) or bracket rates has a stabilizing function. As a statement of fact this is quite correct; but the implicit judgment involved — that stabilization is desirable in itself — should be scrutinized a little more closely. There is no doubt that in, for instance, a general system of bracket rates, transport prices fluctuate less often and less violently than under a system of free pricing. The time necessary to change the price limits depends of course on the procedures followed, but certain time-lags are inevitable in any case, because the rates must be approved by the public authorities. These time-lags rule out any immediate adaptation of the rates to new conditions — at least in so far as the new prices would have to be outside previously authorized limits — and can thus prevent short-term fluctuations of prices outside the bracket. These fluctuations might, however, be desirable. In a system of bracket rates, the range of fluctuations possible without revising rates is obviously determined by the width of the margin between the minimum and maximum limits of the brackets. If stabilization is to be effective the bracket must be fixed in such a way that it really prevents certain rises or falls in price which would occur if there were no price limits.

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It may be asked whether such stabilization, obtained by limiting price rises and falls and by a deferred adaptation of the bracket rates, can be considered

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(1) This may not occur if the carriers are paid black market prices. However regrettable and undesirable such a state of affairs may be from the ethical and institutional points of view, it could be considered an economically valid corrective to too rigid a tariff were it not for the fact that it distorts the conditions of competition at the expense of the railways, which are open to more effective control than the other types of transport.

(2) If, however, investment is centrally controlled and capacity is expanded so that all predictable demand and all unpredictable peak traffic can be handled because there is sufficient reserve capacity to reduce the risk of congestion to a reasonable level, a distortion might occur in conditions of competition between professional transport and own-account transport. In fact, under these conditions, it might be in the interest of transport users to effect their basic transport with their own resources and unload their traffic peaks on to professional transport. Under a centrally controlled tariff system, restrictions would then have to be imposed on own-account transport. This may eliminate distortions in conditions of competition, but it does not resolve the fundamental dilemma, i.e. either to put up with temporary congestions or to create reserve capacity which is economically excessive.

(3) Such as a fall in the level of rivers, especially severe winters, etc.

(4) In the following pages the expression "fixed tariffs" will be used to denote tariffs which are either fixed directly by the competent authorities or determined under a procedure implying their approval and leaving no margin of freedom for carriers. Obviously they are "fixed" not in the sense that they cannot be changed but that changes must be approved; this implies an administrative procedure which may take some time, certainly longer than the time required for decisions by a private firm.

an economic advantage. We have shown [1] that the advantages of price stabilization are very debatable. If we disregard cyclical fluctuations, which give rise to very important special problems and must be examined separately [2], stabilization can never continue for more than a relatively short period: in the long run adaptation to the economic trend is both desirable from the economic point of view and inevitable in practice. This is why, in terms of optimum resource allocation, price stabilization is not relevant to long-term decisions such as those made by transport users concerning the siting of enterprises.

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Short-term price stabilization as such — i.e. disregarding the consequences of stabilization of prices at a level different from the average which would have prevailed under a free pricing system — is often considered an advantage by carriers and/or transport users.

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The fixing of a maximum limit would appear to be chiefly to the advantage of users; but the merits of the case are far from clear. With a free pricing system, users have some possibility of ensuring against the risk of price movements by concluding contracts for a certain period of time. This procedure not only guarantees users a specific price but also has the advantage, considered essential by some of them, of making the required capacity available at this price. However, as we have already pointed out [3], in a system of stabilized prices any increase in demand beyond the available capacity makes it necessary to ration demand by means other than prices (waiting lists, etc.). The user then has no way of expressing the relative urgency of his demand for transport and of satisfying at least that part of it for which he is prepared to pay a relatively high price, i.e. the part whose economic value is high [4].

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Maintenance of too high a tariff on the pretext of stabilizing prices is tantamount to a monopolistic policy which favours carriers in the modes of transport with a competitive system if elasticity of demand in relation to prices is less than unity. But from this point of view the aim would be not so much price stabilization for its own sake as a certain distribution of incomes. Such a policy has economic drawbacks. It jeopardizes the optimum utilization of capacity and it can weaken the incentive to minimize costs by reducing the pressure of competition. Both these consequences are in conflict with the optimum allocation of resources [5].

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The bad effect on optimum resource allocation can be all the more considerable the higher the elasticity of demand. It must be stressed, however, that in practice the *a priori* evaluation of demand elasticity is very hazardous [6]. If it is desired to attain income distribution objectives by means of minimum tariffs and at the same time reduce to a minimum the disadvantages which such tariffs involve from the angle of optimum resource allocation, it would seem advisable to impose them only as correctives after making sure that the resulting higher prices have no ill effects on the volume of traffic.

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Apart from the drawbacks just mentioned, the fixing of minimum prices can lead to a certain restrictive control of transport capacity, with all the disadvantages this involves [7].

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It follows from the above that the various arguments advanced in favour of stabilizing transport prices are open to serious doubt from an economic point of view. Provided that competition, where it can exist at all, is not prevented from functioning, any rigid attitude to prices would seem to run counter to optimum resource allocation. Competitive prices reflect the economic conditions of cost and demand as expressed in the marginal cost and marginal rent of the durable equipment. They thus help to ensure the completest possible utilization of capacity and a rational distribution of available capacity when the durable equipment is fully utilized.

25.37 — *The option of market transparency*

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There is no doubt that sufficient transparency of the market is a necessary condition for rational and efficient operation of the price system. But fixed tariffs or bracket rates are not the only means of

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[1] See Subsection 25.35.

[2] See Section 25.4.

[3] See Subsection 25.35.

[4] Of course, rationing by price raises the problem of whether the given distribution of income can be considered equitable — a general problem outside the province of this report.

[5] See Subsection 25.35.

[6] It certainly differs greatly according to the general economic situation.

[7] See Subsections 25.21 and 25.22 for an examination of the problems of the systems of control of transport capacity and access to the market and their drawbacks (in particular reduction of the incentive to minimize costs, the risk of excessive restrictions, and the unfair nature of quotas).

achieving this transparency. Good market transparency can undoubtedly be assured by the existence of tariffs known in advance, published in some form or other, and binding on the carriers concerned until such time as they are modified. But the result is a certain rigidity in the rates, which, as we have already pointed out, can involve economic disadvantages. However, rates which are fixed by the carriers themselves without having to be approved by the authorities are less rigid than rates fixed by a procedure involving their approval or even imposition by these authorities (1).

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A system of tariffs or price schedules is certainly necessary for some categories of goods transport, in particular small consignments, and for passenger transport. If the tariffs or schedules for such transport were not published in advance, the market would not be transparent enough, for the individual user generally cannot obtain the information he requires except at a cost too high in relation to the price of the transport.

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However, this argument may not hold for large tonnages or transport operations which take a long time. Beyond a certain limit, transport services can be economically large enough to justify special conditions. A system of tariffs or schedules, whether fixed or allowing a certain latitude, could therefore conflict to some extent with the desired flexibility of transport prices, as regards both variations in time and adaptation to the special conditions of the contract envisaged. In such cases, market transparency does not necessarily require the tariffs or schedules to be published in advance; it is sufficient that there should be a procedure by which the user can obtain rapidly and at reasonable cost the necessary information on the conditions under which the various alternative modes of transport can meet his requirements. Furthermore, the terms of such contracts would have to be published post facto in an appropriate form.

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Users can be supplied with adequate information in various, widely differing ways. Freight exchanges for the modes of transport with a competitive system (2) are one instance. The procedures need not be the same for all modes. For example, they can include the publication of tariffs or schedules, especially in the case of small consignments, as mentioned above.

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But although the existence of public tariffs or private price schedules is very helpful to market transparency, when all is said and done a system of tariffs or schedules, whether fixed or involving a limited margin of freedom, is not essential to transparency at least when it can be assured by other means (3).

25.4 — *SPECIFIC PROBLEMS OF CYCLICAL FLUCTUATIONS AND ADAPTATION TO STRUCTURAL CHANGE*

25.40 — *Cyclical fluctuations*

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On several occasions already we have referred readers to the present section for a study of the problems of cyclical fluctuations. These can take the form of more or less temporary recessions, of relatively long depressions, or of accelerations or slowdowns in the rate of economic growth.

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Up to the present our analysis has presupposed full employment and steady economic growth, because this can be considered a desirable situation of economic "normality". It is in fact the declared aim of the economic policy of all the Community States, and so far has been more or less attained. But this does not mean that the possibility of a recession or of a slowdown in growth is necessarily to be ruled out. In fact, fairly recent experience shows that the growth rate of the national product can suffer appreciable fluctuations, even in exceptionally favourable conditions. The consequences of a general recession or a marked slowdown of growth for inland transport should therefore be thoroughly analysed in the near future, with a view to defining the best policy for such circumstances.

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It is manifestly impossible to undertake such a study in the context of this report, for it would require both

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(1) Although "fixed" in the sense defined above, rates may still be widely differentiated, for example as to the times at which the service is supplied. For passenger transport, uniform tariffs are both useless and clearly incompatible with optimum resource allocation, owing to the existence of very marked peak periods. The varying intensity of demand, coupled with the employment of durable equipment and the impossibility of storing transport services, implies that optimum prices, in particular the element of rent for the use of durable equipment, will be relatively high during peak periods and relatively low or even nil when demand is weaker (see Subsection 25.03). At present there are many tariffs whose structure is exactly the opposite, since reductions are granted for travel at the hourly and seasonal peak periods.

(2) See Chapter 33.

(3) Independently of the question of market transparency, the means used must make it possible for the authorities to see whether abuse of dominant positions or uneconomic competition is occuring. This aspect will be considered in Part III (see Subsection 33.21).

detailed research into the types of economic fluctuations and their effects on the various sectors of the transport market and a comprehensive analysis of the pros and cons of the different measures which could be taken. The following comments are therefore intended only to pinpoint a few important aspects. They do not pretend to do more than open the way to a subsequent full analysis, which we consider an extremely important task for the future.

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A first, fundamental observation concerns the nature of economic fluctuations. A general recession results from insufficient overall demand. It can therefore only be remedied by action to influence the level of overall expenditure. Obviously, measures taken in individual economic sectors such as inland transport are not capable of eliminating the general causes of the recession. They can do no more than act on the consequences it produces in these sectors. The primary aim of anticyclical policy must be to regulate overall expenditure.

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The second aspect to be considered is whether the criteria of optimum resource allocation, which we have examined under the twofold hypothesis of full employment and steady economic growth, apply in a situation where these conditions are not fulfilled. It appears that in fact they do apply, without major modification. Neither the general lines of an optimum transport policy nor its manifestations are changed if the optimum resource allocation criteria are applied in situations of recession or slower growth. A fall in demand from the level expected at the time when the investment decisions were made causes reduced utilization of available capacity and therefore a fall in optimum prices which can have the effect of eliminating all rents arising from the existing equipment. The result will be a decline in carriers' incomes which may well be considered unacceptable from the social angle. On the strictly economic plane, however, the falls in prices perform a useful function, by generally preventing even greater underutilization of existing capacity.

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It is often said in opposition to this that overall transport demand is relatively inelastic, so that the imposition of lower limits to prevent or restrict falls in prices would have but little effect on the utilization of capacity, although it would work against an excessively serious drop in incomes. This argument may be relevant to some extent (thorough research into the elasticity of overall demand for transport in relation to prices in a situation of recession would be needed to check the point); but it does not alter the fact that, as demand is generally not entirely inelastic, minimum prices might have no other effect than to reduce utilization of capacity even further. Hence their effectiveness as a means of supporting carriers' incomes would be to some extent diminished, and waste of economic resources would occur.

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In the third place, attention must be paid to the social consequences of an absolute or relative fall in demand. The fall in incomes caused by a recession can be considered particularly undesirable in the modes of transport with a competitive system, where small firms with an inadequate financial basis are predominant. Furthermore, the more durable the equipment, the more serious the consequences are likely to be. This is particularly the case with inland waterway transport, since it is the rents arising from durable equipment which are affected by the fall in prices. Owners of such equipment lose part or even all of the income they expected to receive as rents, while they may still be liable for interest and amortization on the debt contracted when they acquired their equipment. In the case of a recession it is naturally not possible to interpret the bankruptcy of an enterprise as proof that it was inefficient.

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In a situation of recession the strictly economic aspects of transport policy should therefore be supplemented by measures to mitigate its social effects if these are undesirable. The only economic problem which arises here concerns the form these measures should assume, and more particularly the question whether or not they should and could be taken in such a way as to respect optimum resource allocation. This point can only be fully analysed in the context of a comprehensive study of the problems of cyclical fluctuations and their impact on transport. But in general a policy of direct subsidies might be preferable to fixing minimum prices. Direct subsidies have the double advantage of directly supporting overall demand (and consequently of directly combating the recession) and of not impeding better utilization of capacity [1].

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[1] The granting of subsidies may, however, reduce the autonomy of decisions in a decentralized economy. Moreover, it may be fraught with institutional difficulties in practice. Determination of the amount of these subsidies, and in particular the criteria to be applied, pose delicate problems. Political considerations may result in preference being given to the protection of incomes by minimum prices. But besides the drawbacks to this already mentioned, there is a risk of the minimum price being maintained after the recession has ended, through pressure from the carriers. It is clear that the whole question needs to be studied in the light of all the economic, practical and institutional aspects.

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One last point concerns the influence of cyclical fluctuations on investment in transport capacity, particularly in inland waterway transport (1). It is quite conceivable that fluctuations of economic activity or even of growth rate can lead to overinvestment during a phase of rapid expansion. Where this cannot be prevented by keeping carriers better informed (2), other measures may have to be considered. Here again we are obliged to confine ourselves to recommending a special study of the problems posed by cyclical fluctuations as they affect the transport sector.

25.41 — *Adaptation to structural change*

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Structural changes can be due to a shift in the composition of demand for transport, or to technical progress, or to institutional changes. As in the case of recession, the causes of structural change lie outside transport policy. To ensure optimum allocation of resources, transport policy cannot and should not obstruct technical progress and modifications in the structure of demand. Whatever their cause, these structural changes may result in social problems very similar in appearance to those caused by a general recession.

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However, there are at least two important differences. The first is that structural change, unlike recession, is inevitable in a dynamic economy. Expansion involves risks, and the entrepreneur must normally take the good with the bad if a price-based and decentralized economy is to continue to function efficiently. A decline in income due to structural change therefore has not the same economic and social significance as a decline due to recession.

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Secondly, whereas during a recession there are no alternative opportunities for victims of unemployment or a fall in income, such opportunities do exist in the case of structural changes. This factor is of fundamental importance from both the social and economic angles. On the social plane the intervention of the public authorities in one form or another is really justified only if the workers suffering from the structural trend have difficulty in finding other employment rapidly, because they lack natural mobility or because the cost of readaptation is too heavy, etc. Economically, it is clear that the aid granted should be such as not to reduce but strengthen incentives to look for another job. For optimum resource allocation, which may be considered of only secondary importance in a recession, when the first priority is the full exploitation of available but unused resources, retains all its economic importance in the case of structural change.

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It therefore follows that, on both social and economic grounds, whatever measures are taken should aim primarily at facilitating and speeding-up adaptation to the new conditions. Aids for retraining, grants on change of employment, compensation for reduced capacity, and like measures, answer the purpose. Furthermore, those who are insufficiently mobile to take advantage even of these measures may perhaps be given direct allowances to cushion at least partially the effects of a fall in income.

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However, such aids should not obstruct the general process of adaptation. For instance, it would not appear desirable to subsidize a declining sector or to try to maintain incomes earned in such a sector. For the same reason, minimum prices do not seem to be a suitable method of assistance. Like subsidies, minimum prices tend to slow down adaptation to structural change by protecting incomes in a declining sector. Preference should be given to a policy which does not oppose the fall in remuneration from factors of production utilized so as to stimulate the process of adaptation, while correcting the social consequences, when necessary, by measures of the type we have indicated.

25.5 — *SUMMARY*

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The analysis made in this Chapter permits only provisional conclusions coupled with reservations. The final choice of the best system for transport services depends on two sets of considerations which are outside the sphere of economic reasoning in the strict sense. One relates to the basic objectives to be pursued, and it is clear that the decision here can only be a political one. The other concerns the correct evaluation of certain facts which we have shown to be important elements in the choice between the different options. A few remarks must be made on these two points.

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Our analysis is founded on the criteria of optimum resource allocation. If we accept efficiency as the chief aim of policy in the field of transport services, and if it is further agreed that under the conditions we have described a decentralized system based on

(1) See Subsection 25.21.
(2) See Chapter 32.

competition is best calculated to achieve this aim [1], it would seem that the optimum system for transport services should be based on free competition, wherever this is possible in practice. If other criteria are accepted [2], the conclusions might well be different. These objectives, where their achievement can conflict with optimum resource allocation, generally presuppose deliberate intervention by the public authorities. The more numerous such interventions are, the less suitable the competitive system will be, and the more open it will be to criticism.

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However, we have shown in the introduction to this Chapter [3] that these other general policy objectives can probably be achieved in many cases in a decentralized economy without distorting optimum resource allocation. In this respect transport services are very different from infrastructure, where the other general policy aims play a more direct role, particularly in investment decisions.

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In a situation where the level or the rate of expansion of general economic activity is falling, a number of specific problems arise which may require special measures, notably to combat the harmful social consequences. These problems have not been examined exhaustively in this report, for they obviously call for a special study. Hence our conclusions are valid only for a situation of full employment and relatively steady economic growth.

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Realization of these two conditions is one of the Community's general objectives; and if they are fulfilled (as has usually been the case since the war), the competitive system can be efficient from the angle of economic criteria [4], provided it can function without public or private restrictions, and subject to one important reservation and two possible exceptions.

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The reservation is that neither the system of charges for the use of infrastructure nor other external factors shall distort the conditions of competition [5]. This is an important reservation, but we have shown that it can be satisfied, and that the problems involved must be solved in any case, whatever system is applied to transport services.

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The two exceptions concern those cases where free competition can have results incompatible with optimum resource allocation. This occurs when there is either abuse of dominant positions or uneconomic competition, itself due to inadequate information [6] or to a differentiation of charges for infrastructure or operation by "internal subsidizing", as can happen with the railways.

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The importance of these situations clearly depends on the facts of the individual case. After a general examination of the data we have been able to obtain, we feel that the two dangers of abuse of dominant positions and uneconomic competition arise less frequently than is often claimed. We shall come back to this point in Part III.

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[1] This provisional conclusion of our analysis is based notably on the fact that competition is a strong incentive to the minimization of costs (see Subsec. 25.10).

[2] Such as the objectives of regional policy or income distribution (see Ch. 21).

[3] See Subsection 25.02.

[4] According to the indications we gave in Part I, and subject to those in Chapter 21.

[5] See Subsections 25.30 and 25.32.

[6] In particular, inadequate information to carriers in the competitive modes of transport (overinvestment, problem of return loads, etc.).

PART III

ANALYSIS OF VARIOUS SYSTEMS

CHAPTER 30

INTRODUCTION

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In the first two chapters of this Part we shall examine a certain number of systems, first for infrastructure and then for transport services. In view of what has been said in Parts I and II about the differences in the economic and institutional structure of these two stages in the production of transport services, no further justification is required for the separate treatment of actual policies in them.

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The third chapter will deal with some institutional aspects of the various systems, and the last with the steps we suggest for solving the problems of implementing a common transport policy.

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Where transport services are concerned, our study has been limited to the transport of goods. This does not mean that we think the problems of passenger transport unimportant, but simply that it was not possible to study them in the time allotted (1).

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Most of the options suggested for goods transport are also applicable to passenger transport. But in practice, where passenger transport is concerned there are undoubtedly many tariffs that are fixed by the State and are certainly not consistent with an optimum allocation of resources. Where such tariffs are held to be too socially important for correction, it is clearly necessary to estimate the loss of business suffered by common carriers (2). If the aim is to achieve an optimum allocation of resources, the best solution, in theory, would be for the State to compensate carriers for their loss of business.

30.0 — *INFRASTRUCTURE*

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In seeking a policy on charges for the use of infrastructure, we found that two main solutions emerged from our study in Part II. One consists in not charging the users more than the economic charges or in adopting a system of charges that are the best possible practical approximation to the economic charges. We have called this the practical system of economic charges (3). The other solution consists in imposing, in addition, the requirement of budgetary equilibrium; the various ways in which this requirement could be applied have not yet been worked out precisely.

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In Chapter 31 we shall make a detailed study of the first solution (4), and of two versions of the second depending on whether borrowing is allowed or not (5).

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Besides these two main solutions we shall also consider two other systems, the system of development cost (6) and the system of calculated total cost (7). The development cost system is based on charges that remain constant over a period of time, whereas the calculated total cost system is primarily an attempt to equalize the conditions of competition for the different modes of transport.

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The choice between these systems will largely be a political one. On purely economic grounds, the practical system of economic charges would obviously be the best, since it is derived directly from the criteria of optimum resource allocation. There are three possible drawbacks to this system, which we have analysed in Part II (8). Firstly, it may not be compatible with equity. Secondly, when investment in infrastructure is dependent on public funds and therefore on political decisions, such investments may be inadequate owing to the limitations of the national budget, or misdirected owing to the action of pres-

(1) When our terms of reference were explained, all the emphasis was laid on the transport of goods.
(2) These problems are similar to those to be considered in Chapters 32 and 33 in connection with price limits.
(3) See Section 24.2.
(4) See Section 31.0.
(5) See Sections 31.3 and 31.4.
(6) See Section 31.1.
(7) See Section 31.2.
(8) See particularly Section 23.3.

sure groups. Thirdly, if the deficit is financed by subsidies, there will be a danger, where the railways are concerned, that the true infrastructure deficit may be confused with a deficit due to inefficient management, and there may therefore be less incentive to minimize costs. These are mainly sociological and institutional considerations, which cannot be analysed in economic terms alone. Consequently, all the other systems we shall discuss, which in varying degrees attempt to meet the objections to the practical system of economic charges (1), are based on these extra-economic considerations and are therefore to some extent a matter of political choice, on which it is not for us to express an opinion.

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This does not, however, mean that *economic* considerations cannot enter into our study of the various systems. But these considerations are not decisive, since political, sociological and institutional aspects must be taken into account at the same time. The only really positive requirement that follows from economic analysis alone is that the charges for the use of infrastructure should not be lower than the practical economic charges.

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For any components additional to the economic charges, we shall show that economic sophistication serves little purpose; since the political and sociological objectives pursued when the condition of budgetary equilibrium is imposed are of a very general nature, costs do not need to be apportioned or calculated in great detail. In these circumstances, the only reasonable thing to do is to define rules that are clear, simple and not arbitrary, and whose implementation allows of objective control.

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In this connection it should be emphasized that even a rough policy — provided it was consistent — would be a great improvement on the present situation in most countries. Very few serious attempts have actually been made to determine the marginal use costs of infrastructure or to charge them to the users. Even less has been done to adjust the charges to the degree of congestion. The present situation is equally chaotic as regards the nature of the revenue obtained from the users and the relationship between this revenue and expenditure on infrastructure. Road vehicles are subject to several kinds of taxation, but there is usually no direct connection between expenditure on roads and the revenue from these taxes. Although in most countries the total revenue obtained in this way seems greater than the costs of road infrastructures (however these costs are determined), it is difficult and dangerous to express a definite opinion as long as this revenue is fiscal in character. As for the railways, although they are technically responsible for their own infrastructure costs, they are subsidized by the State in most countries (2). And inland shipping contributes little to pay the cost of waterways.

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Without wishing to express an opinion *a priori* as to which is the best system of charges for the use of infrastructure, we can at least say that whatever system is adopted should be coherent. In most countries, however, it seems clear that the present situation is not based on any coherent set of principles, but is more the product of history and often also of political pressures, chance expedients, and concepts that are out of date, erroneous, or appropriate to situations that no longer exist. Transport policy, especially as regards infrastructure, must get free of these shackles, in order to play its proper part in economic progress and European integration.

30.1 — *TRANSPORT SERVICES*

820

In Part II we arrived at the conclusion — tentatively and with certain reservations — that a competitive system, if it were allowed to function without any restrictions of a public or private nature, and if it proved able to function in an economic manner, would generally produce results in keeping with the criteria of optimum resource allocation (3). For the various assumptions on which this conclusion depends, particularly the assumptions of full employment and reasonably steady economic growth, we may refer to the Chapter on the options for transport services (4). We must, however, again consider in detail the exceptions to this proposition, which arise when there is abuse of dominant positions and uneconomic competition.

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In these two cases, competition may produce results that conflict with the optimum allocation of resources.

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(1) Of course, in so far as these systems are not completely free from these objections, more or less the same criticisms can be made of them as of the practical system of economic charges. This applies, for example to the system of development costs, which also generally results in a deficit when it is put into practice.

(2) The subsidies are not always subsidies in the true sense of the word, but may consist, either wholly or in part, of compensation paid for costs arising from public-service or other obligations.

(3) We would repeat that, generally speaking, we are not considering here the other objectives of economic policy that were discussed in Chapter 21, since they would be incompatible with an optimum allocation of resources.

(4) See Chapter 25.

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As we have already said, the significance of these exceptions depends on facts and on the way in which these facts are assessed and interpreted. The information available to us is not sufficient to warrant a definite opinion as to the actual frequency of cases of abuse of dominant positions and of uneconomic competition. However, after a careful study of the available data and of a number of general considerations (1), we have formed the impression that, at the present time, the number of cases is smaller than is often thought.

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In the first place, abuse of dominant positions is not a general occurrence on the transport market, because the railways now face strong competition from the roads and also because, in the other modes of transport, internal competition — when effective — acts as a check on any monopolistic tendencies.

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Secondly, uneconomic competition, which would show itself in the prevalence of excessively low prices over a long period, is associated with internal subsidizing practised by the railways; a presumed structural tendency to overinvestment by the competitive modes of transport, and a situation of cyclical instability and structural change. We have shown that the practice of internal subsidizing on the railways can be largely prevented by imposing the constraint of budgetary equilibrium and by imposing maximum tariffs wherever abuse of dominant positions occurs (2). We also pointed out in Part II that the "overinvestment thesis" must be treated with considerable caution, at least in the absence of restrictive measures and as long as carriers are adequately informed. For this reason, in view of the general disadvantages of licensing systems, we expressed serious doubts of the advisability of systems to control and restrict capacity (3). The omission from our report of any attempt to define an appropriate transport policy for a situation of recession is deliberate: we have shown that, although various social measures might be desirable if structural changes occurred, particularly in order to facilitate conversion, any specific and lasting support of the incomes of carriers (e.g. in the form of minimum prices) would only hamper their adaptation to new economic conditions (4).

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In any case, as we stated in the General Introduction, the policy of transport tariffs suggested in this report, which will be dealt with in detail in Chapter 32, is essentially pragmatic in character; it makes no particular assumptions as to the actual frequency of cases of abuse of dominant positions and of uneconomic competition, and is completely independent of them.

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(1) Which will be dealt with in greater detail in Chapter 32.
(2) See Subsection 25.30.
(3) See Subsection 25.22.
(4) See Section 25.4.

CHAPTER 31

VARIOUS SYSTEMS FOR INFRASTRUCTURE

31.0 — *THE PRACTICAL SYSTEM OF ECONOMIC CHARGES*

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The essential elements of this system have already been discussed in Part II (1). It will therefore be sufficient here to mention a few practical problems.

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For optimum infrastructure utilization, the charges to be paid by the users must — as we have shown — be made up of a cost charge equal to the marginal use cost and a congestion charge which, when the infrastructure is economically fully utilized, is high enough to limit demand to the capacity available. We also saw that, for the roads, the cost charges can be levied reasonably approximately by combining fuel taxes with taxes on vehicles, and that there is no particular problem of application in the case of waterways and railways. The cost charges should — and could — be differentiated according to the deterioration of infrastructure attributable to the various categories of traffic. As these charges probably do not vary perceptibly in time or space, a differentiation according to these two factors would not appear to be essential. On the other hand, the congestion charges, reflecting as they do the degree of economic utilization, show very wide variations both over a period of time and between one part of a network and another (2). It is clearly impracticable to differentiate prices on this basis, at least for the roads. Any system applied will therefore have to confine itself to imposing specific charges for economic congestion in those areas and at those times when the risk of congestion is greatest.

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How close can one get in practice to the ideal pattern of economic charges? The answer to this question, which will largely depend on the cost of collection, raises technical problems that are outside the scope of this report. Nevertheless, much more can surely be done in this direction than has hitherto been done in most countries and if the system of charges for the use of infrastructure were developed along the broad lines set out above (3), considerable progress would have been made towards the introduction of a more rational system.

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Such policy, the aim of which is to ensure an optimum utilization of infrastructures, should prevent any distortion of the distribution of traffic between competing modes of inland transport. For this, of course, the same criteria and the same practical approximations would have to be applied to the infrastructure of each of the three modes. Thus, the general principles on which the classification of roads (4) should be based would also have to apply to the other modes of transport. Subject to a few obvious adjustments, the points we made with regard to regional non-equalization of charges when budgetary equilibrium is imposed may equally well be made here (5).

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As we stressed in the Introduction to this Part, the arguments in favour of the practical system of economic charges derive from economic criteria, and more especially from the objective of optimum utilization of infrastructure, both within each mode of transport and where the distribution of traffic between competing modes is concerned. On the other hand, the disadvantages of the system, which we studied in detail in Part II (6), are based on considerations that lie for the most part outside the scope of purely economic reasoning. Consequently, the final choice is clearly political in character. It will depend in the first place on the importance attached to achieving an optimum allocation of resources, in particular by creating such conditions as will ensure efficient operation. Secondly, it will depend on the weight that is given to non-economic aspects, and on the degree to which the alternative systems are free from the disadvantages of the economic charges system. Lastly, it will also depend on how far objectives other than economic efficiency — objectives of equity in particular — are accepted as aims for transport policy.

31.1 — *THE DEVELOPMENT COST SYSTEM*

31.10 — *General*

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The development cost system springs from essentially the same considerations as those from which the

(1) See particularly Section 24.2.

(2) Varying, for example, with the peak traffic hours or seasons. (See Part I, in which we showed that the congestion charge could not be interpreted as a cost).

(3) See Section 24.2.

(4) We have classified roads into at least three main categories of network: main, urban and suburban, and local.

(5) See Subsection 24.45.

(6) See Section 23.3.

system of economic tolls is derived, namely the criteria of optimum resource allocation, and particularly their marginalist aspect. By and large, the development cost theory seeks to determine the charges for the use of infrastructure from the marginal cost of providing it. But — and this is a vital point — the theory also imposes a certain restraint on these charges, in that it requires them to remain constant over a period of time, and this is generally incompatible with an optimum allocation of resources (1).

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According to the development cost theory, charges for the use of infrastructure should be equal to the cost of progression when traffic is increasing and the existing capacity will have to be expanded in the foreseeable future; they should be equal to the cost of regression when traffic is decreasing so much that the existing infrastructure will not be replaced at the end of its economic life. The cost of progression is defined as the quotient of the total (discounted) cost of an addition to the capacity of the infrastructure (i.e. the sum of the investment cost and the discounted value of future operating costs, less the discounted value of the investment at the end of its economic life) divided by the discounted sum of all future services to be performed by the additional capacity, assessed as physical quantities. The cost of regression is defined as the quotient of the market value at the moment of calculation of a particular element of the infrastructure, plus the discounted value of present and future operating costs, divided by the discounted sum of all future services to be provided by the infrastructure, assessed as physical quantities (2).

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The development cost system occurs in a number of different versions. In particular, the denominator may be defined not as the discounted future traffic flow, but as the total discounted capacity created by the marginal expansion of the infrastructure. Both versions imply fixing conversion factors for the various categories of traffic that will use the infrastructure in question (such categories being assessed as physical quantities), so as to reduce them to a common denominator. The problems involved will be discussed below (3).

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Another version consists in allowing varying degrees of regional equalization of charges. The reasons for equalization, and the problems it raises, which are similar to those mentioned in connection with the system of economic charges, will also be considered in the following subsections.

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Neither the cost of progression nor the cost of regression is really a cost at all in the economic sense of the term, since they do not denote the value of the factors sacrificed in producing the services of which the cost is to be determined. The cost of utilizing the infrastructure does not equal the cost of progression nor the cost of regression but the marginal use cost. This does not mean that the development cost theory is not worth serious examination. The name is certainly a misnomer, but the concept nevertheless suggests at first sight a promising convention by which a system of charges for the use of infrastructure might be worked out.

31.11 — *Advantages and disadvantages*

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The development cost system, at least in some of its versions, may be seen as an attempt to reconcile the criteria of optimum resource allocation (and in particular the marginal conditions) with the desire to achieve some stabilization of charges for the use of infrastructure and to make it easier to calculate them in practice. In some versions it also serves to bring about a certain uniformity of charges in space. Since the basic idea of development cost is similar to that of economic charges, it is worth considering how far the development cost system is free from the various objections that have been made to the latter system (4), and what specific advantages and disadvantages it has in comparison with economic charges.

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Where this system would lead to a deficit, the problems we have shown to be inherent in the system of economic charges would also arise — though perhaps not to the same extent. From certain points of view, this possible difference gives the system of development cost a relative advantage (5).

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(1) See Part I.

(2) The market value will often be very low, either because the element in question cannot be put to any other use (e.g. a tunnel), or because the cost of converting it for other uses is high (e.g. a canal or the roadbed of a railway line in open country).

(3) See Subsection 31.12.

(4) See Section 23.3.

(5) This fact is important when equity is considered, or the social and political pressures that may lead to serious misdirection of investments in infrastructure. But it does not apply to the third aspect of the deficit, namely the risk that the efficiency of the railways might decline if subsidies were granted, owing to the difficulty of distinguishing between rail transport operations and infrastructure. This problem persits as long as there is a deficit — large or small — covered by public funds.

838

Compared with the system of calculated total cost that we shall consider later, it has another, very important advantage, in that it seeks to take into account the present and future consequences of current decisions to expand the infrastructure or close down certain parts of it; also, it avoids any consideration of past expenses, which are completely irrelevant to economic decisions that have to be taken in the present.

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Compared with the system of economic charges, the development cost system may have the relative advantage of reducing the deficit, but at the same time it has the relative disadvantage of causing a certain distortion of the optimum allocation of resources. This is a drawback which it shares in varying degrees with all the other systems we shall consider. In so far as this distortion occurs because the average charges are higher than the economic charges, it is the price that must be paid for reducing the deficit and solving the problems connected with it.

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But development cost has another drawback, which is not necessarily connected with reduction of the deficit. In Part I we showed that the development cost is only strictly equal to the economic charges when the economy is static and there are no indivisibilities. The development cost is a cost that — if we disregard any changes in prices and technology — remains constant over a period of time, as long as the capacity of the existing infrastructure is not changed. Since the economic charges, and especially their rent component, vary with the intensity of demand, the "constant" charges based on the development cost are only equal to the economic charges if demand does not fluctuate. In fact, the charges based on the development cost are therefore at best no more than an approximation to the economic charges in a very special and unrealistic case.

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Stabilization of charges over a period of time is often held to be an advantage — sometimes even the principal advantage — of the development cost system. But the argument that any stabilization of charges would be an economic advantage is doubtful [1]. For long-lived indivisible assets, which will be underemployed for a long time, such stabilization would certainly be harmful rather than good, from an economic point of view. Moreover, in the face of economic congestion, stabilization of charges at an average — and therefore inadequate — level would mean that an efficient instrument for rationing demand had been abandoned in favour of the method of the queue. For this reason, the element of stabilization implicit in the option of development cost is a doubtful advantage, to say the least.

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But this criticism may be somewhat unrealistic, since perfect differentiation of the charges for each element of infrastructure is physically impossible. Considerable equalization is inevitable, which means that in practice the charges cannot be perfectly adapted to the actual degree of utilization of each of these elements. In other words, since the charges must be equalized in practice, a considerable degree of "stabilization" is inevitable.

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This is just as true for development cost as for economic charges. In practice, the development cost system can only be applied to large divisions of infrastructure, such as the three categories of roads that we have mentioned [2].

31.12 — *Practical application*

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When one realizes the practical limitations that militate against adoption of specific charges for the use of particular infrastructure elements, the development cost system appears in a different light.

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It obviously cannot claim to be as precise as the theory would sometimes suggest. The question is, then, how to put into practice a concept which involves very extensively individualized calculations. How, for example, should the development cost be calculated for very large units which include roads with very different technical characteristics and very different traffic prospects?

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Another problem, as we have seen [3], arises because the various categories of traffic, assessed as physical quantities, have to be reduced to a common denominator by means of conversion factors. It is not, of course, impossible to find reasonable conventions for calculating such factors [4], but they remain intrinsically conventional and do not follow automatically from the development cost theory itself.

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It seems abundantly clear that application of the development cost system would give rise to many arbitrary decisions. It should be remembered here

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[1] See Section 24.3.

[2] Main networks, urban and suburban networks, and local networks. This classification is not necessarily exhaustive.

[3] See Subsection 31.10.

[4] See Subsection 24.46.

that some of the major requirements of any rule in this field are that it should be relatively simple, not arbitrary, and such that its working can be objectively checked in practice. These conditions would not be fulfilled by the development cost system as implemented.

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The objections we have stated cannot be met by applying the development cost system. If such disadvantages are to be avoided, other systems must be considered, such as that of budgetary equilibrium without the possibility of borrowing (1).

31.2 — *THE SYSTEM OF CALCULATED TOTAL COST*

31.20 — *General*

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Like the development cost system and the budgetary equilibrium system, the system of calculated total cost takes many different forms. Obviously we shall have to confine our study to the broad outlines of this system and its main variants, without going into details.

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The general idea underlying all versions of the system of calculated total cost is as follows. The system is designed to provide a basis for determining the charges to be paid by the users of infrastructure, and does this by formulating rules for calculating the "total cost" of infrastructure (i.e. the sum that should be paid each year by the users). Its main task is to determine this "total cost" in such a way as to avoid any distortion of the conditions of competition between the various modes of transport. The system is also based to some extent on the idea of a balanced budget, since the charges to be paid by the users are so calculated as to cover all the costs connected with infrastructure — the costs of investment as well as of operation and maintenance. Where investment is concerned, these costs are not, however, the nominal value of the investment but its replacement value, i.e. the price that would have to be paid to construct an identical or equivalent installation at the present time (2). The system of calculated total cost allows for price changes, technical developments and, in one of its versions, fluctuations of demand (3). The sum to be paid each year by the users of infrastructure on the basis of the capital invested must continually be worked out afresh from the present replacement value of the infrastructure; for this purpose conventional schedules of amortization and interest are used to determine the yearly capital burden of infrastructure. In at least one version of the system these schedules are based on the expected length of the installation's economic life, and are adjusted when the latter changes.

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Whatever the version considered, the idea underlying the system of calculated total cost is entirely sound. This system is intended to avert the distortions of the conditions of competition that might occur if the rule of budgetary equilibrium were applied (4). The nature of such distortions can be seen quite clearly by comparing two similar and competing units of infrastructure, such as two harbours built at different times. If the rule of budgetary equilibrium is imposed on each of them separately, the older harbour will be in a more favourable competitive position simply because its original cost of construction has been wiped out by inflation, whereas the other, more recently constructed harbour is burdened with a much higher debt although its installations are essentially the same. Such a situation is unacceptable, both from the strictly economic point of view and from the point of view of equity.

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This example shows very clearly that the system of budgetary equilibrium may lead to very serious difficulties when it is applied to one particular item of infrastructure or to small aggregates (5). If, for some reason, the system cannot be applied to sufficiently large units, it would be logical to adopt one of the following lines of approach; either to reject budgetary equilibrium and accept the practical system of economic charges, or to correct the system of

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(1) See Section 31.4.

(2) In one version of the system, no account is taken of technical developments unless a particular technique is no longer employed at all. In this version, the replacement value is essentially the present-day cost of constructing an installation identical with the one in question.

(3) It follows that the system of calculated total cost need not necessarily satisfy the condition of budgetary equilibrium as usually understood. Recently, however, it would seem to have satisfied this condition completely, owing to inflation. Since in numerous cases the nominal value of the sums that were invested in the past has been reduced to zero by inflation, charges based on the replacement value would generally be higher than charges calculated from the historic cost, except where there has been great technical progress.

(4) We would stress that the practical system of economic charges (see Section 31.0) makes it possible to avoid such distortions completely. But this system does not satisfy the condition of budgetary equilibrium, whereas the system of calculated total cost does at any rate when given a special form.

(5) This will be dealt with in the section on the system of budgetary equilibrium, especially with regard to the version of it without the possibility of borrowing, in which the problem is particularly acute (see Subsec. 31.40).

budgetary equilibrium in such a way as to bring it closer to the system of calculated total cost.

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This conclusion does not necessarily apply to large aggregates. If charges are equalized over wide areas, the problems connected with budgetary equilibrium are reduced to the possibility of distortion between one mode of transport as a whole and another. Such distortions, if they occur at all, are certainly far less serious than those we have just illustrated by our example of the two harbours (1). Moreover, although the method of calculated total cost may have certain theoretical advantages over that of budgetary equilibrium where smallscale aggregates are concerned, the choice is much less easy where the aggregates are large. In this context it is worth repeating that, if the system of economic charges is rejected, a substantial degree of regional equalization of charges for the use of infrastructure is in any case desirable for many other reasons (2). The choice between the system of calculated total cost and that of budgetary equilibrium thus remains open, at least as long as we have not considered the other aspects of these systems.

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On this general level, one final point must be made. Neither the "total cost" derived from the replacement value, nor any other measure of the "total cost" of existing infrastructure, can claim to be an interpretation of budgetary equilibrium consistent with an optimum allocation of resources, nor to be the only possible basis for a system of charges consistent with an optimum allocation of resources. This is clearly demonstrated by economic theory. The only measure of cost that should be considered when an optimum system of tariffs is to be worked out is the cost charge, which is combined with a congestion charge designed to ration the available capacity when the latter is fully utilized. As we have seen in Part II (3), there may be several reasons for also imposing the constraint of budgetary equilibrium, but none of them clearly suggests the adoption of one particular interpretation of the "total cost" of infrastructure. The constraint of budgetary equilibrium is mainly justified by the fact that its aim is to eliminate the various disadvantages inherent in the deficit; more particularly, it aims at ensuring efficient operation of infrastructure within the existing institutional and social context. Its application cannot and should not be other than very general (i.e. accompanied by a high degree of equalization); obviously this necessarily excludes any economic perfectionism.

31.21 — *Practical application*

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If the system of calculated total cost is to be applied, the sum to be paid each year by the users of infrastructure (the "total cost") must be determined by means of i) a conventional measure of the present value of the existing infrastructure and ii) conventional schedules of amortization and interest applied to that measure of value. Both these elements require closer analysis before the pros and cons of the system can be assessed (4).

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There are several alternative definitions and practical interpretations of the concept of present value. It could be defined, for example, as the discounted value of the congestion charges relating to the infrastructure in question. This would certainly be a very convenient definition from the point of view of economic theory, but it provides no answer to the problems that the system of calculated total cost is intented to solve, because it assumes that the problem of optimum charging has been solved already, whereas solution of this problem is in fact the object of the exercise. It would be quite useless to calculate the present value in this way, for that would mean estimating future charges in order to determine a present value that would then be used to determine those same charges. This is obviously a vicious circle.

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The present value is generally interpreted as the current replacement value of the infrastructure in question. At first sight, this is an attractive idea. The charges to be paid by the users are calculated from what the infrastructure would cost if identical or equivalent installations were to be constructed now, for a given scheme of amortization. The conditions of competition would thus be equalized on the basis of current replacement value (5).

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Another line of reasoning is often advanced in favour of this interpretation of the present value of infrastructure. It is said that the replacement value represents the economic value of the factors of production tied up in the infrastructure, and that the interest and amortization to be borne by the present

(1) The overall distortion may be relatively slight, even if the distortion on one particular route is very marked.

(2) See Section 23.3 and Subsection 24.45.

(3) See particularly Section 23.3.

(4) With regard to apportionment of the total cost among the various functions of the infrastructure and among the various categories of traffic, the problems are essentially the same as those connected with the system of budgetary equilibrium (see Subsecs 24.43 and 24.46).

(5) According to one version of the system of calculated total cost, the present value of an infrastructure should be calculated differently if it is not going to be replaced at the end of its economic life. We shall consider this case later.

users should be calculated on that basis, so that the charges would cover the cost of keeping the factors of production in their present employment. This argument is illogical; it would imply valuation of the infrastructure at its opportunity cost (i.e. its value in its best alternative employment) rather than at its replacement value. The opportunity cost of infrastructure is usually rather low, since it cannot be used for other purposes without high expenditure on conversion (1). Consequently, the opportunity cost is almost always far below the replacement value; hence this reasoning would lead to an interpretation of the present value very different from the replacement value, and in certain cases this could cause serious distortion.

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The advocates of the system of total cost calculated from an assessment of infrastructure at its replacement value usually modify this principle when the infrastructure is not to be replaced at the end of its economic life. The value is then interpreted as the recoverable value of the infrastructure at the end of that life. In itself, this modification may seem eminently reasonable, since it avoids further underutilization of an infrastructure that is already so underutilized that it is not going to be replaced when that would normally become necessary. Three other points should, however, be noted. Firstly, the same argument holds good, by and large, for an infrastructure that is expected to be replaced but may be underutilized for a great part of its economic life. This is particularly relevant if the infrastructure is very durable, for it may then be underutilized for a long period. Secondly, such a correction of the replacement cost appreciably reduces whatever institutional advantages there may be in applying this concept strictly, because it makes the system of charges dependent on decisions of an incidental and discretionary nature. Thirdly, this correction is less important if there is great regional equalization of charges, and if the charges are not related to the separate parts of infrastructure but to the right to use the infrastructure over a large area.

860

One other version of present value that should be mentioned here results from correcting the historic cost by applying certain objective price indices, by a method of standard costing, to the various components of the cost of building the infrastructure. This method can take many forms, depending on the extent to which the building costs are broken down. Once agreement has been reached on certain conventional rules, the method has the merit of being completely unambiguous; but there is a danger that it may lead to an ever greater degree of differentiation of the components that go to make up these costs, and this would automatically tend to cancel out the advantages. In addition, it might result in unnecessarily high charges, since technical advances could not at first be fully taken into account.

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The schedules of amortization and interest may also vary considerably, as regards both the duration of amortization and its pattern during that period. As regards the duration, the schedules could be based on the expected economic life of the infrastructure, or they could prescribe shorter standard periods. As regards the pattern, the annual burden of amortization and interest may be constant, degressive or progressive. However, as we have shown in Part I, any rule of this kind for amortization is purely conventional as far as economic theory is concerned. The optimum amortization cannot be determined *a priori;* it can only be determined by considering the charges consistent with an optimum allocation of resources.

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The interest rates would have to be co-ordinated between all infrastructures, for otherwise there would be a distortion of the conditions of competition such as the system of calculated total cost is expressly designed to avoid. These rates would also have to be continually adjusted.

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Special problems arise in determining the value of land occupied by infrastructure. Since such land has no replacement value, its value is usually determined from that of the land adjoining it. The corresponding annual charges on the users can be calculated from such estimates according to the rates of interest chosen. These charges may be very high in areas where land values have risen greatly, particularly in towns. This must be regarded as a logical and inevitable consequence of the system of calculated total cost. Nevertheless it is sometimes suggested that the fraction of this value due to the presence of the infrastructure should be deducted from the value (thus defined) of such land. The underlying idea is not unreasonable. In general terms it amounts to saying that the total benefits arising from the infrastructure could be taken as the sum of all the rents that would disappear if the infrastructure did not exist. Some of these rents are not subject to any tax. This is the case, for example, with the potential income derived by the owners of adjoining lands from the value added to their land by the presence of the infrastructure. These "external benefits" could be taken into account by regarding the value of the land occupied by the infrastructure as

(1) But see what is said at the end of the present subsection about land values in towns.

the value of the adjoining land less the value added to it by the infrastructure.

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There are, however, at least three objections to such a solution. Firstly, it raises problems of valuation that are practically insoluble, and it therefore makes the method of calculated total cost conditional on a great many discretionary estimates. Secondly, the "correction" envisaged is not really logical, because it only takes one type of rent into account and disregards the many others that can be created by the infrastructure and are not subject to a tax either, such as the rents of consumers and producers. Thirdly, it is doubtful whether this correction is an improvement from an economic point of view, because it is precisely in areas where the price of land is high, such as towns, that economic congestion, and therefore the economic charges, tend to be greatest. If the users were made to pay the high charges that would result if the system of calculated total cost were adopted without correction, congestion might be reduced in the cities and an economically desirable improvement in their infrastructure might be promoted.

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In any case, there are a great number of possible solutions here, each of which is based on sound arguments. But it must be realized that they are all basically conventional.

31.22 — *Advantages and disadvantages*

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It is difficult to pass a general judgment on the system of calculated total cost because there are so many different versions of it. The main differences between them concern the way in which the value of infrastructure is assessed, particularly as regards land and installations that are not intended to be replaced, and the length of the period and the pattern of amortization.

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All these solutions are conventional, and can therefore only be judged from an economic standpoint by comparing their actual effects on the optimum allocation of resources. Such a comparison would be beyond the scope of this report, in view of the extensive research required. One general point may, however, be made. The system of economic charges makes it possible to avoid the arbitrariness, and the distortion of optimum resource allocation, that are inherent — though not always to the same extent — in all the different versions of the system of calculated total cost. This system must therefore stand or fall by the advantages it has to offer compared with the disadvantages of the economic charges, all of which are connected with the deficit (1).

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This brings us to a comparison of the system of calculated total cost with the systems of budgetary equilibrium that we shall discuss in the following sections. The former may be regarded as presenting certain economic advantages over the latter, in so far as it avoids the distortion of the conditions of competition resulting from the unequal effects of inflation on the three modes of transport. These advantages are especially important when the two systems are applied on a small scale (i.e. to individual elements of infrastructure or to small aggregates), but they carry much less weight when a considerable degree of regional equalization of charges is applied at the same time. In this connection we would point out — as we have already done several times (2) — that, even if the system of economic charges is rejected, broad equalization is in any case rendered necessary by the economic interdependence of the separate parts of a network. Consequently, the apparent advantages of the system of calculated total cost over the system of budgetary equilibrium are much reduced — if not eliminated — by extensive equalization of charges.

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How does the policy under review stand up to the other criteria? If it is judged by the criterion that any charging policy must be simple, not arbitrary, and allow of objective supervision, the method of calculated total cost gets a fairly low rating, at least in its usual versions (according to which the charges should be determined from the replacement value of the infrastructure). The calculations involved are not simple, even when the system is already in operation, and they necessitate a great many discretionary decisions. Replacement value is not an observable or easily verifiable fact, especially in the case of such unique installations as some of the elements of infrastructure (3). It is essentially a more or less subjective estimate. As was shown in the preceding subsection, these disadvantages are even greater in the version in which the replacement value is corrected so that it becomes equivalent to the recoverable cost of an infrastructure whenever the infrastructure is not to be replaced at the end of its economic life. Moreover, this correction loses

(1) See Section 23.3.

(2) See particularly Section 23.3 and Subsection 24.45.

(3) Of course, this does not mean that there are no objective points of reference for evaluating certain infrastructure elements. These exist, for example, for the permanent way of the railways (rails, sleepers, ballast, etc.).

much of its significance if the idea of equalizing charges throughout large areas is accepted.

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It is doubtful whether these drawbacks can be reduced if the replacement value is determined not directly but from the historic cost, certain price indices being applied to the various elements of this cost in order to arrive at a practical assessment of the replacement value. Compared with the method of assessing the replacement value directly, this has the disadvantage of incorporating irrelevant elements of historic cost (e.g. insufficient productivity in building infrastructure) into present charging systems. Also, it is difficult to make allowance for technical progress when establishing the indices. New distortions might occur if no solution is found to this problem. Finally, it is hard to see how agreement could be reached on any of the numerous opportunities for putting this method into practice.

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All the versions of the system of calculated total cost have essentially the same problems of transition. The system implies regular correction of the valuation of the infrastructure in order to allow for changes in replacement values. This is a difficult task; it may be subject to many uncertainties and hence to many arbitrary estimates. But it is not absolutely impossible.

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Furthermore, when a system of charges based on calculated total cost is to be introduced, the whole of the existing infrastructure will first have to be valued. The great amount of work required to determine the replacement value would almost certainly not be justified by the results; and the usefulness of such valuations would be doubtful, since at best they would only be rough estimates based largely on individual judgments and arbitrary conventions.

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The conclusions to be drawn from all this can be summarized briefly. The method of calculated total cost appears at first sight to offer certain unquestionable economic advantages. It will generally satisfy the condition of budgetary equilibrium, while at the same time avoiding distortions of the conditions of competition by the various effects of inflation. For these reasons the system has a certain appeal. But these advantages are coupled with serious disadvantages. This system — whatever form it takes — is bound to involve arbitrary conventions that do not make economic sense (1). It requires many complicated calculations which can only be approximate. Lastly, and most important, it does not really avoid creating economic distortions, since it will always depart from the economic charges, which remain the optimum charges for the utilization of infrastructure.

31.3 — *THE SYSTEM OF BUDGETARY EQUILIBRIUM WITH THE POSSIBILITY OF BORROWING*

31.30 — *Budgetary equilibrium: general*

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The general principles underlying the system of budgetary equilibrium have been studied at some length in Part II (2). We saw that the main argument in its favour is that it avoids the problems associated with the deficit. Budgetary equilibrium requires that no subsidies for transport infrastructure shall be granted from public funds (3). This rule constitutes a certain institutional barrier against the social and political pressures that may be exerted to influence investments in infrastructure when the latter are largely financed from the national budget; it may thus help to prevent misdirected investments (4). Lastly, it may well promote economic efficiency, particularly on the railways, because it makes it impossible for deficits to be covered by subsidies (5).

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In Chapter 21 we examined several arguments for and against enforcement of budgetary equilibrium. Since most of these arguments are not strictly economic, we did not express a definite opinon either way. We did, however, arrive at the conclusion that, if budgetary equilibrium were adopted, certain parts of infrastructure, such as local networks and all infrastructures in underdeveloped areas, would have to be exempted anyway (6), and that in other cases it would not be feasible without extensive equalization of charges. Moreover, its introduction might have to be gradual.

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We pointed out that the system of budgetary equilibrium can take many different forms (7). In the last analysis, the various versions have only one element in common: they all exclude subsidies from

(1) See Part I.
(2) See Section 24.4.
(3) See Subsection 23.31.
(4) See Subsection 23.32.
(5) See Subsection 23.33.
(6) See Subsection 24.45.
(7) See Subsection 24.40.

public funds (1). Each version is defined by its rules for arriving at "total cost", i.e. the sum to be paid each year by the users of infrastructure, and for apportioning this "total cost" among the different categories of users. The latter problem, which is common to all variants of the budgetary equilibrium system, has already been discussed at some length in Part II (2). In this Chapter we can therefore confine ourselves to the question of how the "total cost" should be defined.

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There is, however, one aspect of the distribution of the "total cost" of infrastructure to which we must now return, because it is particularly important for the interpretation of budgetary equilibrium. This concerns the extent to which the charges for the use of infrastructure should be equalized. Our general analysis of the budgetary equilibrium system in Part II led us to the conclusion that, if the rule is imposed at all, it should be imposed on each mode of transport separately. This conclusion will be taken for granted in what follows. With regard to regional equalization of charges, we saw (3) that wide-scale equalization is generally quite compatible with the objectives for which the rule of budgetary equilibrium is imposed, and is at the same time desirable in itself because it can avert the harmful effects of applying the rule too rigorously. Nevertheless, with regard to the roads, we suggested that infrastructure should be divided into at least three parts, and the rule applied to each of them separately: main networks, urban and suburban networks, and local networks. We also showed that local networks, and all infrastructures in underdeveloped areas, should be exempted from the rule, since other considerations which may be more important than optimum resource allocation can play a part in such cases.

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Before we examine the various possible interpretations of budgetary equilibrium, two general points may be made.

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In the first place, as we have already pointed out several times, any system of charges that is to be consistent with an optimum allocation of resources must be based on the economic charges. The rule of budgetary equilibrium is an additional constraint; it may well conflict with the requirements of optimum resource allocation, but does not invalidate these requirements as a basis for all charging systems. From this point of view, the remarks made at the beginning of this Chapter (4) apply implicitly to all the systems of budgetary equilibrium that we shall examine.

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Secondly, we would point out that in some cases the only practicable version of the budgetary equilibrium system is that which allows for the possibility of borrowing (5).

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The sum to be charged to the users of infrastructure in any particular year is defined by two elements (in addition to the obvious determinant, viz. the expenses connected with the infrastructure): i) the extent to which loans may be contracted to finance expenditure on infrastructure; and — if borrowing is permitted at all — ii) the period and pattern of amortization of such loans. The system of budgetary equilibrium that we shall deal with in the next section is defined as one in which no borrowing is permitted on principle. This is a simple rule which admits of no variations in interpretation of the "total cost". There is another system which does permit borrowing; but the freedom to contract loans may be restricted in a number of ways that give rise to as many different versions of that system.

31.31 — *The system of budgetary equilibrium with the possibility of borrowing: different versions*

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In its most general form, the system of budgetary equilibrium with the possibility of borrowing requires that all expenditure connected with infrastructure should be financed either directly from current revenue (i.e. charges paid by the users) or else from loans, the interest and amortization of the latter being also financed from revenue (6). The sum to be covered by charges on users each year is then quite simply equal to the accountable expenditure, i.e. the interest and amortization on the debt incurred in the

(1) For the formal definition of budgetary equilibrium see Subsection 24.40.

(2) See Subsections 24.42 to 24.46.

(3) See Subsection 24.45.

(4) See Section 31.0.

(5) See Subsection 31.41.

(6) In other words the system with the possibility of borrowing simply requires that the total discounted expenditure should be covered by the total discounted revenue obtained from charges on the users, not counting any subsidies from public funds. This definition agrees with that given in Subsection 24.40, except as regards the constant, i.e. the initial debt which may have to be imposed on infrastructure when the system is first introduced. If this constant is taken as being equal to the discounted net revenue when the charges actually collected are at all times equal to the economic charges, the system of budgetary equilibrium becomes identical with the practical system of economic charges.

past plus that expenditure incurred in the current year which is not financed by borrowing. This system has two great advantages over the system of calculated total cost, for it is flexible and there is no need to determine a conventional formula of amortization.

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Of course, in this form, the balanced budget rule is not very strict; it is in fact always possible to transfer the burden of expenditure to the future users by contracting loans, particularly if the loans are contracted by the State or by a semi-public body which can theoretically borrow unlimited amounts because there is no risk of the debtor's defaulting. Consequently, in its most general form, the system of budgetary equilibrium with the possibility of borrowing is not very clearly defined, nor is it certain whether this system effectively answers the objections that can be made to any policy involving a deficit.

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These difficulties are somewhat reduced in those versions of the system that impose some limitations on borrowing. One solution would be to authorize borrowing only when it is intended to finance investments, or, in other words, not to authorize loans to cover running expenses. Also, these loans could be limited to the expected economic life of the investment or to even shorter periods. It is obvious that the more such restrictions are imposed, the closer the system will be to the system of budgetary equilibrium without the possibility of borrowing.

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The drawback of all such restrictions, however, is that they require a fairly extensive control over borrowing operations (1). This may to some extent reduce the principal advantage which the system of budgetary equilibrium with the possibility of borrowing has over the system of calculated total cost, namely, that it is simple to put into practice and institutionally transparent. Without a full examination of the facts and of the practical possibilities of direct control over borrowing operations, it is difficult to say how formidable this drawback really is. It seems, however, that a control procedure could be devised that would be relatively simple and clear, not very difficult to apply, and not largely a matter of subjective evaluation.

31.32 — *Practical application*

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Provided it is possible to exert a simple and effective control over loan operations, the system of budgetary equilibrium with the possibility of borrowing is quite clear and simple. All it means is that no subsidies are granted for infrastructure. Investments could be financed by borrowing, but interest and amortization would have to be paid out of revenue from use of the infrastructure. No detailed rules need be worked out here, since this criterion is quite unambiguous and its application could be easily checked in practice. The system requires no detailed control and no complicated institutional arrangements. In particular, in the case of the railways, there is no need to separate the administration of infrastructure from that of transport services. The system of budgetary equilibrium frees investments in infrastructure from constraints imposed by the national budget, and effectively prevents investments from being misdirected, because there is a clear and obvious alarm-signal in the event of mismanagement. There might be a risk of underinvestment if those responsible for infrastructure tended to be overcautious and wished to "play safe" when investing. An appropriate institutional procedure would therefore have to be adopted in order to minimize this risk. We have emphasized already (2) that it is in any case vital that investments in infrastructure should be co-ordinated.

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Application of the rule of budgetary equilibrium with the possibility of borrowing raises certain problems when serious misinvestments have been made. For example, if a certain infrastructure had been constructed as a result of such an error, it would be economically very harmful to prevent the optimum utilization of that infrastructure by attempting to meet the full burden of interest and amortization out of revenue. It would obviously be preferable not to make matters worse by penalizing current utilization of the infrastructure in an uneconomic manner. In principle, this difficulty could be overcome by granting subsidies in such cases, and obviously the procedure by which such subsidies were given would have to include firm safeguards against abuse. But even if such safeguards were provided, this procedure would make the charging system dependent on incidental decisions, and would thus open the door to all those pressures that the constraint of budgetary equilibrium is expressly designed to combat. Probably the best solution would therefore be not to allow any exceptions to the

(1) In the case of the railways it might also be necessary, if such restrictions were imposed, to make a distinction between infrastructure and transport services — at least for accounting purposes. As we have seen, various problems arise if we try to make such a distinction (see Subsection 23.33). However, there does not really seem to be any need for it as long as borrowing operations themselves are subjected to some form of direct control as part of a general plan to co-ordinate investments in infrastructure, which we recommend elsewhere.

(2) See Section 24.1.

general rule of budgetary equilibrium but to apply wide geographical equalization of charges (1), in order to mitigate any undesirable consequences that it might have in practice when errors have been made with investments in the past.

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As to the charges to be paid by the users of infrastructure, suitable procedures would have to be worked out for each mode of transport. In order to avoid distortions in the distribution of traffic among competing modes of transport, the conventions adopted for apportioning the "total cost" would have to be reasonably uniform. This applies, in particular, to the degree of geographical inequality of charges, as also to conventions for apportioning the costs that cannot be directly imputed to the individual categories of traffic.

889

As we have seen, the main problems connected with inequality of charges arise in road and inland waterway transport. For the roads, the most sensible system might be an appropriate combination of fuel taxes and taxes on vehicles, designed to cover, in addition to the cost charge and the congestion charge in cases of economic congestion, all expenditure needed to achieve budgetary equilibrium with the possibility of borrowing. These taxes could be differentiated for the various categories of infrastructure, such as the three types of road network we have already mentioned. Similar principles should be applied to the charges for the use of infrastructure in the case of railways and inland shipping. In the case of inland shipping, special problems may arise with regard to the geographical extent of equalization (2). The question of regional equalization is especially important for the railways, where the charges for use of infrastructure are incorporated in the charges for transport services. It will therefore be discussed in the chapter dealing with tariffs for transport services (3).

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Apportionment of the non-directly-imputable costs among the various categories of traffic presents similar problems. In this case too, the general principles applied to competing modes of transport should be equivalent in their effects. As we have already seen (4), the apportionment of non-imputable costs is essentially arbitrary. One solution might be to adopt two-part charges, one component of which would be the marginal use cost and the other the result of distributing the deficit in proportion to the utilization of capacity.

31.33 — *Advantages and disadvantages*

891

The most serious disadvantage of the system of budgetary equilibrium with the possibility of borrowing is that it does not take account of changes in the "cost" of infrastructures due to technical progress and price changes. This is, however, only a real disavdantage if "cost" in this context is implicitly equated with "replacement cost". But from the point of view of an optimum allocation of resources there is no reason why the rule of budgetary equilibrium should be applied to replacement cost rather than to historic cost. As we have already seen, the only component that can really be regarded as the cost of using an asset during a particular period is its marginal use cost. This is probably very low for many infrastructures. All other concepts of cost are merely conventions for the formulation of rules designed to overcome the various drawbacks — mainly institutional — of a system in which the infrastructure deficit is borne by the national budget. In other words, the different concepts of "total cost" can only be judged by the effectiveness with which they fulfil this function and avoid distortions in the distribution of traffic among competing modes of transport.

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Changes in the value of money are not reflected in the original money cost of infrastructure in nominal value, on which the system of budgetary equilibrium with the possibility of borrowing is based. When prices are rising, the original cost will tend to be lower than the replacement cost. Assuming that the authorities responsible for investments in infrastructure in the three modes of transport do not speculate on the future rate of inflation when making their investment decisions, such decisions would be based on the actual cost of the infrastructure at the moment of construction, and the charges to be paid by the users would be calculated from that cost. In that case, the optimum utilization of the existing infrastructure would either not be impaired or else would be impaired less than it would have been but for inflation. This advantage of inflation has often been pointed out, but it depends on the assumption that investment decisions are not modified by inflation — which is doubtful to say the least; in any case, even if the advantage does really exist, it is unimportant compared with the well-known disadvantages of systematic inflation.

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(1) Which is desirable in any system of budgetary equilibrium.

(2) See Subsection 24.45.

(3) See Chapter 32.

(4) See Subsection 24.46.

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The only valid reason for correcting the original investment cost to allow for price changes (i.e. to apply a version of the system of calculated total cost) (1) is that, if such corrections are not made, the system may lead to discrimination between the competing modes of transport. Such "discrimination" cannot, however, be regarded *a priori* as economically harmful unless it is agreed that charges should normally be calculated from replacement cost; but that is to beg the question. It is none the less clear that the effects of inflation on the competing modes of transport are "blind" in the highest degree, and may distort the conditions of competition, as was shown by the example of the two harbours given above (2). There is therefore good reason to eliminate their influence on the conditions of competition as much as possible, in one way or another (3).

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In the absence of full information on the extent to which the various modes of transport actually cover their infrastructure costs, it is difficult to assess the effects of introducing the system of budgetary equilibrium with the possibility of borrowing. If this system is adopted, the newer the installations are, the greater will be the infrastructure charges. In general, they would therefore probably be relatively higher for the roads — a mode of transport that is expanding rapidly and continuously — than for the railways and inland waterways, as the networks of the latter do not vary very much and their past charges have, moreover, been largely wiped out, either by inflation or by the amortization of loans.

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Nevertheless, in many cases the sums actually levied from all road users are probably no less than the total sums that would result from the system of budgetary equilibrium with the possibility of borrowing. The roads would then benefit more than they do at present, for the new system, like the others examined in this report, would mean defiscalization of the taxes on vehicles and motor fuels (4).

31.34 — *Problems of transition*

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The problems connected with inflation that we examined in the preceding sub-section are inherent in the system of budgetary equilibrium with the possibility of borrowing. They arise whenever that system is applied in a dynamic economy, in which price and technology change during the economic life of the infrastructure, which is usually very long.

897

More serious disadvantages become apparent when we consider the difficulties of changing over from the current policy of charges for the use of infrastructure to a system of budgetary equilibrium with the possibility of borrowing. This problem may seem less important than the one discussed in the previous subsection, because it arises only once and its effects gradually disappear. Such a view, however, seriously underestimates the significance of the issue. As the economic life of the infrastructure of transport is very long, the charges to be levied on account of the infrastructure already in existence when the system is introduced will largely determine the charges to be paid by the users for a long time to come.

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The problems of the change-over arise from the fact that, in the past, existing infrastructure was financed to a great extent from public funds. If the system of budgetary equilibrium with the possibility of borrowing is to be introduced, it would seem necessary first to fix the "initial debt" of each mode of transport. This would be technically very difficult, and would, moreover, involve a great number of essentially arbitrary decisions. Even if the original investment expenditure for each separate infrastructure item could be traced — which is quite impossible in many cases — there would be no simple, indisputable rule for determining the part of the hypothetical original loan that would have to be assumed to be still outstanding.

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In fact, however, this "fictitious" procedure would be thoroughly irrational. Generally speaking, past expenditure is entirely irrelevant to present decisions (5). From this point of view there is no difference between a canal dug in the nineteenth century, which may be regarded as a gift from our ancestors, and a river which is a gift from nature. The reasons for adopting the rule of budgetary equilibrium (in any form) are mainly institutional (6).

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(1) There is a certain similarity between the system of calculated total cost and the version of the system of budgetary equilibrium that allows for revision of the initial constant (see Subsection 24.40).

(2) See Subsection 31.20.

(3) For instance, by the system of calculated total cost; the system of budgetary equilibrium without the possibility of borrowing; the practical system of economic charges; or the system of budgetary equilibrium with the possibility of borrowing combined with considerable equalization of charges.

(4) See Subsection 31.42.

(5) Except, of course, in so far as a knowledge of past expenditure makes it easier to arrive at estimates of what will happen in future.

(6) The fact that in the past certain expenses have been incurred by private bodies or public authorities does not justify, either in the present or in the future, the adoption of specific financial measures to protect the fixed assets thus created. The one valid criterion, even during the transitional period, is that "only the future counts" both as regards the investments to be made at or after a certain moment and as regards the existing fixed assets.

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Consequently, the only real "problem of transition" is to prevent too abrupt a break between the past and the system to be introduced. This may necessitate certain special provisions, but it cannot justify any recalculation of past expenditure and the imposition of a hypothetical debt on account of that expenditure. Such an initial debt would be economically meaningless, because it would bear almost no relation to the present situation; inflation, technical progress and changed conditions of demand have altered the situation that was originally foreseen. That would therefore be an unreasonable way of going about things, even if it were regarded merely as a transitional measure. In addition, the fixing of an initial debt would be very arbitrary, and would undoubtedly give rise to endless problems and to ever more complicated formulae, involving a great amount of work which might conceivably be of some historical interest but would be completely worthless from an economic point of view. The disadvantages of the system of calculated total cost would in fact be repeated here.

31.4 — *THE SYSTEM OF BUDGETARY EQUILIBRIUM WITHOUT THE POSSIBILITY OF BORROWING*

31.40 — *General*

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Of all the general approaches under review, the version of the system of budgetary equilibrium that we shall examine in this section is the simplest, clearest and most objective, and the one that leaves least place for subjective decisions. It consists simply in charging the users each year with all the expenses of operation, maintenance, renewal or expansion incurred during that year. If the system is adopted, all subsidies will have to be eliminated and all debts at the moment of its introduction taken over by the State (1).

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There is therefore a direct link between investments and charging policy, whereby the effects of investment policy immediately become apparent to all concerned. Since the institutional advantages of this system are obvious, the main question is whether it conflicts with an optimum allocation of resources and, if so, to what extent.

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One point is clear: the system of budgetary equilibrium without the possibility of borrowing cannot be put into effect unless there is wide geographical equalization of charges. If it were applied on too small a scale, the users might have to pay prohibitively large sums in years when investment takes place since investments in infrastructure are to some extent indivisible (2). In the marginal case, it would even be impossible to recover these costs. Equalization over wide areas is therefore necessary and desirable from this point of view; but difficulties may occur, particularly with regard to the conditions of competition.

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The degree of equalization may, however, be inadequate when indivisible investment projects are so large, compared with the size of the area within which charges are to be equalized, that the charges would have to be increased considerably during the period of construction. This would clearly be the case during the initial stages of construction of an entirely new infrastructure network, or when an existing network was being enlarged so much and so rapidly that this practically amounted to construction of a new network. Consequently, the system of budgetary equilibrium without the possibility of borrowing would certainly not be appropriate for large (3) underdeveloped areas. For such areas, the best solution would be to discard the budgetary equilibrium system altogether and adopt the practical system of economic charges (4). The indirect effects of the infrastructure may be so great in this case that it will be — and must be — constructed, even though it is likely to be underutilized for a long time because the initial traffic will be very light compared with the indivisible minimum size of the network. It would then be absolutely uneconomic to hamper utilization of the infrastructure, and thereby retard the economic growth of the

(1) It is debatable whether this system should be applied to railway rolling stock. If it is not, accounting difficulties might arise, but these do not seem insurmountable. If, however, the system were applied to all activities connected with the railways, but only to the infrastructure of the roads and inland waterways, problems concerning conditions of competition and equity might arise. It might be thought that the railways would inevitably be favoured by a system that freed them from all financial burdens connected with existing means of transport whilst the other modes of inland transport had to bear them; this would not in fact be the case, however, because the railways would be at a disadvantage compared with the other modes in that they would no longer be able to finance an increase in their rolling stock by borrowing. In any case, the probable distortion would only concern the burden of interest relating to means of transport; and for a particular enterprise this distortion would be nil anyway if the means of transport were expanding at a rate equal to the rate of interest.

(2) See Section 23.2.

(3) That is to say, large in relation to the area within which charges are equalized.

(4) See Section 31.0.

underdeveloped areas, by imposing budgetary equilibrium in any form whatever.

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On the other hand, when infrastructure has developed beyond the indivisible minimum — as everywhere in the Community with the probable exception of southern Italy — the infrastructure can generally be expanded more gradually and at a pace more in keeping with the rate at which traffic is increasing. It is then, in principle, no longer impossible to apply the system of budgetary equilibrium without the possibility of borrowing. Certain difficulties may none the less arise in some cases, particularly in inland shipping where some individual investments may be very large compared with the size of the area over which charges would normally be equalized. Of course, the problem could be solved by extending the area, but this might then have to become so large that the connection between financial results and administration would become even more tenuous. This question will be dealt with in greater detail in the following subsection.

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Another question to be considered concerns the influence of the system of budgetary equilibrium without the possibility of borrowing on competitive relations between the modes of transport. This system clearly favours modes of transport that are not expanding, or are expanding only slowly, while it imposes reatively heavy burdens on modes that are expanding very rapidly. The charges under the system of budgetary equilibrium without the possibility of borrowing are in fact just the same as those that would be imposed under the system of budgetary equilibrium *with* that possibility, or under the system of calculated total cost, when the total investment expenditure is equal to the total burden of interest and amortization derived from these other systems (1). This means that the system of budgetary equilibrium without the possibility of borrowing leads to higher or lower charges according to whether the growth rate is higher or lower than the rate of interest. The implications of this relation will be discussed later in this report (2).

31.41 — *Practical application*

907

Adoption of the system of budgetary equilibrium without the possibility of borrowing would seem to present few practical problems other than those inherent in all versions of the system, such as the apportionment of infrastructure costs among the various categories of users and the degree of geographical equalization of charges (3). The total sum to be charged to the users each year is arrived at categorically by considering only the total expenditure on infrastructure. There is no need to fix a schedule of amortization and interest, nor to estimate the value of the existing infrastructure. There are no problems of transition of the kind we examined in connection with the system of budgetary equilibrium with the possibility of borrowing and the system of calculated total cost, since consideration of past expenditure and the difficulties to which that gives rise are eliminated.

908

One problem, however, remains. This always crops up in connection with the system of budgetary equilibrium, but it is particularly important in the version that excludes the possibility of borrowing: the problem of the extent of geographical equalization. We have already seen (4) that, to determine the precise areas within which charges should be equalized, a number of factors should be taken into account, viz.: certain fundamental characteristics of infrastructure (5); the degree of interdependence of the different networks, which is shown in the relation between, on the one hand, the density of traffic travelling between the network in question and the other networks and, on the other hand, the density of traffic within the network; and the competitive situation. Although these criteria cannot be directly applied, it would not seem impossible to deduce operational rules from them. If the areas within which charges are to be equalized are determined in this way, they will usually be large enough to allow the system of budgetary equilibrium without the possibility of borrowing to function satisfactorily.

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There may, however, be investment projects that are so large (i.e. so indivisible) compared with the area within which charges are equalized that they could not be financed out of current revenue without a quite unacceptable increase in the charges to be paid by the users. Inland waterways have already been mentioned as the mode of transport in which such cases are most likely to occur; the canalization of the Moselle could be taken as an example. Electrification of the railways is another case of a large and indivisible investment where difficulties might arise if the system of budgetary equilibrium without the possibility of borrowing were applied unmodified.

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(1) See Sections 31.2 and 31.3.

(2) See Subsection 31.42.

(3) See Subsections 24.42 - 24.46.

(4) See Subsection 24.45.

(5) Which require a distinction at least between main networks, (i.e. roads of national or regional importance), urban and suburban networks, and local networks.

910

There are two possible solutions. One would be to extend the area within which charges are equalized. This, however, has serious disadvantages, both institutional (for the reasons already given) and economic. The cost characteristics of infrastructure may differ substantially from one network to another, so that to equalize charges over a wider area than necessary would hinder the optimum allocation of resources (1) and serve no useful purpose.

911

The second possibility would be to provide a special system for large-scale indivisible investment projects. As we have already shown, there will in any case have to be some central co-ordination of investments in infrastructure (2). It goes without saying that special attention must be given to large-scale indivisible projects. Such projects may have important indirect effects, both in the short term, because they absorb a substantial share of the national equipment budget, and in the long term, because they may appreciably influence the competitive situation and the siting of economic activity. They stand, as it were, midway between a situation in which an entirely new network is being built up — in which case budgetary equilibrium must be ignored altogether — and a situation in which the infrastructure is expanding normally and the system of budgetary equilibrium without the possibility of borrowing can therefore be applied without difficulty. A special system under which no charges would be made for use of the infrastructure in question would have institutional disadvantages that we have already examined at length (3); for one thing, since the infrastructure would be financed from public funds, investment decisions might be influenced by pressure groups. Again, such an exception might distort the conditions of competition. For these reasons, another system might well be envisaged for large-scale indivisible projects, i.e. the system of budgetary equilibrium with the possibility of borrowing (4).

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If this were applied, such projects would be financed by loans, so that the users of today would not have to bear the full cost of investment, and the users in future years would be charged with the financial service on the debt incurred, as well as with all current expenditure for operation, maintenance and renewal. One element of the system with the possibility of borrowing would thus be incorporated in the system without that possibility. Of course, such a solution would not be entirely free of the inherent drawbacks of the system with the possibility of borrowing; for example, there would still be a risk of some distortion of competition, due to the different effects that inflation and technical advances would have on the different modes of transport. But these drawbacks would be much less important, since the service on the debt incurred for large scale indivisible projects will generally be only a fraction of total expenditure for infrastructure. Moreover, if the situation were deemed to be that of an underdeveloped area, the rule of budgetary equilibrium would have to be deliberately abandoned.

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There is another, much less fundamental modification that could reasonably be made when the system without the possibility of borrowing is applied. The authorities responsible for infrastructure would have to have the right to contract short-term loans in order to lessen the fluctuations in their actual annual expenditure. No special provisions would be needed here, other than a general limitation of the amount of such loans and of the period for which they could be contracted; longer term loans would only be authorized as part of the special procedure we have suggested for large-scale indivisible projects. This whole system would be similar to that applied in several countries to the financial operations of local authorities (municipalities, etc.).

31.42 — *Advantages and disadvantages*

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The system of budgetary equilibrium without the possibility of borrowing stands or falls primarily by its effectiveness in promoting an optimum allocation of resources. It has undoubted institutional and practical advantages; for example, it does not entail recalculation of past expenditure, or assessment of the value of the existing infrastructure. It also has the advantage of flexibility, since special provisions (such as those proposed above for large-scale indivisible projects) can be made without undermining the whole system.

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In its economic effects, the system of budgetary equilibrium without the possibility of borrowing is in certain cases similar to the development cost system, but it avoids the chief disadvantages of the latter (5) — particularly as regards the calculation of costs — while at the same time sharing many of its economic advantages. The most important of

(1) For the importance of the ensuing distortion, see Subsection 24.47.

(2) See Section 24.1.

(3) See Section 23.3.

(4) As a general solution, this system has been examined in Section 31.3. It is only studied here as an exception to the standard system of budgetary equilibrium without the possibility of contracting loans.

(5) See Subsection 31.11.

these advantages is that the charges to be paid by users when a network is underutilized are very low; the infrastructure will then not expand at all, and the only expenses will be those of operation and maintenance. This is not a drawback, as is sometimes thought, nor does it lead to a distortion of the optimum division of traffic; on the contrary, it is a definite economic advantage.

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On the other hand, the need to impose relatively high charges on those modes of transport that are rapidly expanding poses a serious economic problem. As was mentioned at the beginning of this section (1), adoption of the system of budgetary equilibrium without the possibility of borrowing instead of some other version of the system would penalize rapidly expanding modes of transport if their rate of investment were higher than the rate of interest.

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This objection is certainly valid in principle, but its practical importance must not be overestimated, since the modes of transport which are expanding most rapidly are usually those that can most easily afford such charges. Moreover, it loses much of its force in the present situation. The same arguments could in fact be put forward here as were used to defend the system of budgetary equilibrium with the possibility of borrowing against the charge that it would discriminate against the sectors where the infrastructure is on the average newest and whose debt has therefore been least depreciated by inflation. In both cases, it is the roads thas would be most severely penalized. But the roads are also major beneficiaries of any system of budgetary equilibrium, since such a system (like other systems in present circumstances) leads to defiscalization of the charges imposed on road users and reduces dependence on the national budget where investments in infrastructure are concerned (2). Also, the practical system of economic charges which is the basis of any rational charging system would in any case result in high charges on road transport whenever road infrastructure is inadequate. These effects of the system of budgetary equilibrium without the possibility of borrowing need not be regarded as economically harmful for the roads, at least not in present circumstances.

31.5 — *SUMMARY*

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It is not the purpose of this report to propose detailed solutions or to express a definite opinion in favour of one system or another. Our analysis is confined in principle to considerations based on the criteria necessary to ensure an optimum allocation of resources, and we have repeatedly shown that in most cases the choice to be made between the solutions we have discussed cannot depend upon such economic considerations alone. The final choice between the different systems has been deliberately left open. These are: the practical system of economic charges, the development cost system, the various versions of the system of calculated total cost, and the different systems of budgetary equilibrium. Arguments have been advanced for and against each of these, but in the last resort the choice can only be a political one since, in addition to economic factors, institutional considerations play a very important, if not a decisive, role in determining this choice.

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Nevertheless, from the preceding analysis a number of conclusions appear to emerge with sufficient force for us to offer them as suggestions that may be of help in deciding on the policy to be pursued.

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1. In so far as the aim is to ensure that transport functions efficiently, the theory of optimum resource allocation is a very useful, indeed an indispensable, guide when a reasoned opinion has to be given on the merits of the various possible systems which will affect both decisions regarding investment in infrastructure and the most efficient utilization of that infrastructure.

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2. Decisions regarding investment in infrastructure, particularly where large indivisible projects are concerned, should be co-ordinated centrally for all modes of transport, such centralization being carried out at regional, national or Community level, as necessary.

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3. As regards the utilization of infrastructure, none of the possible systems is perfect, and none can be put into practice without some modification. They must all be supplemented by special provisions designed to allow exceptions to be made, in order to avoid the undesirable effects that might follow if the system were applied too strictly.

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4. The systems whereby the charges to be paid by the users are derived from calculation of infrastructure costs — i.e. the systems of calculated total cost and development cost — have particularly serious disadvantages.

(1) See Subsection 31.40.
(2) See Subsection 31.33.

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5. The usefulness of the system of budgetary equilibrium with the possibility of borrowing is more apparent than real. Moreover, for each element of infrastructure it entails the use of an initial constant which is bound to be arbitrary and can therefore virtually deprive this system of its constraining effect.

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6. The real choice with regard to the policy for infrastructure may lie between the practical system of economic charges and an appropriate form of the budgetary equilibrium system.

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We must again emphasize that neither of these systems can be adopted without modification. In practice it is only possible to apply the first system approximately, and the second has to be qualified by exceptions of varying importance.

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7. Neither system fully satisfies the two conditions of economic efficiency, *a)* that there should be an adequate incentive to minimize operating costs, and *b)* that the best possible use should be made of the existing infrastructures.

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The budgetary equilibrium system satisfies the first condition, but is sometimes in conflict with the second. The system of economic charges satisfies the second condition, but does not fully satisfy the first.

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8. The budgetary equilibrium system satisfies the condition that all the users of an infrastructure should bear the cost of that infrastructure. But this condition can only be fulfilled if charges are equalized over large areas; otherwise, extensive distortion might occur which would seriously impair economic efficiency.

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9. As regards road and inland waterway transport, these two systems would seem on the whole, when accompanied by some co-ordination of investment decisions, to be most in keeping with the general principle that the rules adopted must be simple, clear and not arbitrary, and their implementation should allow of objective control.

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In the case of the railways, this principle can only be observed if the system of budgetary equilibrium is adopted.

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10. Economically, these two systems have the advantage of looking forward to the future and not back to the past. They do not require recalculation of past expenditure or assessment of the value of investments already made — calculations of very doubtful worth.

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11. If the deficit accompanying an optimum allocation of resources is very large, the practical system of economic charges would seem preferable. If the deficit is relatively small, the advantages of the system of budgetary equilibrium appear decisive.

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12. The rule of budgetary equilibrium must not under any circumstances be imposed on large underdeveloped areas. Special precautions should be taken with regard to those areas, in order to prevent thoroughly unjustified investments from being made.

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13. If the rule of budgetary equilibrium is applied, the charges for use of infrastructure should be equalized over comparatively large subdivisions of the network within each mode of transport. In fixing the extent of these subdivisions, account should also be taken of their competitive position.

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14. When two modes of transport are expanding at very different rates and at least one of them has a relatively large deficit following from an optimum allocation of resources, a serious distortion of the conditions of competition might result if the rule of budgetary equilibrium without the possibility of borrowing were applied to those two modes of transport; this might also produce a situation that would seriously conflict with an optimum allocation of resources.

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Therefore, where the various versions of the budgetary equilibrium system are concerned, a certain preference may be given to a mixed policy based primarily on the version without the possibility of borrowing but modified, for large-scale indivisible projects, in a way that makes it more like the version with the possibility of borrowing.

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15. In practice, in all cases where the existing infrastructures have largely been financially amortized and where management costs independent of traffic are relatively low, there is a high degree of compatibility between the practical system of economic charges and a system of budgetary equilibrium that allows borrowing.

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At present the modes of transport that are rapidly expanding are also those where the economic charges would be very high owing to current congestion; in these circumstances there is also a large measure of compatibility between the requirements of optimum resource allocation and a policy of budgetary equilibrium without borrowing.

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16. The best solution will probably depend on the features of the individual case; it does not appear advisable to invoke the principle of equality of treatment to justify adoption of the same system in all cases, however different conditions may be.

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The best policy cannot be achieved by systematically applying one and the same system everywhere: if the system adopted is to work, it will necessarily be complex and make special provisions for special cases. Even if the aim here is simply the optimum allocation of resources, in practice there is not, and cannot be, any one formula that can be regarded as universally valid.

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We believe that the various points mentioned in this general summary are important, but that none of them is sufficient in itself to decide the issue. Institutional considerations and the different objectives pursued are equally important, and hence no definite answer can be found by economic analysis alone. The final choice must therefore be a political one; those who have to make it must neither disregard the economic advantages and disadvantages of the various solutions, nor confine their attention solely to economic aspects.

CHAPTER 32

VARIOUS SYSTEMS FOR TRANSPORT SERVICES

32.0 — *GENERAL*

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The purpose of this chapter is to analyse the system of transport services and in particular the determination of their prices. The starting point is the endeavour to achieve optimum resource allocation. Following on the preceding analyses it is assumed, as a general principle, that pricing must be less than free whenever there is a possibility of abuse of dominant positions or of uneconomic competition. Where these dangers do not exist free pricing is considered preferable.

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The existence of real dangers of uneconomic competition or of abuse of dominant positions is a question of fact, not theory. We consider that the extent of these dangers cannot be gauged at present for lack of the indispensable empirical data. This is partly because the present regulations are very strict on the whole, and stem at least to some extent from circumstances — the world depression of the thirties or the Second World War — which were very different from those of today.

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This chapter therefore suggests a pragmatic method under which coherent transport policy arrangements could be gradually introduced by following the lessons of experience rather than by defining the policy *a priori*.

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First of all, in every case where abuse of dominant positions or uneconomic competition can at present be noted, the conclusion from the general principle we have stated would be that the existing restrictions on freedom of prices are inadequate or that, where prices are free, restrictions should be introduced. In these cases appropriate restrictions would have to be applied by establishing minimum rates if there is uneconomic competition or maximum rates if there is abuse of dominant positions.

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Conversely, in all those cases where, as things now stand, no situation of this kind can be seen, application of the general principle would result in a progressive reduction in the restrictions. It follows from this that, where there is free pricing, it would be maintained; where a bracket rate system is in operation, the brackets would be gradually widened; and where fixed tariffs exist, they would be replaced by bracket rates.

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Such liberalization could be carried out either in a way appropriate to each specific case or uniformly. The main thing is that it should be done gradually and carefully.

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Three situations can occur. In the first place, the prices actually noted may tend to maintain themselves in the neighbourhood of the lower limits of the rate brackets. This may indicate a situation of uneconomic competition, in which the competent control authorities may act *ex officio,* or be requested to act by any interested party, to stop the lowering of the lower limits of the brackets or to raise these limits.

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In the second place, the prices charged may tend to rise continuously, and this can be interpreted as a sign that dominant positions are being abused. Here again, the competent control authorities can intervene either *ex officio* or on request.

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In the third place, after a certain period of adjustment prices may tend to find a stable average level without the occurence of uneconomic competition or abuse of dominant positions. In this case there is obviously no reason to maintain any restrictions (1).

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Such in brief outline is the procedure suggested for the prices of transport services.

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It would apply *mutatis mutandis* to quantitative restrictions (2).

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(1) Of course the price trend must be interpreted with great caution in all cases in which, in the initial situation, the tariffs diverge notably from the prices corresponding to optimum resource allocation. This is the case in particular when tariffs are maintained at a specially low level through Government intervention, or when they are very high because of particularly marked quantitative restrictions.

(2) In fact, the above analysis leads to the conclusion that although control of access is considered useful to guarantee certain minimum professional qualifications of carriers or to avoid unwelcome market disturbances, such control should not be so restrictive as to cause the value of licences to diverge appreciably from nil.

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The diversity of the initial situations governing transport price formation is only one element requiring change to be gradual. Three other elements also demand such an approach. First, as we have pointed out on several occasions, the information at present available on the actual situation does not yield any exact picture of the real dangers of abuse of dominant positions or of uneconomic competition. Such information can only be accumulated by observation as and when the policy suggested is applied. Secondly, the national markets show external distortions of the conditions of competition (different fiscal or social systems, etc.). Finally, such external distortions also exist at Community level. At both national and Community level they can only be eliminated gradually.

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We will give several reasons to support the suggestion that a pragmatic and gradual approach is preferable to any other.

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It will first be shown that, although it is possible to formulate coherent criteria for the fixing of minimum or maximum rates, these criteria are extremely complex and cannot exclude a residual element of subjective appraisal. This being so, although these criteria can be operational for an authority which has to settle a certain number of concrete cases, the *a priori* fixing of minimum and maximum rates for all categories of transport services would present insurmountable difficulties for the controlling authorities.

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We will also show that fixing two simultaneous limits within a permanent and general bracket rate system would be inconsistent and could be economically harmful because the situations which call for a minimum and maximum rate respectively are mutually exclusive.

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Finally, we will show that a pragmatic solution would have several very appreciable advantages. It would enable the common policy to get off to a good start without transgressing the limits of caution and without waiting for introduction of a coherent system of charges for the use of infrastructure or complete harmonization of external conditions of competition. This would avoid extensive preliminary administrative work of little real significance [1].

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We shall see that if the aim is effectively to oppose uneconomic competition and abuse of dominant positions, the public authorities must be able to judge the rates and prices charged in the light of operational and objective criteria. It will be shown that establishment of such criteria for all transport services on the basis of data on transport costs and the structure of demand presents considerable difficulties, and that it is almost impossible to fix appropriate tariff limits by this method.

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We shall see that every feasible method necessarily implies an element of appraisal, but that this can be based on various objective factors such as the prices actually charged, the degree of utilization of the infrastructure, etc. In the case of the railways there would seem to be a greater risk of improper advantage being taken of dominant positions than in the modes of transport with a competitive system, because of the elements of monopoly power which may still exist, and a greater risk of uneconomic competition owing to the possibility of practising "internal subsidizing". We shall therefore suggest that a comparison also be made between the tariff considered and the rates actually charged elsewhere by the railways for similar transport, when services exist which are at least approximately comparable.

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The remainder of the chapter will contain some remarks on unjustified tariff differentiations and relations between the tariff system and certain other elements of transport policy.

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Finally, we would recall that our whole analysis is subject to two general limitations.

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First, we consider in the main only the objective of optimum resource allocation. Where other objectives are imposed on transport policy [2], and where these cannot be achieved except by means which are distinctly incompatible with optimum resource allocation, certain conclusions of our analysis might call for slight amendment. We have, however, shown that some of the most important of these objectives are consonant with optimum resource allocation and are in fact implicit in it.

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In the second place, our conclusions are only fully valid if there is full employment and fairly steady economic growth. Although these two preconditions are fulfilled at present in the Community, they do restrict the scope of our analysis. Only a special study of the consequences for transport policy of

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[1] As regards the difficulties of control which are inevitable in any system, see Subsection 33.21.

[2] See Chapter 21.

recession or slower expansion will show whether this restriction is serious.

32.1 — *THE CRITERIA FOR DETERMINING UPPER AND LOWER LIMITS*

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The criteria for determining upper and lower limits raise many problems. Ultimately, this is because neither uneconomic competition nor the abuse of dominant positions can be defined unambiguously in economic terms, and it is thus impossible to fix the limits in practice without bringing in an element of appraisal.

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It is often said that objective limits deduced from the criteria of optimum resource allocation can be established simply by considering costs. As we have shown (1), this view is incorrect, since the optimum prices consist of the marginal cost and a rent component which reflects the scarcity value of the durable equipment. Even if the marginal cost is independent of demand — and this is not necessarily the case — the rent component is entirely determined by it, and consequently cannot be incorporated into a rate system except where the variations can be estimated correctly in advance in each particular case (2).

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From the angle of optimum resource allocation there is only one cost which could possibly serve as a yardstick in determining a rate limit: the marginal cost. If the marginal cost of a transport operation is reckoned as being approximately constant, without, of course, necessarily being uniform for all categories of transport, it could at a pinch supply a criterion for determining a minimum rate. Thus the marginal cost might well be an important and economically valid instrument in this respect. But the marginal cost in itself is not the only element to be considered when defining a practical lower limit for transport rates. In any case no transport firm would willingly work below marginal cost except in certain special situations (3).

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As regards the upper limit, no specific and intrinsic criterion can be derived from the consideration of costs once the objective is to ensure optimum allocation of resources.

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The fact that optimum rates cannot be established purely from cost considerations does not, of course, mean that it is theoretically impossible to calculate such rates. In fact it is conceivable that an optimum rate system could be established for the whole inland transport sector. To this end, the public authorities would have to possess all the essential information concerning costs and the future pattern of demand for all categories of transport, and also know how investment in transport capacity reacts to variations in carriers' incomes. In practice, the authorities obviously cannot establish a system of transport rates on such a basis, irrespective of whether it has to be imposed on carriers or used as a yardstick in judging the rates submitted for their approval. The necessary data are not available, and even if they were the practical calculations would be extremely difficult, if not impossible.

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Assuming the calculations were possible, this method would tend to lead to very rigid tariffs because of the difficulties in establishing, and hence in changing, the tariffs.

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(1) See Subsection 25.35.

(2) An inexact presentation of the theory of prices in much economic literature has led many people to interpret optimum prices as costs, and thus to think that they can be determined by calculation on the basis of costs alone. In reality the concept of normal cost, when one goes into it, appears to have concrete significance only in connection with the prices noted on a market characterized by active competition with full employment and relatively steady growth. Whereas the concept of calculated "normal costs" raises insoluble problems, this connection makes it possible to find criteria which satisfy the concerns underlying the doctrine of "normal costs" while avoiding the impasse to which it leads. It is this approach which the present report has adopted by taking as basis not a concept of "normal cost" which cannot be defined in terms beyond dispute but the concept of optimum price corresponding to an optimum allocation of resources, and by looking for the criteria which can be used to determine it.

(3) Apart from the case of public service obligations imposed on transport enterprises, particularly railways, rates can be temporarily fixed below the marginal costs in various exceptional cases, for instance, when demand has weakened so much that capacity is no longer fully used even at a price equal to marginal cost. It may be rational, and moreover quite in conformity with optimum resource allocation, temporarily to apply a rate below marginal cost if demand is expected to increase again in the near future and if it is more profitable to continue to work at a level relatively close to full capacity than to reduce activity substantially or even stop it. A further case of operation at a rate below marginal cost could occur when a transport enterprise and an enterprise of another type are under the same management, for instance in the event of vertical integration, and when the transport enterprise is temporarily subsidized by the other to the point that transport rates are fixed below marginal cost. Finally, the railways could conceivably practise a temporary policy of dumping prices lower than the marginal cost with the aim of eliminating competitors. However, we have noted in Subsection 25.30 that such a policy would be relatively ineffective in most situations if access to the market were free. Hence, the real risk of the railways practising a dumping policy does not seem to be very great.

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The calculations would also involve a great number of estimates and judgments for which the authorities would be largely obliged to rely on the parties directly interested. Control, which is an essential element of the system, might therefore well be ineffective. Moreover, the method would not give any indication as to optimum price limits, except that they would have to be fixed with great caution.

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Finally — and this is an even more fundamental defect — the method cannot supply criteria by which to judge whether a given minimum or maximum rate actually prevents uneconomic competition or the abuse of dominant positions.

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It follows that a system of calculated rates would furnish neither a practical basis for fixing transport prices nor criteria by which to measure the seriousness of uneconomic competition or the abuse of dominant positions. This conclusion holds not only for rates conceived as an approximation of the optimum prices, whose *a priori* determination, as we have seen, presents almost insurmountable difficulties, but also for rates based on a calculation of "average costs". For, no matter how "average cost" is defined for transport services, the main requirement for its determination is a purely conventional "imputation" of the costs which cannot be apportioned directly (1).

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The inherent difficulties in calculating minimum and/or maximum rates or fixed tariffs on the basis of economically objective criteria do not, however, imply that the imposition of price limits is necessarily and in all cases an ineffective method of combating uneconomic competition and the abuse of dominant positions. But the fact that there is no objective rule for calculating prices from the economic angle means that the criteria for determining their limits will always be to some extent a question of opinion based on a number of different factors, which we will examine later, and on the practical experience acquired as and when the tariff is applied. This is why we attach great importance to the empirical procedure we propose, which makes it possible to obtain the necessary information and at the same time ensures, by simple and practical means, the transition from the present situation to the system most appropriate to each case.

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The fact that, up to a point, the criteria for determining the price limits are a matter of personal judgment is unsatisfactory. For it means that the limits, far from being exclusively based on objective and verifiable criteria, are ultimately partly dependent on a more or less broad appraisal. However discouraging this conclusion undoubtedly is, there seems to be no choice but to accept it, since in theory and in practice it is generally impossible to establish, *a priori* and on the basis of objective data, complete economic criteria for the calculation of price limits which could provide an effective barrier against uneconomic competition and the abuse of dominant positions and at the same time avoid any considerable distortions of optimum resource allocation.

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Two further problems remain to be examined. One is the definition of an appropriate institutional procedure for applying the system, allowing for the fact that the more or less wide latitude left for subjective appraisal calls for special procedural guarantees (2). The other concerns the factors which should be taken into account in determining whether, and if so at what level, price limits should be fixed in a given case.

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It is clear that marginal cost is an important element in determining an appropriate minimum rate in situations where uneconomic competition is suspected. In the case of the railways a further indication may be obtained by comparing the particular price presumed to be "excessively low" with the prices of comparable services provided elsewhere by the railways. The same procedure can be followed for rail tariffs which are considered to be too high and as possibly reflecting abuse of a dominant position.

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The difficulties involved in defining "comparable services" are well known. They arise from differences not only in the categories of goods transported and in the features of costs in the various parts of the network but also in the periods at which the transport operation is carried out, the season, the direction, the degree of utilization of infrastructure, etc. In particular, the optimum prices for the utilization of infrastructure, which are incorporated into the prices of transport, are entirely different according to whether the infrastructure is or is not fully utilized, since the congestion charge component can be nil or high, depending on the case. Consequently, any comparison between the price of a given transport service and the prices charged for other services considered comparable must take account of the conditions of utilization of infrastructure in the relevant part of the network at the time when the service concerned is supplied. Another difficulty

(1) See Part I.

(2) See Subsection 33.21.

is that such comparable services may not always exist.

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However, although absolutely comparable services rarely exist, it would nevertheless seem that with railways a transport service can be defined as the sum of components such as the hauling of the trucks, stopping, shunting, administrative operations, etc., and that there is nothing to prevent effective comparison of these components. From this it follows that, although it is difficult to find comparable services for a given transport operation, the operation can be broken down into basic components, each of which can be compared. A similar analysis can also be envisaged for inland waterways and roads.

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Of course, this procedure can furnish useful information on one element only (i.e. order of magnitude of the average cost) among all those which must be taken into account in comparing the prices of the various transport services that are assumed to be comparable. In particular, the rent element, whose importance we have emphasized on several occasions, cannot be evaluated by this procedure since it depends essentially on demand. But certain comparisons may also be practicable for this aspect of the prices of services to be compared, by reference to those charged in situations where the degree of utilization of capacity of both infrastructure and means of transport is comparable (1).

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The problems of the comparative method are serious, but they do not imply that it must be rejected. The method does not claim to offer a complete criterion, any more than the one based on consideration of the marginal cost. But it should be borne is mind when judging whether price limits must be imposed and, if so, at what level they should be fixed. It has the advantage of being relatively easy to apply objectively and to check on in practice. Provided the prices actually charged for each category of transport are published in an appropriate form, the initiative in making complaints to the competent authorities against a tariff or prices charged by the railways could largely be left to the parties concerned, i.e. users and their competitors and the competing modes of inland transport (2).

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In the modes with a competitive system, the question generally arises in a different way, and the danger alleged is that the general price level would be too low because of a presumed trend towards overinvestment. We have already studied this argument (3) and shown that such a trend appears improbable in a situation of full employment and relatively steady economic growth, provided carriers are well enough informed (4). In reality the application of minimum rates in the sectors with a competitive system is often advocated not for the reasons analysed in this Chapter, but as a form of incomes policy (5). Without there being any question of judging the merits of such a policy, it is clear that minimum rates, unless accompanied by a limitation of investments in transport capacity and of access to the market, would be absolutely ineffective, since in themselves they could only be an incitement to new investments and consequently would aggravate rather than correct the causes of price levels considered to be too low.

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In any case, it is also clear that in the context of an incomes policy the appropriate criterion for determining minimum rates must necessarily be deduced from a concept of a "reasonable income" for carriers.

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From this angle the problems which arise for the sectors with a competitive system are obvious. The rates would have to be based on calculated scales whose determination presents difficulties. (Some of these difficulties, of a general nature, have already been examined above.) But the rates would also require a definition of "reasonable income" which would necessarily represent a compromise between equity and efficiency. Since in this case tariff limits are not motivated by strictly economic considerations, the criteria of optimum resource allocation cannot furnish a complete basis for fixing them and do not in themselves give any special guidance, except

(1) In particular, on the route considered and at a comparable time.

(2) The same type of comparison could obviously be used to limit the differentiation of tariffs according to the nature of the goods transported (*ad valorem*), a differentiation which could be considered as constituting uneconomic competition or the abuse of a dominant position for the same reasons as territorial differentiation of tariffs. However, provided it remains moderate, some differentiation of this type can be, and probably is, necessary to enable the railways to meet the budgetary equilibrium requirement. This problem is examined in Section 32.4.

(3) See Subsection 25.21.

(4) See Chapter 33.

(5) Another argument sometimes advanced in favour of minimum rates in the sectors with a competitive system is that such rates can protect small carriers against the competition of the large haulage firms. However, it may be asked whether such protection is necessary, since we hear even more often the reverse argument that the large enterprises need to be protected against the small hauliers, who are said not to respect social legislation and who, being self-employed, are not subject to this legislation anyway. Moreover, it is not clearly proved that the large firms enjoy cost advantages which would enable them to eliminate the little men. If this were the case, however, protection does not appear intrinsically desirable, as it amounts to preserving a certain market structure at the expense of the economic advantages inherent in some degree of concentration.

perhaps to show the need to adopt the least restrictive price limits possible and a general tariff level which weakens the stimulus to efficiency as little as possible.

32.2 — *THE SYSTEM OF PERMANENT AND GENERAL BRACKET RATES*

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At first sight it may seem natural to impose permanent bracket rates on all transport services, in order to protect the transport market against the two dangers of abuse of dominant positions and uneconomic competition. However, closer examination shows that such a solution would have little justification and would also be very hard to implement (1).

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To substantiate this a few remarks may be made regarding the consequences of two factors concerned in distortion of the conditions of competition when there are no price limits.

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First, uneconomic competition (2) can occur in relations between different modes of inland transport. If we disregard external distortions of the conditions of competition (3), which should be eliminated by direct measures, such uneconomic competition seems to stem primarily from the railways' opportunity of practising "internal subsidizing", i.e. differentiating tariffs either between different parts of the network or between different categories of traffic, which leads to dumping prices for services exposed to strong competition from another mode of transport (4). Without going into the complicated problems of defining such a differentiation or of determining the real content of the expression "dumping price" and appraising its economic consequences, we may say that two remedies are possible. One is to impose minimum rates wherever the railways can practise uneconomic competition. Another may be to impose on the railways, as on the infrastructure of the other modes of transport, the rule of budgetary equilibrium and, in addition, maximum rates for the services for which they are in a position to charge relatively high prices (5). These categories of services will largely coincide with, or at least include, those in which there is abuse of dominant positions or risk of such abuse.

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In the second place, as regards uneconomic competition also occurring within the modes of transport with a competitive system, we have already (6) expressed doubt as to the real extent of such competition and as to the power of minimum rates to correct any distortions it causes (7). However, whatever the validity of our judgment may be as regards the facts, and whatever the merits of the policies proposed to combat such uneconomic competition, it is clear that the situation would hardly justify the general imposition of maximum rates in the modes of transport with a competitive system (8).

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Improper exploitation of dominant positions is generally possible only by the railways, though it may occur in the modes of transport with an actual or potential competitive system when competition there is restricted by private agreements or by regulations. Such action by the railways might be prevented by imposing appropriate maximum rates for categories of services in which they enjoy a clearly dominant position. But however we judge the real extent of such situations (9), their existence does not justify the permanent imposition of maximum rates on the other modes of inland transport or for those services where the railways, far from making improper use of a dominant position, charge competitive prices which are described as "excessively low".

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These remarks seem to lead to the following conclusions. Even if the risks of uneconomic competition and abuse of dominant positions were very wide-

(1) It will be shown that, although bracket rates have no permanent economic justification, there are nevertheless excellent reasons for maintaining them where they exist or introducing them where fixed tariffs are at present applied, during the initial phase of a common transport policy, when we are generally in the dark as to where the dangers of uneconomic competition or abuse of dominant positions are to be found.

(2) See Sections 25.2 and 25.3.

(3) See Subsection 25.31.

(4) See Subsection 25.30. See also Subsection 25.34, where we concluded that, with non-increasing marginal returns in the supply of services, "traffic leakage" does not call for special measures provided the rule of budgetary equilibrium without possibility of borrowing (assuming it is necessary) can be applied by the railways and is applied with sufficient equalization of charges.

(5) See Subsection 25.30, in which we saw that such measures could largely eliminate the problems of uneconomic competition where these arise from the possibility open to the railways of practising "internal subsidizing". It should, however, be noted that this method is only really effective when the rule of budgetary equilibrium without possibility of borrowing is applied, since the rule with possibility of borrowing could conceivably be used by the railways, at least to some extent, to procure the funds necessary for "dumping prices'.

(6) See especially Subsection 25.21.

(7) It should be remembered that the analysis was carried out under the two premises of full employment and relatively steady economic growth.

(8) It should be remembered that the reasoning here applies only to a permanent system of bracket rates (see footnote (1) above).

(9) See Subsection 25.33.

spread, they could not be invoked to justify the permanent application to all transport services of a tariff including both a minimum and maximum limit. At most, they might justify the imposition on the competitive modes of a general system of minimum rates, and, on the railways, of maximum rates for some categories of transport and, where necessary, minimum rates for others (1). For the reasons set out above, the simultaneous imposition of a minimum and maximum rate for the same type of service is not justified. There cannot be, at the same time and for the same type of service, uneconomic competition which would take the form of "excessively low" prices, and abuse of dominant positions, which would involve "too high" prices, since these two situations are mutually exclusive (2).

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Admittedly, it could be argued that although, strictly speaking, a minimum and a maximum rate are never required at the same time for the same type of service, they could nevertheless be required shortly after each other.

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It is quite conceivable that the structural situation in a particular part of the transport market may suddenly be transformed, with a transition from a state of affairs in which the railways are charging "excessively low" prices to one in which they enjoy a dominant position (3). In such a case a bracket rate system could prevent the railways from improperly exploiting their newly-acquired dominant position during the time needed to carry through the administrative procedure for substituting a maximum rate for the initial minimum rate. Whatever the real importance of such situations and the probability of whether the railways would in fact immediately misuse their newly-acquired dominant position knowing that this would almost certainly provoke countermeasures by the authorities, it would seem that this eventuality cannot be a valid argument for permanently imposing a bracket rate system on a whole category of transport services.

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A further argument often advanced in favour of the general introduction of bracket rates is that of equality of treatment. It is held that when a mode of transport is subject to such rates, the equality of treatment principle requires that price limits should also be imposed on the other competing modes of transport. But this argument is manifestly illogical. If minimum or maximum rates are applied for the precise purpose of preventing uneconomic competition or the abuse of dominant positions, and if they are in fact imposed in specific cases in which these risks occur, there is no economically justifiable reason to introduce similar limitations for other categories of services or other modes of transport where the risks do not exist (4).

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Simultaneous and permanent imposition of a maximum and minimum price on one and the same type of service is not only economically unjustified; it is also likely to have drawbacks which are all the more serious the narrower the bracket.

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This last statement is based on three sets of reasons.

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In the first place, a system of universal price limits does not imply that a specific bracket rate system can be established for every individual transport service. Such a procudure would moreover be impossible in strict logic, since a transport service is defined *inter alia* by the time at which it is produced. Hence some grouping of services is necessary in any case. Consequently, the bracket would have to be wide enough to allow of all the price variations implied by an optimum allocation of resources for all services in the same category.

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Secondly, we have already shown (5) that fixed tariffs, i.e. by our definition tariffs imposed or approved by the public authorities and not allowing any margin of freedom to the carrier, are often in danger of being too low or too high in comparison with the prices which would correspond to optimum resource allocation. The reason is to be found first in the risk of error implicit in determination of the level

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(1) The expression "where necessary" refers to the fact that the combination of the budgetary equilibrium rule with maximum rates for the services for which the railways hold a dominant position may possibly suffice to prevent "internal subsidizing" and consequently uneconomic competition.

(2) We recall once again that the whole analysis presented here is subject to the two general premises of full employment and relatively steady economic growth.

(3) For instance, let us consider a route between two points A and B on which the railways apply a reduced tariff to compete with inland waterways on a route C - B. It is assumed there is no waterway for route A - B. If, for some reason, traffic from C towards B ceases (shutdown of a colliery, discontinuance of an import flow, etc.), the railways acquire a dominant position on route A-B. Similar reversals of situation could occur when special weather conditions cause, for example, a very sharp fall in the level of navigable rivers, and consequently the more or less complete elimination of these routes for a time. In such a case the railway might find itself in a very strong position which it could be tempted to exploit.

(4) If a minimum or maximum price is imposed as a result of an error on the part of the competent authorities, it would obviously be better to correct this error rather than extend it to the competing modes of transport for the sake of equality of treatment.

(5) See Subsection 25.35.

of the tariffs, and secondly in the fact that market conditions, in particular intensity of demand, can change fairly rapidly, whereas in practice fixed tariffs cannot be adapted at short notice. We have shown that this danger is particularly serious for transport services, since these cannot be stored. In such cases the optimum prices, and in particular the rent component, i.e. the rent arising from the durable equipment, largely depend on the intensity of demand, the variation in which is only partially predictable. These drawbacks of fixed tariffs also exist for bracket rates, although they decrease with increasing width of the bracket. Bracket rates with only narrow limits and small possibilities of making exceptions carry a high risk of serious distortion of optimum resource allocation, particularly in view of the difficulty of establishing objective criteria for the *a priori* determination of price limits.

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In the third place, any rate system subject to official approval naturally tends to be rigid, since the procedure of approval always takes some time.

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A permanent and general system of bracket rates is therefore not to be recommended from the economic angle. As just shown, it would be unjustified and harmful to an optimum allocation of resources.

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The criteria for judging situations of abuse of dominant positions and uneconomic competition are so complex that such a system would be fraught with practically insuperable difficulties if it were proposed to fix the lower and upper limits at all exactly.

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Hence, if reasons unconnected with optimum resource allocation nevertheless led to such a system being applied, the range of the brackets should be wide, in order to minimize the economic drawbacks — which are aggravated by the fact that the general procedure for approval of the tariffs cannot fail to be rather inexact.

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This conclusion is closely related to another, which may moreover be derived from it: that the brackets should be indicative rather than absolute. In other words the authorities would have to allow prices outside the limits when special circumstances justified it. We have not specially examined the criteria for defining such circumstances, but permission to charge such prices would appear to be a logical concomitant of the system provided it did not give rise to uneconomic competition or the abuse of dominant positions.

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Of course, the above remarks in no way answer the question of how to determine the range between the lower and upper limits of the brackets. Since only one limit can be deduced from the criteria, the other is essentially arbitrary. Hence, the system which is simplest, and therefore most appropriate in the absence of other considerations, might be to fix a uniform percentage for the range of the bracket for all categories of transport. However, such a procedure could fit the case only if the range were wide. If it is relatively narrow, other aspects might have to be taken into account, such as the variability of demand for the transport services coming under the tariff in question, the degree of differentiation of the tariffs which could be applied within the category of services considered, the probability of error implied by determination of price limits, etc. As it is not the aim of this report to supply detailed solutions for practical problems, we shall do no more than mention these aspects, and not attempt a complete analysis of the questions of applying tariffs in practice.

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But the general conclusion is certainly that a system of specific maximum and minimum rates would be more suitable than a general system of bracket rates for categories of services in which improper exploitation of dominant positions is probable or where there is risk of uneconomic competition. The procedure we propose in the following section is calculated to permit gradual pinpointing of these categories.

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In fact, wherever there is no abuse of dominant positions or uneconomic competition at the outset, this procedure will generally consist in substituting bracket rates for fixed tariffs where there are fixed tariffs, and in gradually widening the range of the brackets where there are bracket rates, until such time as cases of uneconomic competition or abuse of dominant positions present themselves. The advantages of the procedure are that it does not require *a priori* definition of the limits of the brackets and that it constitutes an empirical method for identifying all those cases where there is a real danger of abuse of dominant positions or of uneconomic competition.

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All in all, the solution suggested appears to be the least unsatisfactory. Although it presents obvious difficulties of application, these are at least equally acute in all the other systems proposed or envisaged. On the other hand it completely lacks some major drawbacks of the other systems.

32.3 — *ADVANTAGES OF A PRAGMATIC SOLUTION*

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We have shown above that the judicious fixing of maximum and minimum prices in a permanent and general bracket rate system would encounter almost insurmountable difficulties. Errors would necessarily be numerous and economically harmful.

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On the other hand, almost all Community states are at present applying systems of fixed tariffs, or bracket rates with relatively narrow range, for certain modes of inland transport, as well as licensing systems which are often very restrictive in the modes with a competitive system, particularly road transport. The result is that it is impossible to know *a priori* which categories of services are susceptible to uneconomic competition or abuse of dominant positions and which categories are free from such risk.

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This being so, if the aim is to apply the general principles suggested by this report — i.e. that restrictions must be imposed on freedom of prices whenever there is a possibility of abuse of dominant positions or uneconomic competition, but that otherwise freedom is preferable — an empirical and gradual method would appear to be the only rational one.

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Procedure could be as follows. Where neither abuse of dominant positions nor uneconomic competition is observable at present, and where fixed tariffs or bracket rates with a narrow range are in operation, whether in railway, road or inland waterway transport, restrictions can be reduced by a percentage not exceeding a specific maximum, on the basis of the current tariffs [1]. In other words, wherever fixed tariffs are in operation they would be replaced by bracket rates, and wherever bracket rates are in operation they would be maintained. The range of the brackets would be gradually widened.

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We can envisage imposing the obligation to widen the brackets gradually and regularly to the same extent in both directions, except where this would clearly have major drawbacks. The argument in favour of a strict obligation in this respect at Community level is that the decision as to the degree of flexibility to be introduced into rigid tariff systems cannot be left to the discretion of those concerned, or even of the national authorities, for this might result in the process lasting too long. Moreover, it is reasonable to try to stimulate adaptation by the certainty that particular time-limits are absolute.

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It may be advisable here to follow the solution adopted by the Rome Treaty as regards the lowering of customs tariffs and abolition of quotas.

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It goes without saying, however, that application of such a procedure would in any case have to be pragmatic, i.e. adaptable to circumstances. In the first place, the process of widening the brackets would be stopped or even reversed whenever the authorities noted that greater freedom had led to improper exploitation of dominant positions or uneconomic competition, and the fixing of an upper or lower limit would be justified. In the second place, in the absence of uneconomic competition or abuse of dominant positions, controlled facilities should be available for waiving the obligation to widen the brackets in the event of serious disturbances caused by difficult problems of adaptation. But the freedom granted should be progressively eliminated once it became possible to suppress these disturbances.

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Furthermore, the possibility of widening the brackets more rapidly than was initially planned should be left open. This could be particularly important if one mode of transport found itself in direct competition with another not subject to price limits.

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From the above it follows that the bracket rate system is an indispensable instrument in ensuring the necessary transitions, since any lessening of restrictions presupposes that bracket rates are substituted for fixed tariffs or the range of the brackets is widened where such rates exist at the outset [2]. On the other hand, as soon as abuse of dominant positions or uneconomic competition appears, minimum or maximum rates are introduced.

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The advantages of the pragmatic solution suggested here appear decisive.

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As we have just indicated, it combines efficiency with flexibility, and minimizes the risks of distrubance due to over-rapid action which would not allow the time necessary for adaptation.

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[1] More severe restrictions would have to be introduced at the beginning only if abuse of dominant positions or uneconomic competition were present from the outset. This aspect will be considered at the end of the section.

[2] Naturally, this recommendation does not apply to those sectors which are at present free from restrictions and where neither the abuse of dominant positions nor uneconomic competition is observed. Here the existing freedom should be maintained.

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Moreover, the solution makes it possible to follow the lessons of experience, rather than the highly uncertain results of extremely complex calculations, without detriment to the correctness of the final result.

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This solution also makes it possible to begin implementing the common policy before full introduction of a coherent system of charges for the use of infrastructure or full harmonization of the external conditions of competition.

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The fact that this harmonization will occur only gradually in no way implies that nothing must be done to lessen restrictions until it is completed. In actual fact, the existing restrictions are only partly justified by inequality of external conditions of competition between the different modes of transport or between the different countries as regards the same mode of transport. Where there is no appreciable distortion of the external conditions of competition there is obviously no reason to slow down the reduction of existing restrictions. If, on the contrary, restrictions are justified by inequality in the external conditions, it would appear desirable from a practical point of view that the two processes of abolition of restrictions and harmonization should go on simultaneously, for they can mutually enforce each other.

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The abolition of quantitative restrictions on access to the market could operate in the same progressive and pragmatic way as the reduction of tariff restrictions (1).

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Thus, the process of transition could be arranged so as to preclude any serious disturbance. The progressive abolition of restrictions, accompanied by parallel harmonization of external conditions of competition and the gradual introduction of a common system for infrastructure, would make it possible to observe the general or particular effects of each step in the process and to use the information garnered in preparing for the following step. As we have already indicated, the process could be slowed down, stopped or even reversed when experience showed that to continue abolishing restrictions would lead to the improper exploitation of dominant positions and uneconomic competition. Conversely, in all cases where such situations did not appear, the process could be speeded up.

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In a general way, with experience making it possible to accumulate a large number of factual data, the firm lines of a transport system would gradually emerge.

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In certain cases, whose number and importance need not be estimated from the outset, dangers of uneconomic competition or abuse of dominant positions would become evident. The bracket rate system would then be replaced by a minimum or maximum price.

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In the other cases the limits of the brackets would gradually become nominal. The bracket rate system would then cease to exist.

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There is nothing to imply that this process should go on at exactly the same pace in all transport services. In certain cases practical experience may rapidly prove conclusive in one way or the other, while in others it will have to continue for a longer time.

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But whatever technical and economic difficulties have to be foreseen in implementing the policy suggested by this report, it does not seem that, with the procedures suggested, recognition of cases of abuse of dominant positions and uneconomic competition should take more than about ten years. From the same technical and economic angles, adequate harmonization of the external conditions of competition would seem to be possible within about the same time limit.

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Having said this, there is no question of claiming that implementation of the policy suggested here will not give rise to difficulties. Quite the contrary. But no effective policy can be free of such difficulties.

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They cannot possibly be dealt with exhaustively in this report. We will therefore confine ourselves to a few remarks.

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In addition to the difficulties of introducing the institutional procedures which will be examined later (2), mention should be made of the pace at

(1) Although, for road haulage and/or inland waterways, control of transport capacity is considered expedient to ensure that carriers have a certain minimum of professional qualifications or to avoid undesirable market disturbances, such control should not be economically restrictive. In other words, the market value of the licences should be close to nil.

(2) See Subsection 33.21.

which the brackets are widened in the initial phase. This can hardly be decided categorically; it is more a problem of appraisal, and calls for an empirical judgment.

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It can nevertheless be affirmed that, at the outset, a widening of the rate brackets by about two per cent per annum in both directions is feasible and prudent, it being understood that this pace would need to be adjusted in the light of experience and of the parallel advance made in harmonizing external conditions of competition.

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Another problem concerns the fate of the modes of transport at present free of any notable restriction. In all cases the proper solution can be found only by thorough study of the existing situation. Three cases may present themselves. First, if restrictions are not justified by a real risk of abuse of dominant positions or uneconomic competition, it would be inconsistent, from the point of view of optimum resource allocation, to introduce such restrictions. Secondly, when there is no such risk, and when one of two competing modes of transport is subject to restrictions while the other is exempt from them, the most sensible solution would be to speed up the easing of the restrictions. Thirdly, when the abuse of dominant positions or uneconomic competition is possible in one mode of transport because restrictions are imposed on another mode, the solution would again be to ease these restrictions.

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There will, of course, be serious initial difficulties in working out the provisions for fixing maximum or minimum prices where there is improper exploitation of dominant positions or uneconomic competition. But the only reasonable approach here is to propose a method based on practical and consistent principles. These have been set out above and there is no need to revert to them here. Nevertheless, these principles will never furnish automatic solutions for concrete cases, and we would repeat once again that any decision would inevitably involve a more or less substantial element of subjective appraisal. This is the root of the difficulties of any tariff policy for the control authorities. However, it would be as unscientific to declare them insoluble without examining them as to deny their existence.

32.4 — *PRICE DIFFERENTIATION*

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So far we have considered the problems of uneconomic competition and abuse of dominant position in their most general form, together with the possibilities of remedying them. However, our suggested solutions may not be sufficient in themselves to meet a group of special cases likely to require further measures. These special cases stem from the possibility open to the railways of systematically differentiating their prices.

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In principle, price differentiation can be defined as charging different prices for identical services. This may be extended to cover similar services, but to do so naturally entails many difficulties.

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Such price differentiation can take three different forms. The first is a differentiation in prices charged in different parts of the network. This type of differentiation, the extent of which depends on how far the railways are in competition with other modes of transport on the various parts of the rail network, has already been considered in studying minimum and maximum rates. The second type consists in charging different prices for different categories of goods transported (*ad valorem* rates). We have already noted that this type has become considerably less important following the rapid development of competing modes of transport, in particular road haulage. The limited opportunities still open to the railways in this respect can probably not be further reduced by public measures without endangering their ability to meet the requirement of budgetary equilibrium, should this be imposed on them.

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The third type of price differentiation consists in application by a carrier of transport rates which differ for different consignors, in respect of the same goods carried under the same circumstances. This type of differentiation — which, like the *ad valorem* rates, may give rise to problems of equity — can be justified to some extent by the fact that the railways are in a situation of increasing returns and may therefore not be able to achieve budgetary equilibrium without such differentiation. However, there are several factors which seem to indicate that special guarantees against abuse may be necessary. The chief one is that the centralized administration of the railways is inevitably exposed to pressures, both public and private (except where the railways are managed in a purely commercial spirit); and this can give rise to a certain favouritism which has no economic justification. Such favouritism may manifest itself at both national and Community level.

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This latter possibility is obviously of special importance to a Community transport policy. It constitutes a very real danger, since most railway com-

panies have been traditionally considered as instruments of national economic policy, all too frequently with the result that their tariffs have been openly or secretly manipulated for national economic ends. A tendency to favour home industries can persist even when there is no direct intervention by the national authorities. Such discrimination clearly conflicts with the objectives of the Rome Treaty, whether it directly favours home industries or takes the form of other types of price differentiation indirectly affecting the conditions of competition between the various Community states.

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Abuses of this kind would be contrary both to optimum resource allocation and Community interests. To prevent them, it is not sufficient to suppress discrimination which consists in the application by a carrier, in respect of the same goods conveyed in the same circumstances, of transport rates and conditions which differ on the ground of the country of origin or destination, or to limit imposition by a Member State of prices and conditions involving elements of support or protection for one or several enterprises or particular industries. A more general procedure would be necessary, precisely because discrimination can take place without intervention by the national authorities, and because the effect on conditions of competition between the Community States can be entirely indirect (1). The same conclusion must be drawn as regards unjustified price differentiations which might be applied at purely national level.

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Consequently, there should be a procedure to enable any interests which may be injured to present their defence. The institutional aspects of this question will be examined briefly below (2). No illusions should be entertained regarding the difficulties of proof inevitable in such a matter. As in the case of abuse of dominant positions and uneconomic competition, no control will be effective unless it leaves the authorities entrusted with it a certain freedom of discretionary judgment.

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It is important to emphasize again that one of the elements which must be taken into consideration is the degree of utilization of the durable factors in both infrastructure and transport services. Consequently, the procedure to prevent unjustified discriminations in no way implies that prices should be equal for all services which are comparable on a cost basis. Hence, when comparing different services whose prices are supposed to be discriminatory, account must be taken of these other elements, and in particular of the demand situation.

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Whatever the procedure adopted, it should in any case be supplemented by publication in a suitable form of the prices charged, so as to enable users to know whether they are right or not in thinking themselves victims of unjustified discrimination. Such publication could take several forms, but should at least include *post facto* notification of the average prices actually charged (3).

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When the railways have a published tariff (i.e. a rate schedule which, although not itself subject to official approval, conforms to the minimum or maximum rates, if any, approved by the public authorities), such a tariff should as a general rule be applicable without discrimination to any user for any comparable transport service. This tariff would relate only to normal cases, and it goes without saying that the carrier would be free in principle to grant special conditions for special cases provided such conditions were published later in an appropriate form and provided the possibility of making special arrangements within the price limits to meet the conditions of competition never led to systematic discrimination at national or Community level.

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If the railways have no systems of published tariffs, adequate procedures would have to be worked out to prevent systematic discrimination in the sense indicated above. These procedures would imply *post facto* publication of the transport prices actually charged in a form giving users enough information to enable them to decide whether they had a case for complaining of systematic discrimination. The competent authorities should also have the right to know the prices actually charged, to enable them to examine properly all complaints concerning unjustified discrimination, particularly when applied against users of another nationality.

32.5 — *RELATIONS BETWEEN THE PRICE SYSTEM AND CERTAIN OTHER ASPECTS OF TRANSPORT POLICY*

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We have drawn attention several times to two additional points. The first concerns the link between

(1) The concept of discrimination involves very many difficulties, whose examination is outside the scope of this report.

(2) See Chapter 33.

(3) These averages concern groups of services of sufficiently small extent for the information not to be devoid of practical significance. It would also be desirable to publish the highest and lowest prices actually charged.

the fixing of prices for transport services and the system of charges for the use of infrastructure. The second concerns relations between tariff policy and the other method of market regulation, which is to impose quantitative restrictions on transport capacity and/or access to the market. Each of these two points calls for more detailed examination.

32.50 — *The link between the prices of transport services and charges for the use of infrastructure*

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The charges paid by carriers for using infrastructure are obviously a component of the price of transport services. The various policy options for infrastructure which we studied in the previous chapter have varying effects on the prices of transport services, as regards both their absolute level and the relations between the different categories. These effects are visible both within each mode of transport and within the inland transport sector as a whole, and on both the national and the Community plane. The choice of the system of charges for the use of infrastructure must naturally take them into account.

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However, once this choice is made, charges for use of infrastructure no longer pose any special problem in connection with fixing prices for services in the modes of transport with a competitive system: road haulage and inland waterways.

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Things are different in the case of the railways, where there is no autonomous procedure for charging for infrastructure use. This is why any appraisal of a railway tariff must be based not only on the "transport service" component but also on the "infrastructure" component. Hence, if tariff discrimination is defined as the application of differing prices for comparable services (1), two transport operations which are otherwise perfectly identical could not be considered comparable if one were carried out in a slack period and the other in a period of full economic utilization of the infrastructure, since the optimum prices for use of the latter, and particularly the congestion charge, are different in the two cases.

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The considerations on the pricing of transport services in this chapter presuppose that two problems have been solved.

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On the one hand, it is understood that a specific system has been adopted for infrastructure — in the case of roads and inland waterways a perfectly defined charging system, and for railways a general rule, for instance a variant of the budgetary equilibrium system. Hence, only in the case of the railways is there any reason to fear that charges for the use of infrastructure may raise special problems in pricing transport services.

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On the other hand, the system for infrastructure is assumed to be neutral with respect to the conditions implied by an optimum allocation of resources. In other words, it must not give rise to a distortion of the conditions of competition (2).

32.51 — *Tariff policy and quantitative restrictions*

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We have already seen (3) that there is a close connection between the two methods of regulating the market, viz. tariff policy and the control of transport capacities and/or access to the market. Obviously, this question concerns only the modes of transport with a competitive system, since for the railways limitation of access to the market by a concession system necessarily follows from their very nature.

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In Part II (4) we came to the conclusion that there is little likelihood of overinvestment in transport capacity constituting a serious problem in a situation of full employment and steady economic growth. Quantitative restrictions on investments and/or access to the market would therefore not be necessary in such situations. A permanent system of licences could nevertheless play a useful part in preventing the disturbances which might be provoked by carriers occasionally entering the market for transport services for short periods without restriction of medium- and long-term investment and access (5). This objective could be attained if the licensing system were applied in such a way that the value at which licences could be freely negotiated was practically nil. Furthermore, it may be desirable for access to the market to be subject to the condition that the prospective carrier is able to meet the technical and financial obligations of his profession.

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(1) As we have already indicated (see Sec. 32.1), the concept of comparable services raises very many difficulties.

(2) It goes without saying that all the other distortions, for instance those due to unequal fiscal and social systems, are also eliminated.

(3) See especially Subsection 25.22.

(4) See Subsection 25.21.

(5) See, for instance, the special case mentioned in footnote (2) page 101.

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A policy of this type for the control of transport capacities and access to the market fits in well with the general policy concept we suggest. Minimum rates may not be sufficient to prevent uneconomic competition which results from a trend to overinvestment, and may even be of only secondary importance here. Under this hypothesis their introduction unaccompanied by any other action might further stimulate investments and reduce the utilization of existing capacities.

32.6 — *SUMMARY*

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The above considerations are based on a general principle. The final objective is that minimum or maximum price limitations calculated to prevent any uneconomic competition or abuse of dominant positions should be established where such situations are met with or are possible. Otherwise, prices are to remain free.

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In order to gradually achieve this situation, an approach is suggested which is based in the main on lessons drawn from observation.

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Whenever no abuse of dominant positions or uneconomic competition is found, existing restrictions shall be relaxed to some extent, on the grounds that the restrictions have proved to be too strict. Hence, whenever the risk of abuse of dominant positions or uneconomic competition is nil or negligible, prices gradually become free.

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On the other hand, as soon as uneconomic competition or abuses of dominant positions are seen to exist, minimum or maximum rates are introduced. The method suggested for fixing these is based (a) on a price threshold beyond which complaints of uneconomic competition or abuse of dominant positions will arise, (b) on comparisons, and (c) on an overall appraisal of the circumstances in the light of the general criteria set out in this report.

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The first element is purely empirical and is essentially based on the possibility open to every interested party either to lodge complaints with the competent authorities or to initiate action in the courts.

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The second element is based on the prices charged and the costs shown by industrial accounting, and on the degree of utilization of infrastructures and means of transport in relation to demand. The breakdown of transport services into their basic components may supply useful information on costs, particularly as regards the railways. Furthermore, observation of the prices charged is an additional factor to be considered in making at least an approximate estimate of the order of magnitude of those costs which can be looked upon as "normal". The degree of utilization of infrastructures and means of transport is a factor whose importance has been emphasized in this report in connection with judging the existence of uneconomic competition or abuse of dominant positions. In the main it can be ascertained from objective factors.

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The third element consists in a general appraisal of all the circumstances of each specific case in the light not only of the first two elements but also of any other relevant factor, such as harmonization of conditions of competition, the system of charges for the use of infrastructure, quantitative restrictions, the general economic situation, etc. The difficulties of making such an appraisal are obvious, but they are unavoidable and occur in all systems in one form or another.

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In the context of our suggestions, a system of bracket rates would seem to be an indispensable instrument for any policy aimed at easing the transition, since any lessening of restrictions presupposes the substitution of brackets for fixed tariffs or the widening of the brackets where such are present at the outset. In the initial phase the brackets, where they exist, would be progressively widened at a rate which could be laid down by the authorities. The widening process would naturally be stopped or even reversed whenever it resulted in uneconomic competition or abuse of dominant positions. Furthermore, provision could be made for allowing exceptions, in order to prevent serious disturbances due to difficulties of adaptation.

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The method thus supplies a body of common principles for determining the factors to be considered in fixing minimum or maximum rates wherever such are necessary. These principles are not to be applied dogmatically. Their operation is essentially pragmatic and largely based on practical rules which can be applied without undue difficulty. But in any case, whenever there is a possibility of abuse of dominant positions and of uneconomic competition, the price limits to be imposed will inevitably rest on a compromise between the need to cope with these situations and the no less imperative need to leave some price margin in order to facilitate the

adjustments to the variations in market conditions called for by optimum resource allocation. In its turn, such a compromise is bound to rest largely on subjective appraisal, and it is this which constitutes the intrinsic difficulty of any tariff policy for the authorities.

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Similar suggestions hold good for quantitative restrictions. Although supervision may be deemed useful to guarantee certain minimum professional qualifications for carriers, or to avoid undesirable disturbances of the market, it should never be unduly restrictive, in so far that the value of the licences should not diverge appreciably from nil.

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A gradual approach appears necessary anyway, because of the diversity of the initial situations, the inadequacy of the information at present available on the actual dangers of uneconomic competition and abuse of dominant positions, and the existence of external distortions of conditions of competition both on national markets and at Community level.

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Seen from the purely economic angle on which we were consulted, these suggestions are based on the following considerations:

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1. First and foremost, no policy can be usefully applied unless its objectives have been clearly defined beforehand. Our general point of view has been that of optimum resource allocation; and our suggestions are therefore fully valid only if this objective is actually pursued.

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2. Upper and lower tariff limits should be fixed only if, in the absence of such limits, there was abuse of dominant positions or uneconomic competition.

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Abuse of dominant positions can only occur if there is no real competition, and uneconomic competition depends to a great extent on the general economic situation. As regards real competition between modes of transport and the general economic situation, the existing regulations largely owe their origin to situations which no longer exist. Hence, it would be as unscientific to assert presumptively that there is everywhere danger of abuse of dominant positions or of uneconomic competition — and to conclude from this that restrictive measures should be introduced everywhere — as to maintain that such dangers do not exist and conclude that all restrictive measures are inadvisable. The only proper approach is to rely on observation, imposing restrictions where these dangers are really present and abolishing them where such is not the case. This is why the approach we recommend is essentially pragmatic. In such a field nothing would be mode dangerous than to rely purely and simply on dogmatic theoretical views.

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3. Lower or upper limits for tariffs cannot be calculated simply on the basis of costs. At any given time and place, the economically optimum prices depend on other conditions — such as demand — which are equally if not more important. It follows from this that none of the many concepts of costs discussed can be considered entirely adequate for establishment of a price policy. All are based on conventions which may seem to offer practical advantages of simplicity but actually cannot be justified by optimum resource allocation theory and do not really correspond with reality. All rest on theories which have no foundation. This is obviously a rather depressing conclusion, but nothing would be more dangerous than to adopt an inexact view of reality simply for the sake of convenience. To look for a system of cost calculation which is entirely suitable and valid from the economic angle is like trying to square the circle: it means looking for a solution which does not exist.

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4. Nevertheless, it is possible to establish a line of approach, via a series of useful approximations, which could lead to effective regulations for combating abuse of dominant positions and uneconomic competition. We have defined a whole set of criteria relating to demand and capacity which enable a valid judgment to be made in each case. Here again, the fact that there is no universally valid and automatic formula may be disappointing but is fully consonant with the real state of affairs. Only theories which flagrantly simplify matters could yield such formulae. In fact, only by examining each case, taking into account the special elements of each situation in the light of the various criteria we have suggested, is it possible to judge whether dangers of abuse of dominant positions or uneconomic competition do or do not exist. Here we must abstain from preconceived theoretical views which tend to reduce a complex reality to a unitary system, and adopt an approach which is certainly more difficult but also better suited to the real state of affairs.

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5. Although it is impossible to calculate price limits *a priori* and with complete validity on the basis of costs alone, it is possible to find empirically approximate values for these limits which are such that in all cases that matter their imposition can

prevent any abuse of dominant positions and any uneconomic competition.

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6. The essential aim of the system of bracket rates which we suggest for application wherever price restrictions exist at present is to make prices as flexible as possible while at the same time effectively combating abuses of dominant positions and uneconomic competition. The analysis suggests that the use of bracket rates is in fact essential at the beginning and for a period long enough to obtain the necessary information and to pass without interruption or excessive disturbances from the present to the final situation. However, it also shows that in the meantime the application of these rates does not necessitate previous calculation of the lower or upper limits from costs. All that has to be known is the present situation of the tariffs and the prices actually charged, and this knowledge is largely available.

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7. Normally, bracket rates are not necessary, and where dangers of the abuse of dominant positions or of uneconomic competition actually exist it is sufficient to impose upper and lower limits on the prices charged. Here again, previous calculations from costs are not sufficient to determine these limits; but the empirical approach we suggest provides a practical way of finding them.

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8. Implementation of our suggestions will involve numerous difficulties, but these are in the nature of the case, which cannot be ignored with impunity. The verdict on a policy can only be relative. All have drawbacks, and the one to be chosen cannot be an exception, since the perfect policy does not exist. It must be the one which appears preferable among all those that can be envisaged. If the pragmatic approach we propose presents manifest disadvantages and difficulties, it is nevertheless founded on reality and capable of leading, by a prudent approach and successive approximations, to a satisfactory solution, whereas any other choice, based on preconceived views, can yield only arbitrary solutions which are still more difficult to implement.

CHAPTER 33

INSTITUTIONAL ASPECTS AND PROBLEMS OF TRANSITION: GENERAL COMMENTS

33.0 — *INTRODUCTION*

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At various points in the preceding chapters we have mentioned certain institutional aspects of the different policies under review; but we have not yet dealt with the possible institutional arrangements that could give effect to these policies. The main purpose of this chapter is to comment on a number of important institutional questions that arise in connection with all, or nearly all, of the systems we have discussed. These comments will inevitably be rather general, because it is clearly impossible within the scope of this report to undertake a detailed examination of all the practical issues involved in each of the systems.

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Once again, a distinction must be made between infrastructure and transport services. On the institutional level there is, as we have frequently pointed out, an essential difference between these two stages in the production of transport services. In all modes of inland transport management of the infrastructures must be centralized to a considerable degree, but transport services can largely be left uncentralized, at least in the modes where competition operates. This latter point does not apply to the railways — at any rate, not generally; nevertheless, even where they are concerned, it is advisable to study the institutional problems connected with infrastructure and transport services separately, because the problems in these two stages of the production process are basically quite different.

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The institutional aspects are particularly important for infrastructure, because large parts of it are managed centrally. In addition. as we have shown, a rational policy of investment in infrastructure requires some co-ordination between the different modes of inland transport (1). For these two reasons, special institutional arrangements are necessary. In our study of these, we shall deal first with investment decisions (2) and then with the system of charges for the use of infrastructure (3).

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The problem of co-ordinating investments in infrastructure is essentially the same in all systems; we have shown that such co-ordination is a prerequisite for any rational transport policy, no matter what system of charges for the use of infrastructure may be adopted.

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The measures for implementing the system of charges for the use of infrastructure obviously depend to some extent on the particular system chosen. We shall pay special attention here to the systems of budgetary equilibrium because they demand special institutional arrangements for keeping the revenue and expenditure connected with infrastructure separate from the general budget. Achievement of this financial autonomy would entail such measures as defiscalization of the various taxes and charges at present levied on the users of infrastructure, especially on road-users.

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Where transport services are concerned, the institutional questions concern (a) an intensification of the competitive system and (b) the restrictions to be imposed on this system whenever its effects are considered harmful. In dealing with the pricing of transport services and with investment in vehicles and boats in a competitive system (4), we repeatedly stressed how important it is for carriers to be adequately informed. We also pointed out (5) that transport users should also have quick and easy access to any information they may need on prices and other transport conditions. This problem of information and its institutional aspects will be examined separately (6). Finally, private agreements tending to restrict the freedom of carriers can certainly have serious effects on the free working of competition; but the institutional problems they pose will not be considered here, because they lie outside the proper domain of this report.

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With regard to restrictions of competition imposed by the public authorities, two main policies may be distinguished: a policy that restricts capacity and access to the market, and a policy that involves some control over prices. The first policy will not be dealt with in this chapter; we would only point out

(1) See Section 24.1.
(2) See Subsection 33.10.
(3) See Subsection 33.11.
(4) See Chapters 25 and 32.
(5) See Subsection 25.37.
(6) See Subsection 33.20.

that, when there is full employment and relatively steady economic growth (which we have assumed to be the case throughout this report), such a policy must confine itself to imposing a licensing system that will not be economically restrictive but will prevent the disturbances that might occur if casual carriers entered the market only for short periods. We shall, however, examine the various institutional aspects of a policy that involves some control over prices (1).

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In every case, whether the policy to be worked out relates to investment in infrastructure or to the prices of services, we consider it essential that there should be some suitable procedure by which all the interested parties could take part in determining that policy.

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We shall conclude this chapter with some comments on the problems connected with the change-over from one system to another.

33.1 — *INFRASTRUCTURE*

33.10 — *Co-ordination of investment in infrastructure*

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It follows from all we have said that co-ordination of investment in infrastructure is a technical and economic necessity. Such co-ordination need not mean that all investment decisions or the management of infrastructure must be completely centralized. The ultimate responsibility can be left with the local, regional, national or Community authorities, depending on the primary function of the infrastructure concerned. However, the fact that the different parts of a single network are interdependent at every level means that investment decisions must be co-ordinated on a sufficiently broad scale and with sufficient authority to ensure an integrated pattern of investment for the entire network. Also, the level at which such co-ordination takes place must depend upon the extent to which the charges for the use of infrastructure are equal.

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Two questions connected with co-ordination must be examined more closely. The first concerns the part that the users of infrastructure should play when decisions are to be taken with regard to new investments. The second concerns the institutional arrangements for the co-ordination of investments in infrastructure for each entire made of inland transport. The importance of these two questions is obvious.

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Investments in infrastructure must largely be geared to the expected volume of traffic. The investment plans both of the direct users of infrastructure (who include, in the competitive sectors of inland transport, professional carriers, firms transporting for own account, and private infrastructure users), and of the indirect beneficiaries (i.e. industries using professional transport or whose activities are closely linked with infrastructure capacity), are clearly an important source of information on future needs for infrastructure. Consequently, for rational planning of infrastructure it would seem very useful, if not essential, to establish a procedure for investment decisions regarding infrastructure in which both the carriers and the other direct and indirect users of transport can play an active part, together with all other interested parties, such as producers of transport equipment. Such a procedure would also be justified for reasons of equity in cases where infrastructure is financed by charges on the users, as in the systems of budgetary equilibrium and, in practice, also the system of calculated total cost.

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There are various reasons why it is necessary for investments in infrastructure to be co-ordinated between the different modes of inland transport (2). In the first place, completion of a particular infrastructure project will reduce the total benefits to be expected from a competing project (by another mode of transport, for example), and may therefore prevent the latter project from being undertaken at all — when account is taken of the criteria of optimum resource allocation — even though comparison of the two projects might have shown that the second would have been preferable. Secondly, different modes of transport may be complementary to some extent, or may require common installations.

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These two considerations are in themselves sufficient to show the need for co-ordinating investments in infrastructure between the modes of inland transport. This applies to local and urban networks, but it is particularly urgent in the case of the main road and railway networks and the principal inland waterways. Most countries of the Community, however, lack an adequate procedure for achieving a permanent and effective co-ordination of investment in transport infrastructure.

(1) See Subsection 33.21.

(2) For a full discussion of this question, see Section 24.1.

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Many different institutional arrangements are possible, but they must all contain the following elements. In the first place, whenever any major project for expanding, renewing, modernizing or scrapping infrastructure is contemplated, there should be consultations between the various authorities directly responsible for taking the decisions. Such consultations, in which carriers and the other direct and indirect users of the infrastructure should be able to participate in one way or another, could be based on quantitative proposals containing date or estimates for all the various factors that must be considered before the investment decisions can be taken (1).

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Secondly, the investment plan (which, if it covered a period of years, would have to be revised annually) could be submitted to the competent central authorities, either at national or Community level for approval, or arbitration in a case of conflict. Before approving an investment plan, these authorities might consult an independent body in order to obtain an impartial opinion on the economic merits of the proposals.

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Finally, once the investment plan had been adopted, the authorities directly responsible for infrastructure in each mode of transport could be left to effect the investments and manage the infrastructure according to the specific requirements of the various sectors, provided they complied with the general trend of the investment plan. If the infrastructure were subject to the constraint of budgetary equilibrium without the possibility of borrowing, a greater degree of freedom could be left to these authorities (2), especially to the railways, than would be possible under any of the other systems of charges for the use of infrastructure that we have studied.

33.11 — *THE INSTITUTIONAL ARRANGEMENTS CONNECTED WITH THE VARIOUS SYSTEMS OF CHARGES FOR THE USE OF INFRASTRUCTURE*

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The appropriate arrangements for putting a particular system of charges into effect obviously depend to a great extent on the nature and function of that system. A primary distinction must be made here between the systems that are based explicitly on the concept of budgetary equilibrium and those that are not. We will first consider the systems that are not based on this concept, i.e. the practical system of economic tolls, the development cost system, and the system of calculated total cost (3).

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The disadvantages of these systems (4) could be somewhat mitigated by suitable institutional arrangements, such as those envisaged in the preceding subsection for investments in infrastructure. In addition, independent bodies could be set up to advise the public authorities, put forward proposals, or even take decisions as to the total volume of the charges and their apportionment among the different categories of users. This procedure raises a number of problems which cannot be dealt with fully in this report. We would emphasize, however, that the systems of calculated total cost and development cost necessitate many detailed calculations which greatly depend on subjective judgments. This also applies to the practical system of economic charges, though not to the same extent. This being so, the procedures and institutional arrangements for these different systems will have to include effective safeguards against the influence of pressure groups. The working rules would therefore have to be as simple and clear as possible, so that all the interested parties would be able to see whether or not they were being complied with.

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As regards the railways, any system of charges likely to lead to a deficit would in principle make it necessary for the financial matters connected with infrastructure and transport services to be kept completely separate, so as to prevent any deficit that might be occasioned by inefficient management from being confused with the infrastructure deficit and consequently also financed from public funds. For the same reason, investments in infrastructure would have to be subject to strict central control. The difficulties of separating infrastructure and transport services in the case of the railways have already been mentioned (5).

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The systems based on budgetary equilibrium have the advantage of avoiding some of these institutional difficulties. If the constraint of budgetary equilibrium were imposed on the roads and inland waterways, separate funds would have to be set up for each of these modes of transport, and these might perhaps be subdivided, especially in the case of the roads, according to the various categories of infra-

(1) Of course, the contents of the proposals and their justification will be affected by the constraints imposed on the infrastructure, such as the requirement of budgetary equilibrium.

(2) Provided the area over which charges were equalized was not too large. See Subsection 24.45.

(3) At least one version of the system of calculated total cost does in fact ensure budgetary equilibrium.

(4) See Section 23.3.

(5) See Subsection 23.33.

structure we have distinguished (1). The charges on the users would be defiscalized and paid into the various funds, which would be responsible for all financial transactions connected with infrastructure. The total amount of such charges would be determined according to the rules implicit in whatever version of budgetary equilibrium had been adopted.

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In practice, however, these rules are only of limited application in those versions of the system of budgetary equilibrium with the possibility of borrowing which impose no limit on the ability to contract loans. The absence of such limits would mean that the actual level of charges to be paid by the users of infrastructure during the year would be largely determined by discretionary judgments. This would raise problems similar to those already mentioned in connection with the systems that do not impose the constraint of budgetary equilibrium. Only if the ability to contract loans is limited — and *a fortiori* if it is practically excluded, as in the system without the possibility of borrowing — does the constraint of budgetary equilibrium become a useful guide, free from arbitrary elements, for working out a system of charges. This leaves only the problems connected with apportioning the total charges for infrastructure among the various categories of users. We have noted that this distribution is largely conventional but that certain reasonable rules could be worked out wich could be laid down once and for all — taking into account the objectives pursued and the differences in the total amount of the charges — and then applied for a relatively long time without requiring revision (2).

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In the case of the railways, implementation of the system of budgetary equilibrium raises no particular institutional problems. If there were no deficit to be financed from public funds, and if the ability to contract loans were limited (3), no special arrangements would be required. There would then be no need to keep financial matters connected with infrastructure separate from those connected with transport services, nor to create a special procedure for fixing the charges for the use of infrastructure, since the sums in question would be included in the rates charged by the railways. Of course, the railways' freedom to apportion the total charges connected with infrastructure among the different categories of users does in fact create certain problems (4); but that is only one aspect of a more general problem. Internal subsidizing can be practised with regard to all railway costs, not just those of infrastructure. We have already discussed how the distortions that may result from such practices can be combated (5).

33.2 — *TRANSPORT SERVICES*

33.20 — *The flow of information to carriers and transport users*

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The transport system can only operate efficiently if every operator possesses all the information he needs for the decisions he has to make. This applies as much to transport users as to carriers.

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The decisions to be taken by carriers are of two types. There are, on the one hand, decisions concerning current operations (i.e. output and charges) and, on the other, decisions concerning investment in transport equipment. Decisions of the first type require information on the present state of costs and demand, separately in respect of all groups of products that are not perfect substitutes for others at the production stage. As transport services cannot be stored, and as services provided in different places are not always substitutable at short notice, the decisions regarding current operations are numerous and call for precise information that must be available at the right time and place. It follows that these decisions demand a substantial degree of decentralization. Such decentralization already exists in the competitive modes of inland transport, but this does not mean that there is always an adequate flow of information on which decisions concerning current operations can be based. The market may in fact be insufficiently transparent for the individual carrier.

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(1) Viz., main, urban and suburban, and local networks. In Part II (Section 23.3 and Subsection 24.45) we showed that local networks would probably have to be exempted from the requirement of budgetary equilibrium. This would mean that the expenditure on that type of infrastructure would be covered, at least partially, by the national budget. The same exception might be made for all infrastructures in underdeveloped areas. If the principle of budgetary equilibrium were applied to the various categories of infrastructure separately, it would obviously be necessary to share out the total revenue from fuel taxes and taxes on vehicles among these different categories. This problem does not seem insoluble in practice. Fuel taxes could be apportioned according to the relative amounts of traffic. The revenue from taxes on vehicles would be differentiated automatically, since the system would involve separate (or supplementary) road licences for urban and suburban traffic respectively.

(2) See Subsection 24.46.

(3) For instance, if the bonds issued by the railways were not guaranteed by the State, thus automatically limiting the ability to borrow.

(4) Connected with the possibility of internal subsidization; see Section 32.1.

(5) See Subsection 25.30 and Chapter 32.

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We touched on this problem when dealing with the question of the return load (1). It was shown that one of the most efficient methods of providing such information might be to remove all restrictions on transport rates, so that they might regain their signalling function and possibly even induce intermediaries to provide the necessary link between supply and demand, or encourage firms to rationalize their activities by technical and commercial co-operation. The removal of such restrictions would have to be accompanied by appropriate measures for providing information, such as the creation of public freight exchanges.

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Other difficulties arise in the case of the railways, where the possibilities of decentralization are limited by technical factors which necessitate close co-ordination between the different services provided on the same network. In this case, a suitable compromise must be found between some decentralization of the power of decision and the need for centralized management in matters concerning the entire network. The problem of information takes different forms, depending on the nature of this compromise. When management is centralized, it is important that information should be sent by the operators to the central authority above them, and that the central authority should issue specific directives to the operators. The delays inherent in such a procedure usually lead to a system of "fixed" directives and "fixed" tariffs (i.e. directives and prices that are determined by the central administration and can only be modified with difficulty). As we have seen, this causes a certain distortion of the optimum allocation of resources (2), which is probably to some extent unavoidable but might possibly be reduced if the power of decision were suitably decentralized. Such decentralization undoubtedly raises problems of internal organization that cannot be discussed here, but the solutions adopted in certain countries show that it is not impossible.

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Investment decisions require information of a different kind, i.e. estimates of future demand and future cost conditions. Obviously, the more durable the equipment is, and the more uncertain the future development of demand, the more important such information will be. There is no particular reason for believing that transport services as a whole are generally exceptional where durability of equipment and uncertainty of the future development of demand are concerned. But special difficulties may arise in the case of the inland waterways, because the equipment there is very highly durable and activities mainly concern the transport of primary products which are liable to considerable fluctuations in price and quantity.

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There are two reasons why a centralized information procedure is an advantage where investments are concerned. In the first place, many factors that determine future conditions concern all carriers, and can therefore be estimated better and more efficiently by a common effort. This applies particularly to future development of the total demand for transport, and to its distribution among the different classes of goods and different areas. Secondly, the share of the market that each individual carrier can expect to obtain in the future will depend upon the investments of his competitors. Both these considerations appear to support the idea of a system under which information could be pooled and distributed centrally by co-operation between all carriers and transport users, in a context of long-term economic forecasts. Such systems do at present exist in some countries. A special study should be made of the specific institutional arrangements that would be suitable for inland transport, and of how they could be put into effect at Community level. Such arrangements can in any case only be really effective if they form part of a wider system of economic forecasting for all sectors of the economy (3).

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A transport system based on the freedom of users to choose the mode of transport and the carrier they prefer can only operate efficiently if the users can obtain, without difficulty or delay, all the necessary information on the various ways in which their particular needs can be met. This applies as much to prices as to all other transport conditions. For some classes of services, particularly small-tonnage consignments and passenger transport, an adequate transparency of the market can in practice only be achieved if the prices are published in advance, either in the form of tariffs or as price schedules. We have, however shown (4) that this procedure has the disadvantage of rendering prices less flexible: necessary changes in them take too long to make, and they cannot be readily adjusted to meet individual transport requirements. This disadvantage is, however, less noticeable in the case of price schedules, which are drawn up by the transport firms and do not require official approval, than it is in the case of tariffs, which are imposed or authorized by the competent authorities. Since transport services cannot be stored, the optimum prices may often differ greatly for individual loads, depending on the special features of the contract, particularly the period within which it is to be carried out. Consequently, more flexible procedures,

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(1) See Subsection 25.21.

(2) See Subsection 25.5.

(3) Such a procedure has recently been instituted by the EEC Council of Ministers.

(4) See Subsection 25.37.

to achieve adequate transparency of the market, could be adopted for those classes of service for which published price schedules are not absolutely necessary on practical grounds. Without going into the specific institutional and practical arrangements in detail, we would here only repeat the suggestions that we have already made (1). In the competitive sectors, price formation could, for example, be effected by means of public freight exchanges. The prices actually charged would be published subsequently in some appropriate form.

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Whenever price limits are imposed, they would obviously have to be published in advance.

33.21 — *Price policy*

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Suitable institutional procedures will have to be introduced, particularly at Community level, to deal with most of the problems arising from the conditions and the pace of implementation of the policy suggested, and to assess actual situations and the effects of the measures taken.

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Such procedures are especially important because no objective general rule can be evolved for determining price limits (2), we did mention several objective factors that ought to be taken into account when each particular case is being examined, but we nevertheless concluded that a certain amount of discretionary judgment will almost inevitably be involved. It is therefore essential that the procedure to be followed in determining the price limits, and the institutional arrangements to be made, should be taken into account when a tariff policy for inland transport is being worked out.

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Obviously, the appropriate institutional structure for transport services is susceptible to a great many variations (3). The choice between these possible forms must largely depend on considerations that lie outside the scope of this report. Nevertheless, whatever variations are considered, the appropriate institutional framework would seem to be one that satisfies the following general requirements.

Elimination of restrictive practices and harmonization of the external conditions of competition

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Of course, when a system is based on competition, it can only function completely and properly within an appropriate institutional framework. In particular, an effective policy against restrictive practices that distort competition is an essential prerequisite for any regime based on a free market; this is true of transport as of any other sector of the economy.

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In addition, it is essential that there should ultimately be no perceptible external distortion of the conditions of competition, caused; for example, by the existence of different fiscal and social systems (4).

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Finally, when there is a danger of abuse of dominant positions or of uneconomic competition, investment in transport capacity and access to the market must not be restricted to any great extent, and all other restrictive measures must be abolished.

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This means that the existing conditions of competition must be gradually harmonized and that licensing systems, where they exist, must be gradually relaxed.

Flow of information to the authorities and interested parties

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First of all, the controlling authorities and interested parties must have precise and extensive information as to the rates in force. When there are officially approved tariffs, the authorities and the public would get to know the rates through the process of approval and publication of these tariffs. When there are price schedules drawn up by firms, the authorities would, and the public could, get to know the rates

(1) See Subsection 25.37 and Section 32.3.

(2) Wo have seen that in practice there is no method of calculation by which the rates in keeping with an optimum allocation of resources can be worked out *a priori*, and that in each particular case the risk arising from dominant positions or uneconomic competition can only be assessed if a number of factors are considered together. These factors may be the current rates or costs, or they may be directly related to the situation of the market and the extent to which the infrastructures are utilized (see Chapters 12, 13 and 32).

(3) Notably as regards procedure, burden of proof, possible sanctions, etc.

(4) Or due, throughout the period when bracket rates are in existence, to different degrees of specification of rates (this possible distortion would finally disappear if maximum or minimum rates were imposed only where there was a real danger of abuse of dominant positions or of uneconomic competition). Important though the conditions of competition may be, the authors of this report nevertheless feel that implementation of most of their suggestions need not wait until complete harmonization of the conditions of competition has been achieved, but that the policy they propose could be put into effect while these conditions are in process of being harmonized.

through the process of notification and publication of these schedules. If there were neither tariffs nor price schedules (1), appropriate statistical returns would have to be published; these should cover an adequate number of categories of transport, and give not only the average of the rates in force but also some indication of their range (i.e. their upper and lower limits).

Effectiveness and ease of control

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Secondly, the methods devised for the exercise of control must be both effective and easy to operate. In this connection, the question of degree of control is an essential factor, for the reasons stated in the preceding chapter. The degree and precision of such control will, in fact, largely be in inverse ratio to each other. This is one of the reasons why, under the system we suggest, maximum or minimum rates would not be laid down except where there was a real danger of uneconomic competition or abuse of dominant positions.

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Whenever rates are at present restricted in any way, a bracket rate system is an excellent means of ensuring a gradual transition from a situation that is strictly regulated, chaotic, and probably very far from achieving an optimum allocation of resources, to one that is less strictly regulated, more coherent and closer to the optimum. Nevertheless, one of the main ideas underlying the present report is that, in spite of this, a system of bracket rates cannot permanently prevent uneconomic competition or abuse of dominant positions, in transport services as a whole, without seriously compromising optimum resource allocation. In fact, as the optimum level of the limits (and *a fortiori* the optimum rates) cannot be assessed in advance, any policy based on a permanent and generally applicable system of bracket rates would be condemned — from the point of view of optimum resource allocation — to operate blindly or, at best, in the light of crude approximations.

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This is regrettable because in principle prevention is always better than cure. But it would be pointless, and indeed very dangerous, to ignore the fact simply because it is regrettable.

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Consequently, where the optimum allocation of resources is concerned, the best system of control would be one based not on preventive measures, as under a system of permanent and generally applicable bracket rates, but on an arrangement whereby the authorities could intervene swiftly when a case of abuse of dominant positions or of uneconomic competition had been observed. Such an arrangement would entail rapid and effective investigation of the complaints that would inevitably be made in such an event.

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Control is relatively simple when maximum rates are laid down, because one of the two parties to the contract may then have an interest in respecting the limits fixed by the controlling authority. But control certainly becomes much more difficult when the rates laid down are minimum rates, because both parties may then have an interest in ignoring these limits, at any rate temporarily: the users would pay a lower price, and the carrier would improve his competitive position. Hence, no system of control can be effective unless it is really possible for any interested party to lodge complaints or institute proceedings with regard to the level of certain prices or specific cases of alleged discrimination. Moreover, unless there is such a possibility, the parties concerned will not be adequately protected.

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It cannot be denied that the system we are proposing involves a risk of temporary disturbance of the market by the possible occurrence of cases of uneconomic competition or abuse of dominant positions. But such risks are much reduced if the system is implemented pragmatically, gradually and cautiously, as we have suggested.

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If, instead of this, an arrangement were adopted that was essentially preventive in character, the risk of serious and widesread distortions would be all the greater, because rates would be controlled more strictly.

1122

An arrangement enabling any interested party to lodge complaints or institute proceedings would be very effective (for it is much more likely that a large number of unjustified complaints would be brought than the reverse). It therefore appears that a form of control based on such an arrangement would be suited to take very rapid intervention action.

1123

All these arguments obviously point to the conclusion that the system we are suggesting would very probably have fewer disadvantages than a system of general control — especially because control would be stricter in the latter case.

(1) See under "Price schedules established by firms", page 160.

Official approval and post facto control

1124

The need for gradual and cautious implementation of tariff policy for transport implies that methods of control should evolve as time goes on.

1125

At the start, as has been suggested, a system of gradually widened rate brackets would apply to all the categories of traffic at present subject to price regulation. In this initial phase control would therefore probably be in two stages. First, a procedure of official approval would make sure the rules concerning the brackets were properly observed. The second stage would arise only if a complaint were lodged on legal action taken in respect of a specific category of traffic, or if the control authority decided *ex officio* that there were grounds for an inquiry. In such case the purpose of the control would naturally be to verify by thorough examination whether there was in fact a situation of uneconomic competition or abuse of a dominant position. If there was, a maximum or minimum price would have to be imposed.

1126

For categories of traffic in respect of which bracket rates had been abolished without any maximum or minimum price being imposed, only the second stage of control would apply. Here, it would be sufficient for the control authority to have at its disposal the information and means of investigation enabling it to examine any complaint properly.

1127

Once bracket rates had ceased to exist and minimum and maximum rates had been imposed, it would, of course, be possible to submit applications for the modification of these. The grounds advanced by applicants would be examined in the light of the criteria we have suggested for determining maximum or minimum prices.

1128

When, as could quite well be justified in principle, the proposals submitted included changes in the rate limits, whether specific or general, the purpose of official approval would be to see whether such changes involved systematic bias and were likely to jeopardize the aims of the system, for instance by transferring certain goods from one class to another.

1129

Should there be a fall in the purchasing power of money, the aim of official approval could be to judge applications based on this ground. Here a simpler, but more drastic and probably more fitting, alternative solution would be simply to tie the limits of the brackets or the minimum and maximum rates to a suitable index (1).

Price schedules established by firms

1130

Another institutional question with important economic repercussions is whether or not transport enterprises should be required to establish price schedules (2). The advantage of these is that they increase market transparency and are an obstacle to possible discriminactions (3). Their disadvantage is that they are liable to introduce some rigidity into the formation of prices on a market where the balance between supply and demand is likely to fluctuate in the very short term because the service cannot be stored, and where such fluctuations are very difficult to foresee. It hardly appears possible to decide beforehand for what categories of transport and enterprises the disadvantages would outweigh the advantages of the obligation to establish price schedules. In the final analysis, experience is doubtless the only basis for decision.

1131

If firms were not forced to establish price schedules, they would remain free to do as they chose, provided they observed any minimum and maximum limits imposed. They could either freely settle prices with their clients (4) or publish a list in advance of the prices at which they were prepared to carry out transport operations.

Questions of procedure

1132

It is obviously desirable where possible to prevent the supervisory and legal authorities from being inundated with ill-founded complaints and suits. To this end the costs of inquiries could be charged to plaintiffs in cases where examination or judgment showed their complaints or suits to be unjustified. In the contrary case these expenses would be borne

(1) Such indexing would, of course, apply only to the limits of the brackets and not to the rates or prices charged, which would remain completely free within these limits. It also goes without saying that all the points made here concerning approval and control are themselves only valid for the minimum and maximum price limits.

(2) By this we mean price schedules not subject to approval, which simply imply an undertaking by the enterprise to supply transport services at specific prices it has fixed in advance.

(3) See Section 32.4.

(4) Obviously this facility could only be granted to carriers subject to what has been said in Section 32.4 concerning the risk of systematic discrimination between different users.

by the operators responsible for the abuse of dominant positions or uneconomic competition.

1133

Furthermore, again in the interest of rapid and efficient control, it would seem advisable for the competent authorities to take interim conservatory decisions pending full study of a case, when the issues involved appear sufficiently important and a preliminary examination indicates that the request is based on pertinent arguments.

1134

Finally, the competent authority should have the character of a tribunal, since it is essential that all interested parties should have an opportunity of being heard.

1135

In fact, the suggestions we submit offer every interested party two opportunities: first, complaints may be lodged with the competent authorities, which would have to examine them; and secondly, proceedings can be instituted with the appropriate legal bodies. In principle the control authorities would be responsible for imposing minimum or maximum prices where necessary, while the legal authorities, once the matter was referred to them, would have to pronounce (a) on the facts and (b) on the conformity of such minimum or maximum prices with the general principles of the tariff policy.

1136

Harmonization of legal systems throughout the Community is an essential condition for a coherent common transport policy and should therefore be assured. This in no way prevents national or regional authorities from being competent in complaints concerning disturbances affecting purely national or regional traffic. But to eliminate the risk of conflicting decisions by regions or countries, at least an opportunity of appeal to an appropriate Community authority [1] would seem to be indispensable. It is indispensable anyway whenever the interest at stake are not exclusively national, in view, for instance, of the possibilities of discrimination at Community level [2].

1137

Finally, it should be remembered that disputes will essentially concern questions of fact, the appraisal of which inevitably entails some margin of discretion, and that optimum resource allocation is not necessarily the only objective of transport policy. The authority to be responsible for rate control in transport services would have to be chosen, and its composition and rules of procedure estabilished, in the light of the very complex character of the decisions it would be called upon to take [3].

1138

It is not for us to make suggestions on this head, and we will confine ourselves to pointing out that decisions on minimum or maximum prices or unjustified discrimination always have an economic, a legal and a political aspect.

33.3 — *SOME FURTHER OBSERVATIONS ON PROBLEMS OF TRANSITION*

1139

In view of the diversity of the transport policies at present applied in the various Community countries, implementation of any common policy in the field of inland transport will give rise to problems of transition. There is no doubt that these problems are of great practical importance for both infrastructure and transport services, and must be taken into consideration in every system. Any change of policy inevitably has serious repercussions not only on inland transport itself but on the economy as a whole.

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Despite the importance of this question we have refrained from studying it in detail for several reasons. First, this part of our report deals with a certain number of possible systems, and only with the main aspects even of these. Such a general examination is obviously inadequate for appraising the problems of adaptation which implementation of each system would involve. It would clearly be impossible in the framework of this report to make such a detailed analysis in respect of each of the systems examined and their different variants. Furthermore, an analysis of that kind would have no point unless it was made from the angle of the existing transport situation. It is impossible to study problems of adaptation without taking account of the particular initial situation in which a given

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[1] This suggestion in no way calls into question the final competence of the Court of Justice.

[2] See Section 32.4.
Or of distortions of the conditions of competition which could be introduced by the existence of lower or upper limits which are not equivalent throughout all the national territories.

[3] From the economic angle alone the study of transport tariffs is very complex. Transport services differ widely; the structure of costs, particularly in the railways, is extremely intricate; and the optimum prices for transport services corresponding to optimum resource allocation vary with demand. Similarly, the influence of possible distortions of the conditions of competition may be extremely difficult to determine. For all these reasons, appraisal of the actual existence of abuse of dominant positions or of uneconomic competition or, again, of situations of discrimination, may present considerable difficulties, and the authority concerned would then require wide economic competence.

system would have to be introduced. Study of the specific transition problems involved in the various systems would demand not only a detailed quantitative analysis of each system but also comparison with the actual position in the different Community countries. A study of such magnitude would obviously be beyond the scope of this report (1).

1141

For all these reasons we have confined ourselves to presenting a few general comments on the problems of the change-over. We supplement them here with some remarks on the nature of these problems and their influence on the choice between the systems and on the types of measures which can facilitate adaptation to a new policy for inland transport.

1142

It is generally considered that the problems of transition involve two distinct though closely interdependent elements: the necessary economic adaptation and the impact on incomes. These two aspects are obviously of concern to transport. Any change of system may require some adaptation of inland transport itself, particulrly if such change affects the conditions of competition within and between the modes of transport. Moreover, any change in the system of inland transport is likely to influence both national and international conditions of competition in other sectors of the economy, because it usually affects the relative costs of transport either of competing products or of the same products manufactured in different places. In addition to these economic repercussions, and often because of them, a change in the transport system may appreciably affect distribution of incomes. One example will suffice to illustrate this. If an end was made of the restrictions on road haulage capacity now applied in many countries, the value of licences — sometimes very high at present — would fall to practically nil.

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Because these transition problems are imminent and manifest, they tend to play an important and sometimes even a determining role in political discussions on the choice of systems. However, from the angle of optimum resource allocation it is doubtful whether these problems, though certainly very important in themselves, should be a decisive factor in the choice of a transport policy. In particular, the argument that any change of policy would entail a "loss of capital" for society which would reduce the advantages accruing from the proposed reorganization appears to be incorrect if the reorganization conforms with the criteria of optimum resource allocation.

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These criteria imply that reorganization (2) should be carried out if — and only if — the sum of all discounted future benefits is higher than the sum of future costs, including all readaptation and conversion expenditure, the difference being maximum. When such is the case, the reorganization is desirable from the point of view of society even if it lowers the market value of some durable equipment.

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In actual fact, a reorganization which is desirable in the interest of society could cause a "loss of capital" in the accounting sense. But this is not a valid economic reason for preventing such a reorganization. If, in order to avoid this "paper loss", the reorganization is not carried out, the books will naturally show no loss, but the economic waste to the detriment of society will continue.

1146

Furthermore, it would be economically harmful to try to protect the value of existing durable equipment by imposing minimum prices. Falling prices ensure that this equipment is used for as long as it makes a positive contribution to the economy, and are an incentive to reorganization as soon as it ceases to do so. Sectors affected by reorganization will continue to use their durable equipment for as long as the revenue from it covers the direct cost of utilization, which includes costs of operation and maintenance. In this case the "loss of capital" for society will only be a paper one (i.e. the value of the durable equipment will decline), not an economic one. If, on the other hand, revenue over a relatively long period is insufficient to cover direct costs of use, the equipment will be abandoned or sold at a price corresponding to its value in the best possible alternative employment. It should be repeated that this does not mean a "loss of capital" for society, since a decline in operations shows — if total demand has not decreased — that alternative facilities are apparently available to users at a price below the cost of operating the existing equipment.

1147

Accordingly, from the angle of optimum resource allocation, adaptation to a change of system does not present any fundamental economic difficulties but only technical and social ones. Such adaptation may elicit a new pattern of activity in several sectors of the economy — a process which can be facilitated and speeded up by various measures, particularly

(1) In addition we must stress that the policy we have suggested as regards transport services takes account, in its principles, of the diversity of the existing situations.

(2) Consisting, for instance, in closing down a railway line, abolishing quantitative restrictions, etc.

in the field of information and vocational retraining. But the real problem is not here; it is in the redistribution of incomes resulting from a change of policy (1). We have already given an example to illustrate this, and it would be possible to quote many others.

1148

Once the real problems involved in changing from one system to another are admitted to be linked with the possible impact on incomes, the nature of these problems and their practical effects on the policy choice appear in a new light. The importance of the social consequences is undeniable; but from the purely economic angle they are only an essential element at a second stage in the choice of a transport policy. They then entail measures to mitigate any harmful effects on the social plane, and such measures must as far as possible avoid hampering the process of adaptation (2).

1149

Only when measures which are neutral from the angle of optimum resource allocation are impossible can the choice of a transport system be influenced by the problems of transition. But it should be remembered that if the aim is a policy to integrate European transport there is no room for choosing between change and maintenance of the status quo. In view of the differences existing in this field between the various Community countries, and whatever the final policy may be, certain modifications are inevitable if it is desired that the organization of inland transport in the EEC shall be based as far as possible on coherent economic principles (3).

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(1) It must not be forgotten that a gradual and cautious development of State transport policy is of decisive importance in this context. It is in the light of a certain conception of transport policy that enterprises take decisions which bind them for a long time.

(2) See Subsection 25.41.

(3) We speak of "coherent" and not of "uniform" principles deliberately here, because many people think that a Community organization of transport should always entail the application of uniform principles or even rules, whether the situations concerned are identical or not. However, the only reasonable solution is to apply principles and rules which, given the diversity of situations, enable the general objectives to be attained in the most effective way.

CHAPTER 34

THE APPROACH SUGGESTED

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1. In this final chapter we shall not try to sum up Part III of our report. Such a summary could make our suggestions sound too categorical, whereas we have emphasized throughout that the necessary decisions will in many cases be determined largely by facts at present insufficiently known and also by political considerations which it is not for us to judge. The sole aim of these final remarks is therefore to point to a few general lines which emerge from our analysis and which we consider significant for an understanding of the types of solution we suggest.

1151

Our whole analysis rests on the argument that any solution must be practicable and based not on abstract and preconceived ideas but on the actual situation of the transport market. In this respect, as in many others, our analysis is in close harmony with both the spirit and the substance of the initiatives already taken regarding the common transport policy.

1152

2. From the twofold viewpoint of optimum resource allocation and practical procedure we have come to the conclusion, in respect of both infrastructure and transport services, that prices and price limits cannot properly be determined solely on the basis of costs. Admittedly, costs are a necessary element of any policy, but consideration of them alone is insufficient. Calculation of prices on the basis of costs means adopting conventions for apportioning the costs among the many types of services supplied by means of the same factors of production at different periods and in varying situations of capacity utilization. In the transport field, where there is no possibility of storing production, demand must be taken into consideration for determining prices in conformity with optimum resource allocation. This applies both to infrastructure and to transport services. It follows that price calculation on the basis of cost alone is faced with a fundamental dilemma. Either such a calculation must make use of certain conventions for cost imputation, in which case the demand situation cannot be fully allowed for and there is a conflict with the criteria of optimum resource allocation; or an endeavour is made to integrate the demand situation into the calculations, and the method then becomes practically unworkable.

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For these reasons, and for others stated in more detail in the preceding chapters, we have based our analysis neither on the calculation of cost nor on the definition of certain conventions for their imputation. On the contrary, we have tried to find working procedures which, although adapted to the real situation of inland transport, are calculated to lead to a situation in which the conditions corresponding to an optimum allocation of resources are realized as satisfactorily as possible.

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3. The implications of this approach are particularly evident in the field of infrastructure. It is too often thought that the fundamental question here is how to impute costs, i.e. to determine appropriate scales by which the total cost of infrastructure, however this may be defined, can be apportioned in time and between the different categories of users. We consider that such a solution is not economically justified. The basic question is not how to impute a given amount of costs, irrespective of their definition, but to implement procedures which can yield correct decisions.

1155

Two types of distinct though closely related decisions may be distinguished. The first concern investments in infrastructure, and the second its use. The very nature of infrastructure investments, and particularly the close economic interdependence between the different parts of an infrastructure network and between competing networks, raises the problem of centralization of decisions. We have pinpointed criteria for investment and proposed procedure for co-ordinating decisions on the different modes of inland transport. This procedure includes participation, or at least consultation, of all interested parties in an appropriate institutional framework like that envisaged on a more general plane for the medium-term economic policy in the Community.

1156

As regards charges on infrastructure users, the first problem is to fix these in such a way as to achieve optimum utilization of the infrastructure. If it were possible to apply procedures for infrastructure investment decisions which would shield the latter against all pressure groups, the most suitable system for fixing prices for utilization would obviously be the practical one of economic charges. This system is in no way based on apportionment of the "total

cost" of infrastructure; the prices comprise simply the direct cost caused by the user and a scarcity price when the infrastructure is fully utilized. All methods of apportioning "costs" are arbitrary, and for this reason they are probably both incompatible with optimum resource allocation and hardly likely to furnish a basis for agreement. On the other hand, the system of economic charges, while being sufficiently practical, conforms as far as possible to the criteria of optimum resource allocation.

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The investment decisions may, however, be subject to pressures of various kinds, and these essentially social and political considerations may lead to the requirement of budgetary equilibrium being imposed on infrastructure. We are obviously not in a position to judge such considerations, which depend to some extent on facts insufficiently known and for the rest are a matter of political appraisal. However, generally speaking it seems evident that the decision whether or not to impose the additional requirement of budgetary equilibrium depends on the features of each individual case. As regards the infrastructure of underdeveloped regions and local networks, the verdict appears to be clearly against imposition of this balanced-budget requirement.

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If the requirement is imposed, the question arises of how the total amount to be borne by infrastructure users should be defined, and how it should be broken down between the different categories of users. Here again we have suggested a pragmatic approach. We have given special attention to the variants of budgetary equilibrium which would provide an effective barrier against pressure groups without being unnecessarily complex and without unduly jeopardizing optimum resource allocation, i.e. the best use of infrastructure. Here too we came to the conclusion that an allocation of costs is useless. Taking account in particular of the fact that, in every system of budgetary equilibrium, extensive equalization of charges is necessary and desirable, such an allocation is an unnecessary complication; it is hardly practicable because of the many calculations it entails, and it imposes an excessive constraint on infrastructure prices to the detriment of the objectives pursued.

1159

4. Our analysis of the pricing of transport services has been guided by the same considerations, i.e. the need to define a workable system and to base all policy on the real situation of the transport market. Whenever effective and correctly functioning competition exists, it is an incitement to efficiency and a powerful stimulus to technical progress and speedy adaptation to change. But it can only function properly in an appropriate institutional framework, and this implies harmonization of the conditions of competition. Competition must be supplemented by social policy measures and restrained whenever its free play yields results conflicting with the criteria of optimum resource allocation. In the transport services field these results may be, in particular, uneconomic competition and the abuse of dominant positions. Any policy for inland transport must take account of such situations and include suitable measures to combat their undesirable effects.

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When examining the various possible policies we met with one difficulty, i.e. the facts about uneconomic competition and the abuse of dominant positions are not sufficiently known to justify a judgment on whether these situations are relatively common or, on the contrary, exceptional. This is why we have proposed a procedure which would enable the authorities concerned to obtain the necessary information and, guided by this, to set limits to the freedom of competitive prices whenever uneconomic competition or abuse of dominant positions can actually be observed.

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Such a procedure is justified for a further reason, i.e. because any common transport policy can be implemented only gradually, in view of the diversity of the initial situations as regards both the pricing of transport and the external conditions of competition [1]. A bracket rate system seems to be a suitable instrument for achieving this gradual evolution. Implementation of all the necessary measures depends chiefly on the political will of the Member States. However, from the technical and economic points of view, we consider that this process can be achieved within about twelve years.

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Our indications concerning the transition period are only scanty, and do not claim to answer all the questions arising in this connection. The institutional problems, in particular, have only been partially tackled. This does not mean that the Community's transport policy must not include the establishment of appropriate administrative bodies and tribunals during the transition period. On the contrary, it will be necessary to obtain numerous statistical reports, to introduce regulations and administrative procedures and, finally, to impose economic sanctions in order to ensure the efficient and uninterrupted execution of the transport policy. Whatever that policy may be, such arrangements seem necessary if it is to conform to the criteria and objectives fixed by the Community institutions.

[1] Tax systems, social arrangements, other systems of charging for the use of infrastructure, etc.

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But our task was only to examine the substance of the transport policy as economists, and we are not competent in legal and institutional matters.

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The approach we suggest is extremely pragmatic and does not provide any general "open Sesame" for determining price limits. We think we have shown that such general solutions would not be appropriate. They are not necessary in the transition period, since the procedure of gradually widening the margin available for price formation in a competitive framework starts from given tariff systems. Hence no criteria for fixing price limits are needed except in specific cases where uneconomic competition or abuse of dominant positions actually appear, and here they are always needed. Moreover, any general application of price limits to all transport services also conflicts with the criteria of optimum resource allocation. Optimum prices for transport services, like those for the use of infrastructure, cannot be determined simply on the basis of costs, and any attemps to take account of all the relevant demand factors renders all systems of calculated prices or price limits impracticable.

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For those reasons, and allowing for the fact that a certain element of appraisal and judgment is inevitable in fixing suitable price limits, we have proposed an institutional procedure to detect actual situations of abuse of dominant positions and of uneconomic competition and to determine and impose specific price limits in all the cases found. According to this proposal, any party which considers itself injured by the price policy followed by one or more carriers could ask for a price limit to be imposed. The applicant would have to justify his allegations, and if his application were rejected the costs of the action would be charged to him. This would appear to be necessary to prevent a flood of such appeals. In judging each case, account would have to be taken of a great number of factors, in particular the marginal cost of the transport operation considered and other cost components, the demand situation, utilization of capacity, etc. It is impossible to define generally valid practical rules for determining price limits, and hence the procedure proposed has the advantage of enabling the authorities to base their decisions and any measures they may take on the actual facts of each case. The intervention of the interested parties is an essential element of the procedure.

1166

We believe that this general approach can supply a serviceable framework for a system of pricing in inland transport which combines the advantages of competition with the necessary guarantees against abuse of dominant positions and uneconomic competition. It might be necessary to supplement it by various measures concerning access to the market and transport capacity. Since our terms of reference specified that we were to concentrate particularly on tariff policy, we have not studied these measures in detail. We have nevertheless become convinced that the strongly restrictive licensing systems which various countries at present apply, particularly in road haulage, are difficult to reconcile with the criteria of optimum resource allocation. These restrictions could be reduced gradually to the point at which control would cease to be unduly restrictive. This point could be recognized in particular from the fact that once it was reached the market value of licences would not deviate substantially from nil [1].

[1] Naturally, this overall view of the general lines of Part III is given here only for the sake of convenience. For any details of application or interpretation, reference should be made to the analysis in the preceding chapters.

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This report presents no overall conclusions nor, as conceived, could it present any. There are two main reasons for this.

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Firstly, it deals with the subject chiefly from the point of view of economic efficiency. But, however important this aspect may be, other objectives can be pursued at the same time. The attainment of such objectives may more or less depend on the existence of an efficient economy, but this does not alter the fact that they cannot be considered identical with concern for efficiency. Hence, since other objectives may be pursued, notably on the social and political levels, it was impossible for the authors to conclude in favour of any specific policy.

1169

Secondly, viewing the matter again solely from the angle of economic efficiency, the report clearly shows that in practice no policy could fully satisfy all the conditions of optimum resource allocation. For example, the rule of budgetary equilibrium will to some extent jeopardize optimum resource allocation, since the prices established under this rule are not optimal. But the rule appears essential if sufficient pressure is to be exerted in favour of that minimization of costs without which prices, whatever their level, lack their full economic significance. This is only one instance among many which have been discussed in this report.

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On the economic level alone a compromise between conflicting desiderata is therefore indicated, and this can only result from an appraisal of the empirical data supplied by observation. Moreover, this compromise must take full account of the various objectives pursued, in particular those of a social and political nature.

1171

Although the report does not and could not submit any general conclusions, we feel that it constitutes a useful instrument of analysis and that — again, solely from the economic angle — it gives a certain number of limited judgments and conclusions which could perhaps facilitate the definitive choices.

1172

This study is presented and was planned not as an academic exercise but as a project of operational research geared to finding practical applications. The object was to furnish, in the light of the available information and within a given time, an opinion on tariff policy in transport. These conditions explain the manifest limitations of the report as regards the subject dealt with, the context in which it is placed, and the partial conclusions submitted. They also justify the pragmatic approach which is one of its essential proposals for the implementation of any policy. Although it does not submit any overall conclusion it does offer suggestions for analysing facts and working out the requisite policy in each period from the information obtained during the preceding phase.

1173

Finally, on the practical level, we would like to emphasize that, in so far as a policy aiming at efficiency is pursued, it can and must be applied differently in each specific case. For instance, it is quite possible that a policy of balanced budgets may in fact be the most suitable for one part of the transport economy, while a policy founded on the practical system of economic charges could present essential advantages in another case. Nothing would be more erroneous than to imagine that the practical details of a policy ultimately directed towards optimum resource allocation must necessarily be the same in the different parts of the transport economy.

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[1] The numbers are those of the paragraphs in the Report. Those in heavy type relate to the paragraphs containing the most important information on the subject or the definitions of the terms.

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