

May/2001

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ISSN: 1025-9384

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# IPTS

**REPORT**

EDITED BY THE INSTITUTE FOR PROSPECTIVE TECHNOLOGICAL STUDIES (IPTS)  
AND ISSUED IN COOPERATION WITH THE EUROPEAN S&T OBSERVATORY NETWORK



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EUROPEAN COMMISSION  
Joint Research Centre

ENGLISH VERSION

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PUBLISHED BY THE EUROPEAN COMMISSION  
Joint Research Centre  
ISSN: 1025-9384  
Catalogue Number LF-AA-01-054-EN-C  
DEPOT LEGAL: SE-1937-95

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**PRODUCTION**

CINDOC-CSIC/L&amp;H Spain

**PRINT**

Graesal

**TRANSLATION**

CINDOC-CSIC/L&amp;H Spain

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**THE IPTS REPORT**

is published in the first week of every month, except for the months of January and August. It is edited in English and is currently available at a price of 50 EURO per year, in four languages: English, French, German and Spanish.

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## C O N T E N T S

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**2 Editorial. Promising Change to Mobilize Energies: the Macro Level****Transport****4 Port Development and Competition Issues**

Technological developments and global competition are making the port sector more capital and technology intensive. This is encouraging ports to forge alliances and merge into ever larger groups, with possible repercussions for future competition in the sector.

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**Environment****16 European Stratospheric Research: Present and Future Challenges**

A number of important changes in atmospheric composition can be expected over the next few decades. The European stratospheric research programme, working within the framework of the European Research Area, is monitoring these changes and its findings have already produced policy-relevant insights.

**Information and Communication Technologies****24 Society and Technological Infrastructures: Examples from the Past, Hints for Future Policies**

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(such as caricature and oversimplification). Two examples which stand in many ways as opposites were Ronald Reagan's 1980 caricature of activist government, which captured the mood of the US public at the time: "What are the most frightening words an American can hear?" "Hello, I am with the government and I am here to help you" ... Twenty years earlier John Kennedy's famous: "ask not what your country can do for you, ask what you can do for your country" found very receptive ears in a prosperous and optimistic country at a prosperous and optimistic time.

Ideally, however, mobilizing human energies should involve more than merely sound-bites expressing existing hopes/frustrations in condensed form. As in the case of firms and the introduction of technologies, success involves suggesting an appropriate vision, charting a feasible course towards it, and building the social and political consensus, which will sustain the boat on its course. But indirectly the importance of consensus building has brought us back to the science and governance nexus which we have discussed in the past and will occupy us again in our next issue.

The analysis that follows concentrates on three main issues of policy relevance:

- The technology-driven factors that stimulate the transformation of the operational environment of ports.
- The competition issues that arise from the consolidation of the port sector.
- The limits on state intervention in the context of EU port policy.

### Technological and organizational trends

The 1990s witnessed the rise to dominance of container transport worldwide. What was once a trade limited to a handful of large seaports is now the main activity of the majority of seaports and an increasing number of inland ports (i.e. ports on inland waterways). Containerized goods now account for the bulk of international maritime trade, and container traffic represents the main source of income and profits for the majority of ports. So much so, that in practice the number of containers moved has replaced total cargo throughput as the measure of a port's activity, size and importance.

The dominance of containers has stimulated a continuing trend towards larger containerships. The newest generation of containerships have capacities of over 6000 TEU<sup>1</sup>. The purchase of such vessels, along with the terminal infrastructure and equipment needed for the port to be able to serve them, brings economies of scale but requires significant capital investments that only large shipping companies or large ports can afford. In addition, the efficient operation of containerships is economically feasible only if a small number of ports are used as central hubs for an international shipping network. An extended system of feeder services that connect the hub ports with feeder ports and inland distribution systems is required for the system to operate efficiently.

Optimizing the operation of the whole transport chain also entails the use of advanced information and communication systems such as tracking and tracing applications, Electronic Data Interchange (EDI), scheduling systems, etc. Most of these applications give optimum results if used by all actors in the transport chain; moreover, these systems often use proprietary technologies. The use of common information and communication technologies along the whole length of the transport chain is a driving factor for cooperation between transport service providers and the formation of strategic alliances.

Another main factor affecting the organizational characteristics of modern ports is the globalization of the port community. Port services address the world market in this highly competitive context. Given the extensive use of information and communication technologies and the fact that the Internet allows producers, shippers and consumers to access information with minimal delays, port hinterlands can no longer be considered captive and the role of the port in the market cannot be considered to be immutable. On the contrary, in order for a port to survive competition it would seem to be essential for it to adopt the practices followed by the leading actors in the freight transport and other industrial sectors.

The organizational culture of modern ports has also changed with the changing perception of their role in the supply chain. The leading port authorities in Europe, of which Rotterdam is a typical example, are in practice not simply port operators but logistics services providers. As already mentioned, modern ports have become integrated with the other elements of the freight transport system and their role cannot be easily distinguished from the seamless services offered to the actors at the two ends of the chain. The concept of the port itself is also becoming vague;

*The predominance of containers is making the investments in containerships and infrastructure that companies need ever greater, thus favouring large companies that can afford the capital outlay and so benefit from the economies of scale*

*The use of common information and communication technologies along the whole length of the transport chain is another factor encouraging cooperation between transport service providers and the formation of strategic alliances*

*The organizational culture of modern ports has also changed along with their role in the supply chain. The leading port authorities in Europe are increasingly logistics services providers rather than simply port operators*

the already extensive operations of the Danish company, will form a giant that will control a large share of international container traffic.

The integration of transport chains and the application of new technologies are in principle beneficial for users, since they increase the quality of transport services and can lead to cost reductions. But, on the other hand, the need for an efficient operation of the extended transport networks implies that in the future the actors in the field will be fewer in number and larger in size. This raises the question as to whether this will make it possible for a company, or a group of companies, to acquire near-monopoly control of the market.

Theoretical and empirical research results suggest that the benefits from the improved operation of the transport system can outweigh the potential risks that may result from the market being controlled by a small number of players. The standardization and optimization of transport services, which to a large extent are stimulating consolidation in the port and shipping sectors, increase efficiency and so are beneficial to users. However, consolidation also entails the risk of the small number of participants that remain in the market indulging in collusive pricing, for instance, and thereby distorting market conditions.

Policy intervention may therefore be required to ensure that such a risk is minimized. Especially since transport activities are being deregulated at national level and the globalization of economic activities is becoming more pressing for the transport sector, the need for suitable legislation at EU level is evident. However, four main conditions have to be met in order for competition to remain healthy and lead to short- and long-term benefits for both users and the port sector:

- The number of actors remaining in the market and their respective market shares should be

such as not to encourage or allow monopolistic practices to arise in relation to prices or services offered. This condition should be satisfied as regards the number of actors operating on both a global scale (e.g. mega-carriers offering world-wide coverage) and at the local level, such as port operators or shipping lines serving a particular area.

- The entrance of new competitors in the market should not be limited by the existing competitors' effective control of the market. Access to port infrastructure should be guaranteed for all potential users, shipping lines and terminal operators.
- Users should be able to enjoy a fair share of the benefits, in terms of price and quality of service, that result from the consolidation of the market. New mergers and acquisitions should not harm users' interests.
- The competitive environment should be such that it promotes the adoption of new technologies. In a market controlled by a few large players, competitive pressure could eventually stop being intense enough to stimulate innovation. At the opposite extreme, a dispersed market of small actors would not be competitive enough and port operators would probably lack the necessary funds to invest in new technologies.

The European Commission is already working on measures aimed in this direction. Current EU competition policy comprises three main areas, namely restrictive agreements and practices (antitrust), the regulated or monopoly sectors and state aid. In particular, restrictive practices include certain types of vertical agreements and/or distribution systems and unjustified refusal to allow third parties non-discriminatory access to essential infrastructure.

*The integration of transport chains and the application of new technologies can increase the quality of transport services and lead to cost reductions. However, over-concentration can lead to monopolistic behaviour and price mark-ups*

*For competition in the port sector to remain healthy the number of actors in the market needs to remain sufficient to avoid monopolistic practices arising and the incumbents should not be able to prevent new competitors from entering the market*

## Keywords

Ports, transport, competition, state intervention

## Note

1. TEU: Twenty feet Equivalent Unit (the standard measurement of container traffic)

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Transport

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...technological matters.

## Research and growth

A large part of economic growth is explained by increases in total factor productivity. In simple terms, this means that the same inputs (i.e. labour and capital) can be combined more productively to generate output. The way this is achieved is through the innovations that allow us to combine the same basic inputs in ever more efficient forms. The direct role played by research in this simplified model is that it creates the knowledge on which such innovations increasingly often rely. Some of the knowledge produced by research may find its way into products after undergoing further refinements (and investment) in the development phase of the cycle. However, the creation of such knowledge may in practice be hindered by the fact that incentives have to be limited, so as to allow benefits from inventions or discoveries to accrue to society as a whole; after a reasonably short period of time, rather than to an individual inventor.

The results of basic science are usually sufficiently removed from immediately market-

able results for it to be conducted in academic settings where ideas are exchanged freely and both the private sector and other researchers can benefit from them. At the other end of the spectrum, development work with obvious immediate market impact is usually undertaken or funded by individual firms. What has at times proved more difficult is funding efficiently intermediate types of research.

Turning ideas into concrete products is generally protected by patent and other intellectual property rules, which provide a mechanism whereby firms can recoup their investments through the unchallenged exploitation of their innovation thanks to temporary monopoly power over it in the market place. Obviously the balance between the interests of consumers and of producers has to be watched closely and is not always without friction (witness the recent developments in biotechnology and pharmaceuticals).

However, as we signalled in Issue 12 of the IPTS Report (Kyriakou, 1997), there is potentially a grey area between basic research at one end of the scale and product development at the other encompassing problems that have an impact on an industry as a whole (and not merely individual firms) where research is needed to deal with certain bottlenecks in translating ideas into marketable results, but is often not forthcoming given the difficulty the firms investing in it have in securing the benefits of their investment to themselves. Indeed, although individual firms might in fact benefit from undertaking the research at their own expense (despite the possibility of "free-riders" in the industry getting the benefit without the investment) they may be encouraged to wait to see if one of their competitors will take the first step, with the possible outcome (if all the firms apply the same reasoning) that the industry as a whole is held up.

*Research is sometimes needed to deal with certain industry-wide bottlenecks but is not forthcoming because an individual firm cannot see how it will recoup its outlay if solutions are available to all firms*

sales and the tax rate decided upon, the allocation of each firm's contribution to each of the various IIBs set up in the sector is for it to determine – i.e. it would be able to decide what proportion to devote, for instance, to the design IIB, safety IIB, testing IIB, etc.

Equally important is the fact that there is an element of competition between IIBs. If firms are not satisfied with the performance of a specific IIB they can start a new one, either addressing the same issues or issues the firm(s) starting it consider more relevant. If disappointed, firms could vote to abolish any or all their IIBs and rescind the tax.

### Past examples of similar approaches

Although the IIB proposal is as yet untested, it is not without precedents. One of the oldest forerunners exists in the USA as a result of the enactment of the Agricultural Marketing Agreement Act of 1937. This act provided for setting up 'marketing orders', given a two-thirds majority approval and periodic referendums (every 6 years) to gauge continued support. Although marketing orders were also used as vehicles for output restrictions, about three quarters of them collect funds for R&D and market promotion. What they lack compared to the IIB proposal is the provision for free entry of new boards and the possibility of competition among them.

The most obvious, and possibly most successful example of an idea of this kind is that of Bell Labs in the USA, which was supported by payment of a small percentage of the revenues of operating companies to AT&T. To the extent that this 'support' was permitted by the regulators to be part of the rate base of operating companies, the government, in effect, sanctioned a tax to be used for industry-wide research. Since AT&T controlled the vast majority of the operators, free-riding behaviour was not a problem.

Perhaps the most recent example comes from the US pharmaceutical industry. The US Food and Drug Administration was persuaded to raise the fees it levies when drugs are submitted for approval, so that more evaluators can be hired with the extra revenue, leading to a reduction in the "approval-pending" time.

In Europe similar efforts have also been undertaken. These include cooperative research projects dedicated to industrial sectors, using a bottom-up approach and taking ideas for research projects which reflect the needs of the industry. Industry commonly finances cooperative research, in some cases with the help of public co-sponsorship. Research results are available for all participating companies, and they are supposed to be strictly pre-competitive. In some countries such as Germany, Belgium, France and the UK, there are established structures of cooperative research; in other countries efforts depend on more spontaneous actions. Institutional examples include, but are not limited to, the AiF in Germany (The National Body for Industrial Cooperative Research), FEICRO (The European Body for Industrial Cooperative Research), and the EU Commission's CRAFT (The European Programme for Industrial Cooperative Research) (AiF, 1992).

What the IIB approach offers that is new is that all these examples have not included the element of competition between the research entities set up by industries.

Most efforts to date (in Europe and elsewhere) have not included the competition element among such research entities set up by industries. In the examples described here, only one entity has usually been set up per industry, and it therefore exercises an effective monopoly. The multidimensional competition allowed by the proposal presented here is absent in

*Competition between IIBs is an important factor. If firms are not satisfied with the performance of a specific IIB they can start a new one, either addressing the same issues or another issue the firm starting it considers more relevant*

*Possibly the most successful example of an idea of this kind is that of Bell Labs in the USA, which was supported by payment of a small percentage of the revenues of operating companies to AT&T*



The whole process of setting up an IIB begins with an application, which needs evaluated by the relevant official body to assess its merits. This entails a risk of the build up of bureaucracy, and may make it hard to rescind IIBs once they have been created. Safeguards therefore have to be built into the scheme to guarantee the effective right of the participating firms to rescind the tax and abolish the IIBs.

One potential criticism is that, foreign consumers will reap the benefits of the higher quality and/or lower prices which have been achieved thanks to taxes paid by domestic consumers. This could be alleviated if such mechanisms are not limited to individual states. This is one area where the European Research Area (ERA) initiative to create a common European space for research activities can play a key role.

Finally, the location of the R&D centres receiving funding from IIBs is also an important issue. Governments are not likely to be indifferent

to where Bell-labs look-alikes are situated. Furthermore, even if foreign firms participate in the IIB approval and funding process, it is likely that spillovers will most readily benefit domestic research centres rather than foreign ones, giving incentives to countries to adopt the IIB scheme early on. Thus, once started such a scheme is likely to spread quite quickly.

### Conclusion

All in all the IIB proposal deserves attention as it provides a way to empower firms to solve collective action problems of a kind which are bound to emerge when providing industry-specific public goods. The scheme combines both government aspects (taxes to eliminate 'free-riding' behaviour) and market mechanisms (free entry, competing industry investment boards, etc.). Moreover it provides a way of reinforcing the relevance of science, by placing it in contact with practical challenges, without sacrificing the free exchange of ideas and the positive spillovers arising from them.

*To avoid the build up of bureaucracy, safeguards have to be built into the scheme to guarantee the effective right of the participating firms to rescind the tax and abolish the IIBs when they are no longer useful*

### Keywords

R&D, investment, innovation, public goods, collective action

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