eurostat

STATISTICS IN FOCUS
Economy and finance

1995 □ 5

ISSN 1024-4298

THE INTERLINKING OF ECONOMIC BRANCHES

- A comparison between the European Union and Japan based on harmonized Input-Output Tables -

Input-output tables (IOTs) can be considered especially suitable for isolating the linkages between the economic branches. An IOT for Japan 1990, drawn up in accordance with the European System of Economic Accounts (ESA), can be used to study individual economic sectors in comparison with the European Union. A consolidated IOT for the Union for 1990 has also been drawn up[1)], being based on projected tables of the Member States and estimations.

Having 1990 as the reference year means that a rather early period is covered. In view of the comparatively slow rate of change in economic structures, these tables should still give a good picture of the current state of the two economic areas overall. The harmonized IOTs not only provide a comparison of economic areas, but also allow comparisons concerning structural changes over time.

1) Information on the basic aspects of drawing up the two IOTs is given on the last page of the report. For detailed information on how to read and analyse the Eurostat IOT, see: Eurostat, The interlinking of economic branches in the European Union, Rapid Reports, Economy and Finance, N° 2 (1994).

Manuscript completed on = 25.04.1995

For further information please contact: M. UNGAR - M. HEUSCHLING
Eurostat, L-2920 Luxembourg, tel. 4301-34977 / 33575 Fax: 4301-34150

Price (excl. VAT) in Luxembourg: Subscription ECU 240,
single copy ECU 6

Catalogue number: CA-NJ-95-005-EN-C

Basic information in the IOTs

The basic components of the IOTs concern the linkage in intermediate consumption, in the imported intermediates, in the individual components of value added and in the structure of final demand. These can be used to determine several characteristic values by economic area, such as the proportion of wages and salaries in value added, the proportion of taxes at the production stage, the proportion of imports in intermediate consumption, and several others.

Some of the particularly useful information on the structural aspect consists of the backward/forward linkage effects arising from a reduction/increase in production in a given branch on the other branches. These backward/forward linkages can be determined from the relevant data in the IOTs, which give resources (cost structure) in the columns and uses (sales structure) in the rows.

These linkage coefficients represent the degree of linkage by branch, which in each case can be broken down into direct and indirect effects. The overall effect of a variation in production is composed of the effects on the Input side (backwards) and the Output side (forwards). A comparison of these interlinking indicators in the Union and in Japan is given below.

Macroeconomic effects of production variations in individual branches

The linkage coefficients which have been determined from the IOTs for the European Union and Japan 1990 are given in Table 1. Although they are conceptually static, they give a detailed picture of the structure of the two areas at the beginning of the 1990s.

A comparison of the profiles of the macroeconomic effects (Table 1, Figure 1) for the European Union and Japan shows very clearly the quite markedly higher degree of linkage in the Japanese economy. The differences are more noticeable in the industrial than the services branches.

The general effect in Japan is considerably greater in a number of key industrial branches, transport equipment being the most marked. The coefficients[2)] are approximately 3.6 for the Union and 4.7 for Japan, which makes the macroeconomic effect of a variation in production in this branch almost one third greater in Japan. There are also great differences in the electrical goods, paper and printing and rubber and plastics industries.

On the other hand, the differences between mineral products, machinery, office machines etc. and also the foodstuffs and textile industries are not so great. In the building industry, too, the differences are small.

In the services industries the coefficients are greater for Japan than for the Union in wholesale and retail trade and also lodging and catering, but in the transport branches the converse is true.

---

2) These coefficients are very easy to interpret: For example the coefficient of the transport equipment branch for the EU (3,6) indicates, that an increase/decrease of production of one bn ECU in this branch results in an increase/decrease effect of 3,6 bn ECU on the whole economy, being the outcome of the forward and backward linkages.

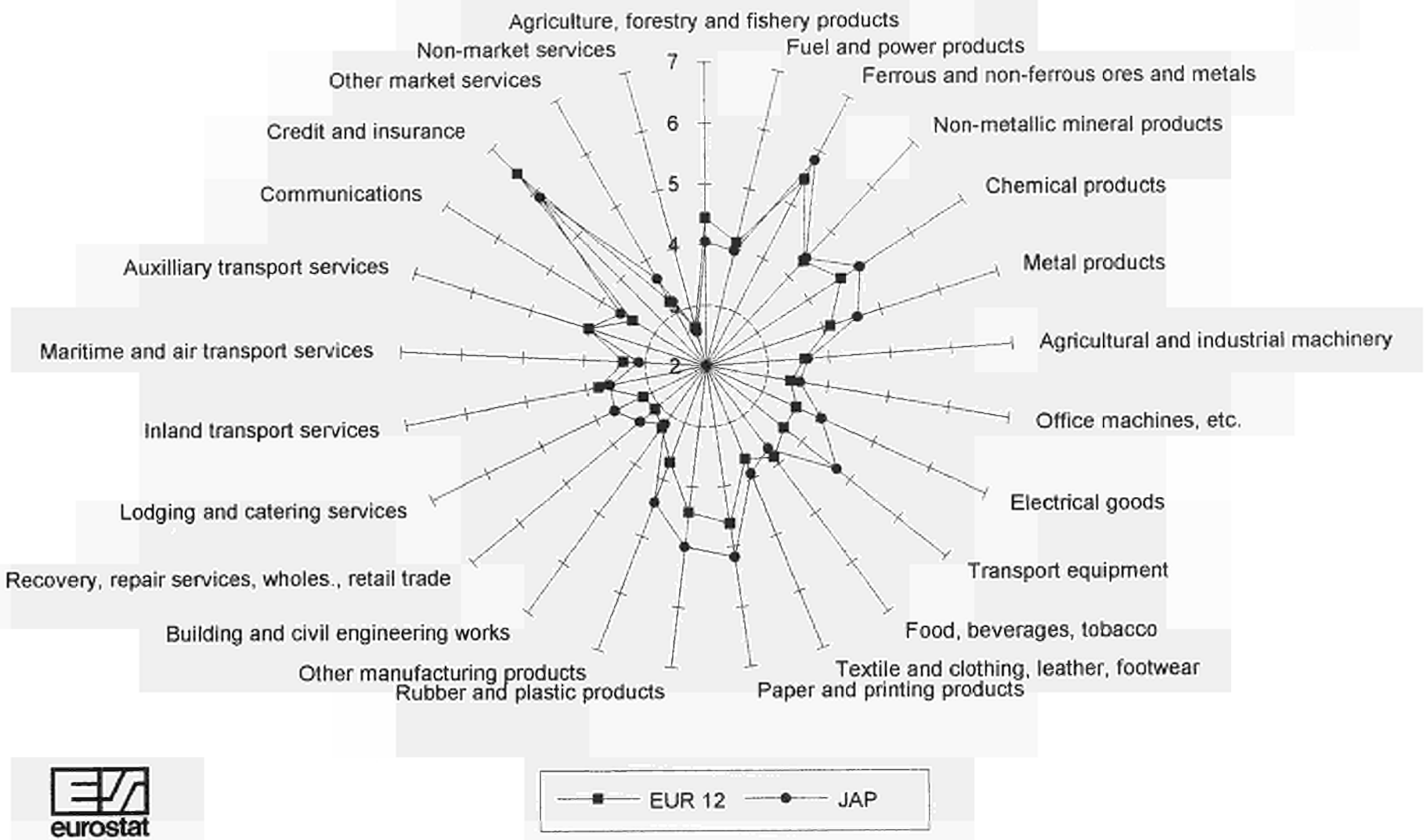
Table 1

Forward and backward linkages of a production variation by branch to the total economy, coefficients* for the European Union and Japan in 1990

eurostat	direct backward linkages		direct and indirect backward linkages		rank		direct forward linkages		direct and indirect forward linkages		rank		direct and indirect total linkage effects		rank	
Branch	EUR 12	JAP	EUR 12	JAP	EUR 12	JAP	EUR 12	JAP	EUR 12	JAP	EUR 12	JAP	EUR 12	JAP	EUR 12	JAP
Agriculture, forestry and fishery products	0.5304	0.3884	2.0620	1.7248	7	17	0.7918	0.7530	2.3822	2.3289	8	10	4.4442	4.0537	5	11
Fuel and power products	0.3696	0.2421	1.6109	1.4100	20	24	0.6932	0.7029	2.4855	2.5373	4	6	4.0965	3.9473	9	13
Ferrous and non-ferrous ores and metals	0.7048	0.6533	2.5027	2.4044	2	3	0.8458	0.9182	2.9707	3.4242	2	1	5.4734	5.8285	2	2
Non-metallic mineral products	0.5296	0.5318	1.9482	1.9653	13	15	0.8502	0.9239	2.4085	2.4565	7	7	4.3567	4.4217	7	8
Chemical products	0.6171	0.6011	2.1871	2.1430	4	10	0.6782	0.8043	2.4433	2.8483	6	4	4.6304	4.9913	3	5
Metal products	0.5193	0.5716	2.0462	2.1897	9	8	0.6365	0.8895	2.0815	2.4095	12	8	4.1276	4.5993	8	7
Agricultural and industrial machinery	0.5335	0.5813	2.0199	2.1927	11	7	0.3482	0.3005	1.6005	1.4690	16	21	3.6203	3.6617	16	17
Office machines, etc.	0.5234	0.6288	1.9309	2.2725	14	5	0.2942	0.1948	1.4641	1.2795	22	23	3.3950	3.5520	19	21
Electrical goods	0.4790	0.6280	1.8997	2.2786	16	4	0.4375	0.4669	1.7211	1.7833	14	19	3.6208	4.0619	15	10
Transport equipment	0.5901	0.7516	2.1515	2.8411	5	2	0.3209	0.4716	1.4687	1.8751	21	15	3.6203	4.7162	17	6
Food, beverages, tobacco	0.6431	0.6044	2.2830	2.1001	3	12	0.3459	0.3318	1.5789	1.5878	18	20	3.8619	3.6879	11	15
Textile and clothing, leather, footwear	0.5564	0.5638	2.0812	2.1053	6	11	0.3562	0.4351	1.5733	1.8095	19	17	3.6545	3.9148	14	14
Paper and printing products	0.5347	0.5585	1.9931	2.0711	12	13	0.7802	0.9081	2.6331	3.1104	3	2	4.6261	5.1815	4	3
Rubber and plastic products	0.5395	0.6083	2.0546	2.2293	8	6	0.7715	0.8747	2.3781	2.7734	9	5	4.4327	5.0027	6	4
Other manufacturing products	0.5339	0.6016	2.0214	2.1673	10	9	0.4220	0.7251	1.6735	2.2390	15	12	3.6949	4.4064	13	9
Building and civil engineering works	0.5049	0.5307	1.9300	2.0288	15	14	0.2032	0.0767	1.3235	1.1531	23	24	3.2535	3.1819	21	23
Recovery, repair services, wholes., retail trade	0.3055	0.3270	1.5166	1.6032	23	21	0.3091	0.4325	1.5824	1.8191	17	16	3.0990	3.4223	24	22
Lodging and catering services	0.4402	0.4721	1.8506	1.8730	17	16	0.1666	0.4000	1.3009	1.7999	24	18	3.1516	3.6728	23	16
Inland transport services	0.4140	0.3051	1.7110	1.5427	19	22	0.5833	0.5463	2.0829	2.0684	11	13	3.7939	3.6110	12	20
Maritime and air transport services	0.4804	0.3946	1.8219	1.6883	18	18	0.2832	0.2170	1.5381	1.4232	20	22	3.3600	3.1115	20	24
Auxilliary transport services	0.3126	0.3609	1.5275	1.6418	22	19	0.7585	0.7139	2.4787	2.3788	5	9	4.0062	4.0206	10	12
Communications	0.1646	0.2102	1.2722	1.3428	25	25	0.6221	0.6656	2.1435	2.2948	10	11	3.4157	3.6376	18	19
Credit and insurance	0.8818	0.7687	3.3024	2.9851	1	1	0.7764	0.7160	3.1211	2.8996	1	3	6.4235	5.8847	1	1
Other market services	0.2023	0.3519	1.3431	1.6393	24	20	0.4864	0.5173	1.8776	1.9998	13	14	3.2206	3.6391	22	18
Non-market services	0.3267	0.2851	1.5625	1.5261	21	23	0.0632	0.0318	1.0919	1.0634	25	25	2.6544	2.5895	25	25

*) intra-branch effects included

Figure 1: Total linkage effects of a production variation by branch to the total economy, coefficients for the European Union and Japan in 1990



eurostat

Only in two branches are the macroeconomic effects much greater in the Union than in Japan. These are the agricultural, forestry and fisheries industries on the one hand, and banking and insurance[3] on the other.

By breaking down the relevant components it can be determined to what extent, if at all, the differences in the degree of linkage between the two trading areas are attributable to the forward or the backward linkage.

Overall, the backward linkage effects (Table 1, Figure 2) on intermediates supplying branches in the Union and in Japan are very close to each other. Exceptions are a few key industrial areas such as machinery, EDP, electrical goods and transport equipment, where the effects are substantially greater in Japan than in the Union.

On the other hand, the forward linkage effects (Table 1, Figure 3) are not only greater than the backward linkages for the most part, but they are also much more varied in structure. In addition, in the Union and in Japan, the forward linkages are often very different in those branches where the backward linkages are quite similar.

In a number of basic industries the higher coefficients for the total linkage effects are very clearly due to greater forward linkage effects. This applies to iron and steel and chemicals, as well as, to a lesser extent, the metal products industry.

The particularly high linkage for transport equipment in Japan is apparent in both the input and the output sides, and the difference from the Union as regards intermediate consumption is even greater. In the electrical goods industry, the greater macroeconomic effect in Japan is generated predominantly on the intermediate consumption side, since the forward linkages are fairly equal.

Machinery and office machines are the only industrial branches in the Union in which the forward linkage effects exceed those in Japan for an output variation. On the other hand, the effects on the output side are much less in the Union than in Japan in textiles and clothing, paper and printing products, rubber and plastic products, and other industrial products.

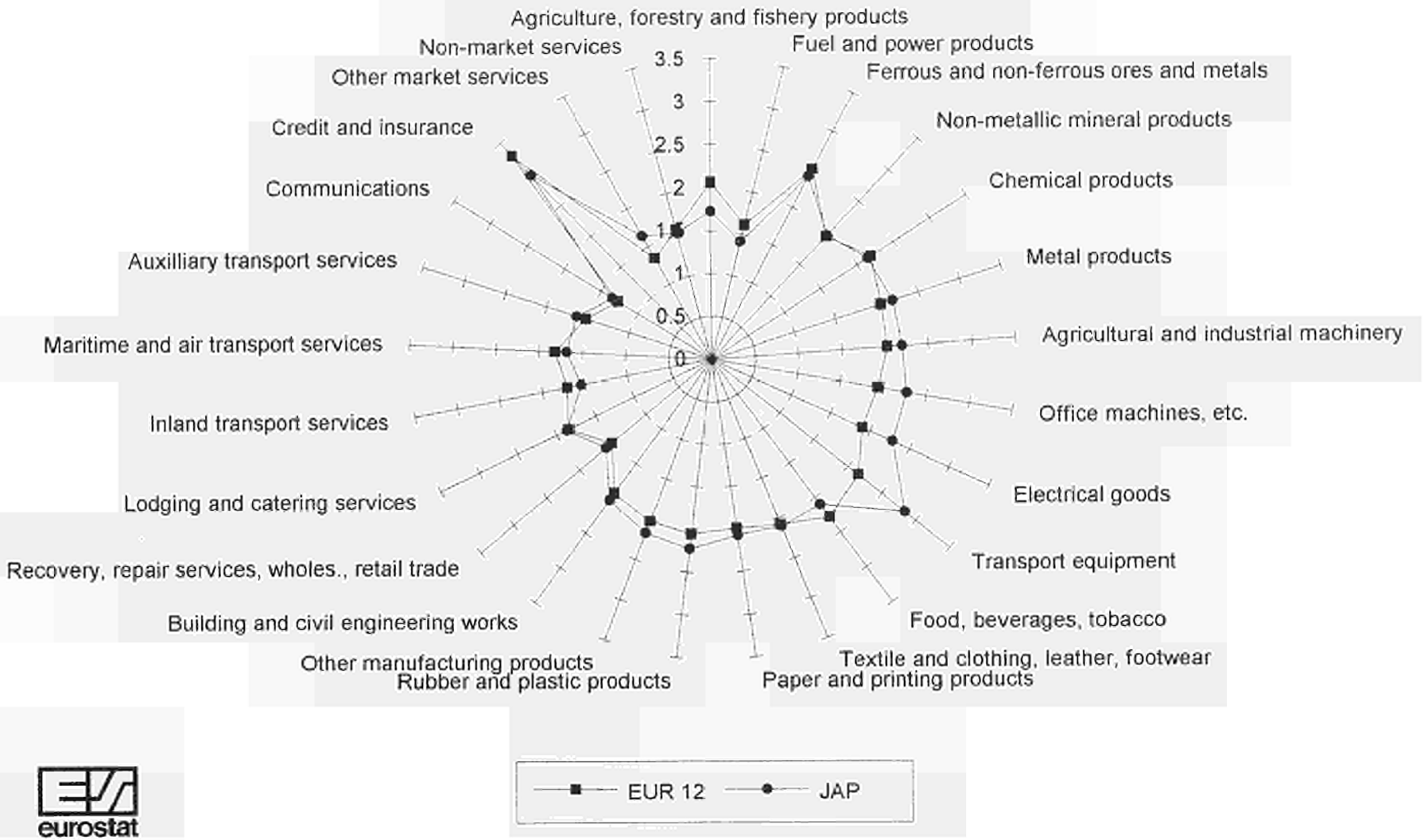
The forward linkages for services are much more differentiated than the backward linkages in wholesale and retail trade and lodging and catering, for which the coefficients for Japan are considerably higher than for the Union. By contrast, the differences in the transport branches are quite small.

Overall, there are some first information concerning the structural decomposition of the very large scatter of the total linkage effect profiles regarding production variation in individual branches. If the differences in the above shown profiles of the backward/forward linkages are measured by the average deviation of the Union's and Japan's coefficients, then they are more marked on the forward side. The average deviation for the total linkage effects is 0,0831 (8,31 %), for the backward ones 0,0459 (4,59 %) and for the forward linkages 0,0553 (5,53 %).

---

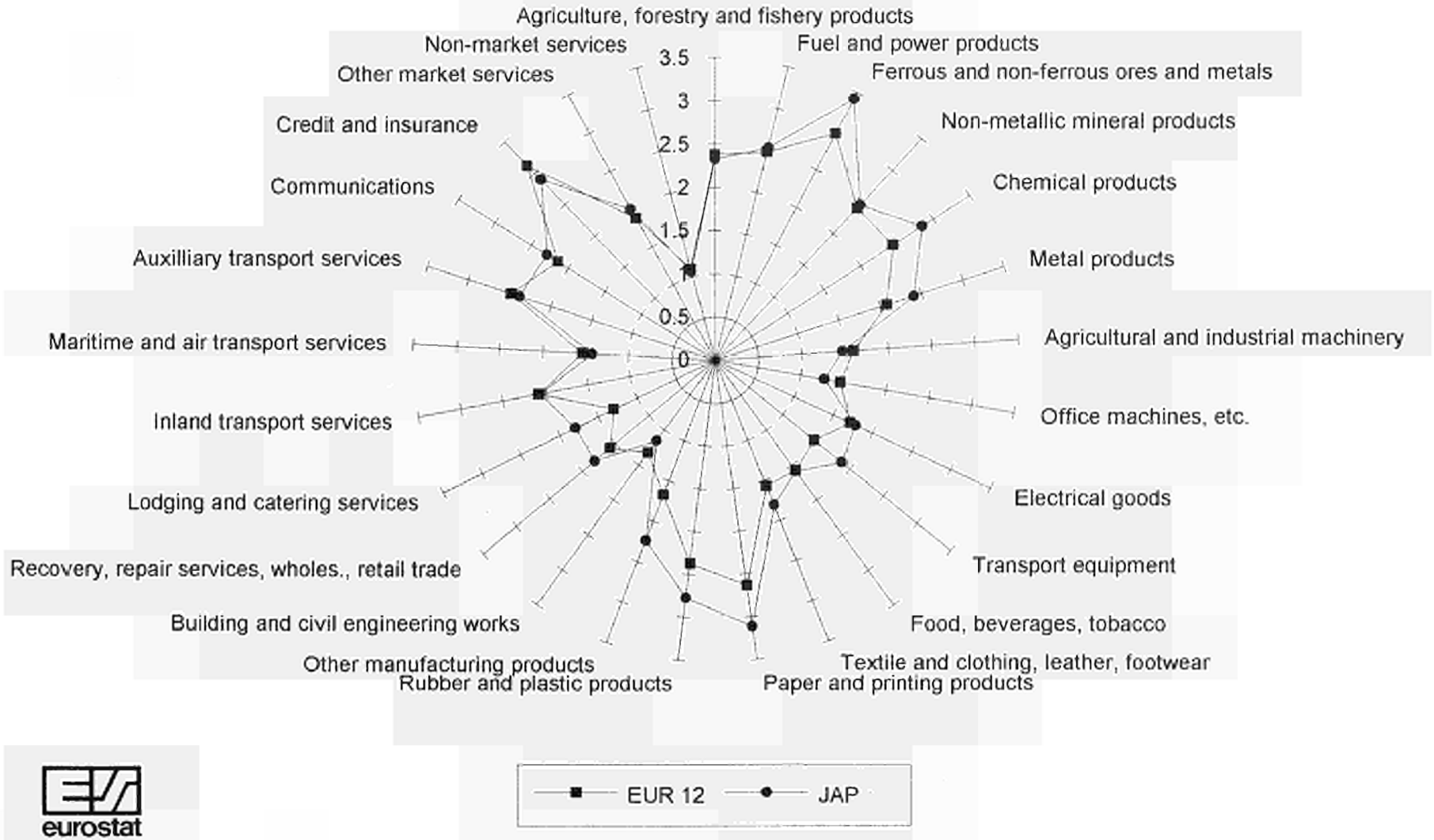
[3] For the credit and insurance branch, the recording of imputed charges as intermediate consumption in the first quarter of the IOT has also an effect on the use components. Due to this special accounting rule in the ESA the coefficients for this branch are not fully comparable to the other ones.

Figure 2: Backward linkages of a production variation by branch to the total economy, coefficients for the European Union and Japan in 1990



eurostat

Figure 3: Forward linkages of a production variation by branch to the total economy, coefficients for the European Union and Japan in 1990



eurostat

But it is precisely in the particularly important Japanese export branches, i.e. machinery, EDP and electrical goods and - most of all - transport equipment, that already the intermediate consumption effects exhibit considerably more linkage.

Structure of intermediate consumption

A major aspect on which the above shown interlinking effects of the branches has to be considered, is the structure of intermediates in respect of their breakdown into domestic and imported ones. As the forward and backward linkages are related to the domestic economy, different linkage effects might be partly a result of different import ratios in intermediate consumption. For example a higher backward linkage effect of one country in comparison with another might be the result of a considerably lower import ratio in the intermediates in the branch concerned.

To shed some light on the questions as to whether and to what extent the above shown linkage effects are influenced by different import ratios, table 2 presents a structural breakdown of the intermediates. For example, the input coefficients show that in agriculture, forestry and fishing in the Union, about 52% of total inputs consist of domestic intermediates and 3% are imported ones. The remainder (45%) are primary inputs such as wages and salaries, social contributions, taxes on production etc.

The comparison of import ratios in total for intermediate consumption shows that in the Union's economy about 5% of the inputs are imported intermediates, which is about one third higher than the ratio for Japan (3,7%). By contrast, the share of domestic intermediates in total inputs is about 8,7% lower in the Union compared with Japan. This results in a 5,6% lower input-share of total intermediates for the Union's economy than the Japanese.

For agriculture, forestry and fishing in Japan, the figures indicate that the share of primary inputs (wages etc.) is about one third higher than in the Union, where the share of intermediates is 54%. The input-share of imported intermediates for the Union is nearly double that of Japan. For fuel and power products the Union's input-share of intermediates is higher than the one for Japan, but the import ratio is considerably lower.

The overview of the input-shares of intermediates and the imported part of them in the industry-branches (table 2, figures 4 and 5) clearly shows that:

- in a number of cases the input-shares of intermediates are substantially higher in Japan than in the Union,

- particularly in these branches, the shares of the imported intermediates are considerably lower in Japan compared with the Union.

In the transport equipment branch, the EU/Japan comparison shows a large difference in input-shares of intermediates, being far lower in the Union for both the total (-16.3 %) and the domestic (-22.4 %) values . By contrast, the ratio of imported intermediates is 250 % higher in the Union compared with Japan. Similar structures, although not marked by such an intensity, can be found for

Table 2

Structural decomposition of intermediates into domestic and imported ones, coefficients for the European Union and Japan 1990

	EUR 12			JAP			Deviation		
eurostat	Intra-EU inter-mediates 1	Imported inter-mediates 2	Total inter-mediates 3	Domestic inter-mediates 4	Imported inter-mediates 5	Total inter-mediates 6	(1)/(4) in % 7	(2)/(5) in % 8	(3)/(6) in % 9
Agriculture, forestry and fishery products	0.5152	0.0288	0.5440	0.3886	0.0146	0.4032	32.6	97.3	34.9
Fuel and power products	0.3701	0.2228	0.5930	0.2451	0.2590	0.5042	51.0	-14.0	17.6
Ferrous and non-ferrous ores and metals	0.6986	0.1066	0.8052	0.6618	0.1057	0.7675	5.6	0.9	4.9
Non-metallic mineral products	0.5303	0.0396	0.5699	0.5366	0.0314	0.5680	-1.2	26.1	0.3
Chemical products	0.6175	0.0798	0.6973	0.5992	0.0788	0.6780	3.1	1.3	2.8
Metal products	0.5193	0.0553	0.5746	0.5690	0.0184	0.5874	-8.7	200.5	-2.2
Agricultural and industrial machinery	0.5356	0.0539	0.5894	0.5805	0.0178	0.5983	-7.7	202.8	-1.5
Office machines, etc.	0.5069	0.0942	0.6011	0.6283	0.0378	0.6661	-19.3	149.2	-9.8
Electrical goods	0.4743	0.0650	0.5392	0.6277	0.0369	0.6646	-24.4	76.2	-18.9
Transport equipment	0.5847	0.0605	0.6452	0.7539	0.0173	0.7711	-22.4	249.7	-16.3
Food, beverages, tobacco	0.6520	0.0639	0.7159	0.6044	0.0694	0.6737	7.9	-7.9	6.3
Textile and clothing, leather, footwear	0.5586	0.0776	0.6362	0.5635	0.0788	0.6423	-0.9	-1.5	-0.9
Paper and printing products	0.5354	0.0692	0.6045	0.5585	0.0368	0.5953	-4.1	88.0	1.5
Rubber and plastic products	0.5327	0.0655	0.5982	0.6083	0.0343	0.6426	-12.4	91.0	-6.9
Other manufacturing products	0.5372	0.0723	0.6094	0.6014	0.0809	0.6823	-10.7	-10.6	-10.7
Building and civil engineering works	0.5076	0.0266	0.5342	0.5307	0.0184	0.5491	-4.4	44.6	-2.7
Recovery, repair serv., wholes., retail trade	0.3054	0.0152	0.3206	0.3270	0.0113	0.3383	-6.6	34.5	-5.2
Lodging and catering services	0.4484	0.0217	0.4701	0.4718	0.0378	0.5096	-5.0	-42.6	-7.8
Inland transport services	0.4141	0.0272	0.4413	0.3051	0.0100	0.3151	35.7	172.0	40.1
Maritime and air transport services	0.4802	0.1949	0.6751	0.3946	0.3010	0.6956	21.7	-35.2	-2.9
Auxiliary transport services	0.3144	0.0145	0.3289	0.3609	0.0109	0.3718	-12.9	33.0	-11.5
Communications	0.1644	0.0191	0.1835	0.2102	0.0049	0.2151	-21.8	289.8	-14.7
Credit and insurance	0.8815	0.0143	0.8958	0.7687	0.0087	0.7774	14.7	64.4	15.2
Other market services	0.2069	0.0083	0.2152	0.3519	0.0150	0.3668	-41.2	-44.7	-41.3
Non-market services	0.3179	0.0179	0.3358	0.2851	0.0096	0.2947	11.5	86.5	13.9
TOTAL	0.4357	0.0493	0.4850	0.4771	0.0367	0.5138	-8.7	34.3	-5.6

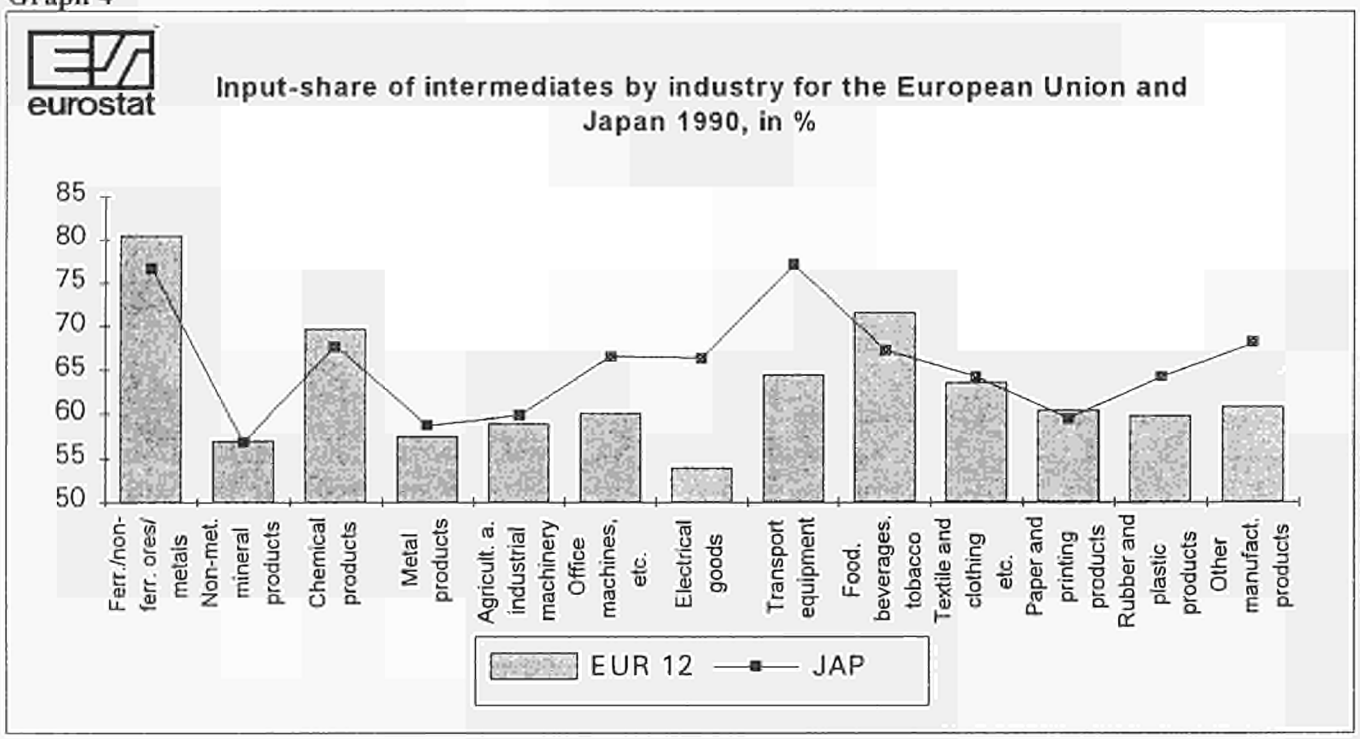
the office machinery and computer branch, as well as for the branch producing electrical goods.

In metal products and agricultural/industrial machinery, the input-shares of intermediates in the Union do not show large differences from those in Japan, but those for the imported intermediates are roughly 200 % higher for the Union.

For the chemical industry as well as for textiles and leather the comparison EU/Japan indicates only minor differences. Considerably higher input-shares for the imported intermediates in Japan may only be found in food, beverages and tobacco and for the group of other manufacturing products.

For market services, (table 2, figures 6 and 7) in some cases the structural decomposition of intermediates are quite similar to those found in the industries, although with a lower degree of intensity. However, for the communications services, the input-share of imported intermediates exhibits an even

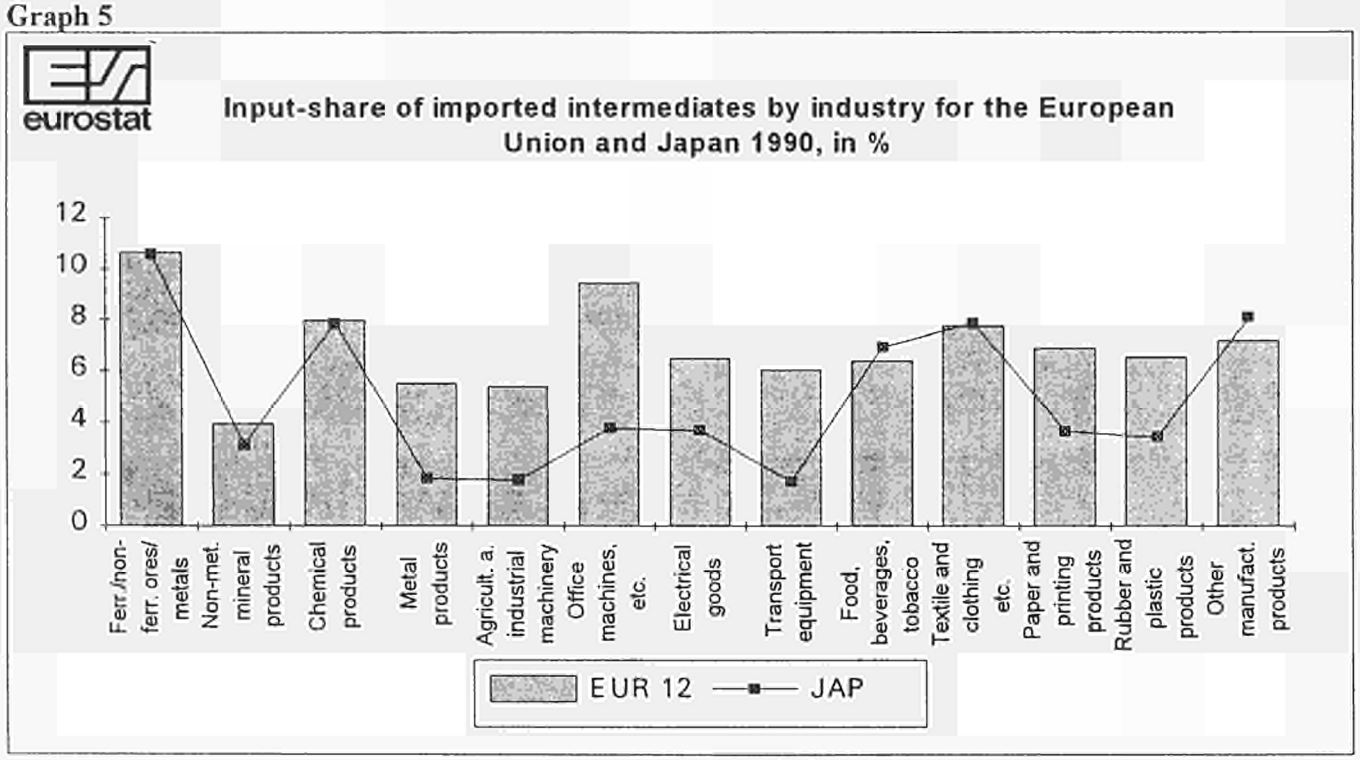
Graph 4



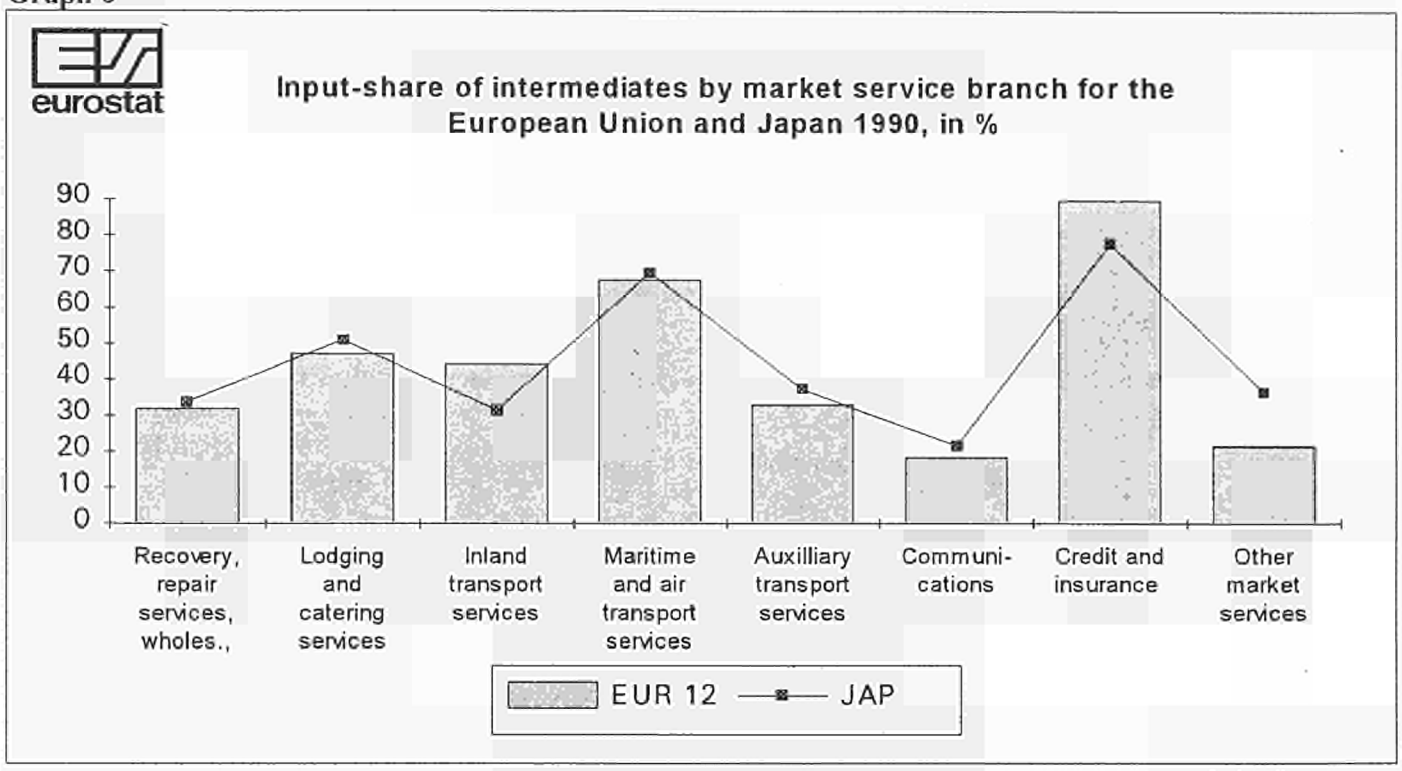
larger difference than in the transport equipment branch, showing an almost four times higher value for the Union as for Japan.

Also for the inland transport services the import share in intermediates of the Union is considerably higher than for Japan (+172%). Significant lower

Graph 5

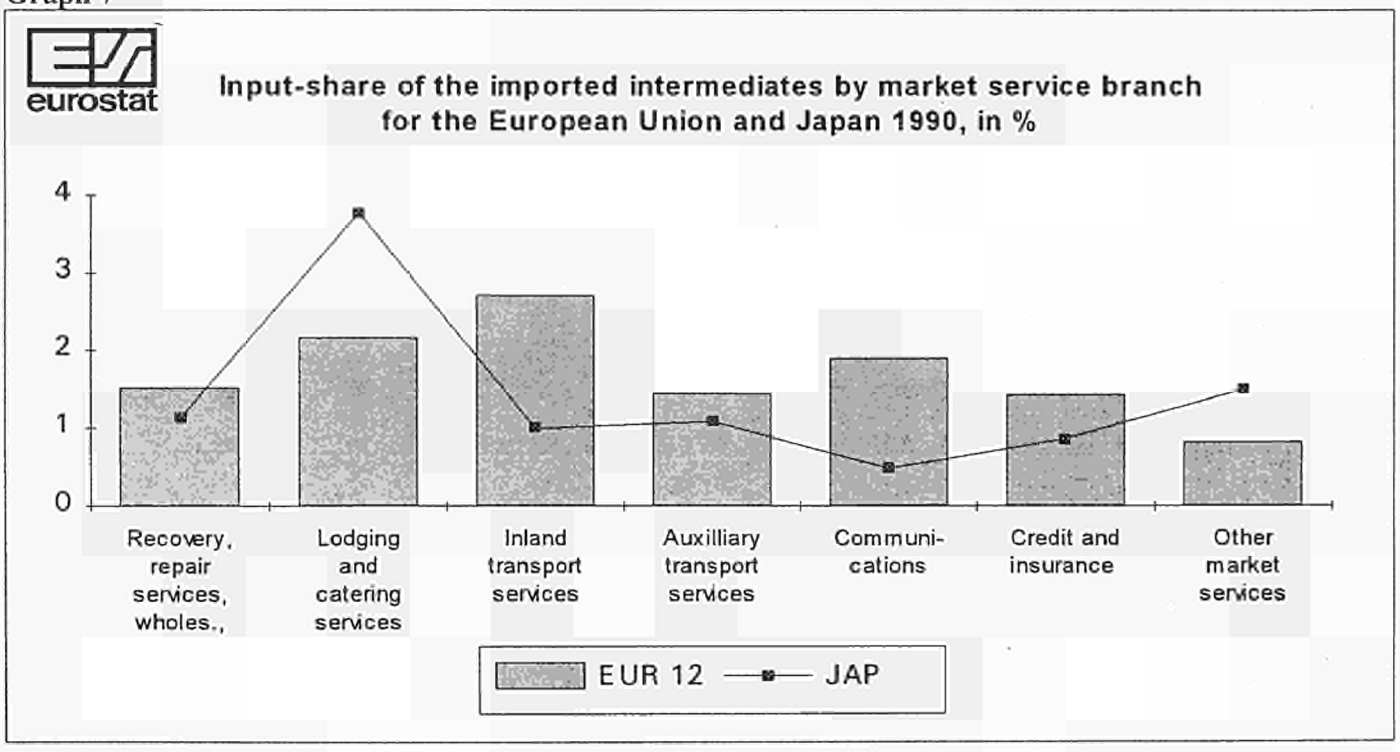


Graph 6



shares for the imported intermediates for the Union are found in the following service branches: lodging and catering, maritime and air transport as well as for the "other transport services".

Graph 7



Stock of Input-Output Tables at Eurostat

As part of its five-year programmes, Eurostat has been producing harmonized national Input-Output Tables since 1959 which are based on the European System of Integrated Economic Accounts (ESA).

The series of national tables available (producer and/or ex-factory prices), which also contain detailed information on intra-Union trade, covers the years 1959, 1965, 1970, 1975, 1980 and 1985. The IOT for Spain is already available for 1990. In general, these tables are subdivided into at least 44 producer branches; depending on year and Member State, however, a more datailed breakdown of up to 59 branches is possible.

Comprehensive Input-Output Tables have been produced for 1985, 1990 and 1991 for the European Union (EUR 12), there being 25 aggregated production branches covering all Member States. For 1990 and 1991, these tables are based on data projected by the EURO procedure (cf. methodological notes below).

A set of tables referring to this short report is available. These cover IOT for the European Union and Japan at ex-factory prices (excluding VAT), import matrices, employment matrices and input coefficients.

For detailed information on the availability of input-output data, please contact:

Jos Heuschling
Eurostat/APC A5-09
Department B2
P.O. Box 1907
L-1019 Luxembourg

☎: (352)-4301-33575
Fax: (352)-4301-33879

For detailed information on the EURO procedure:

Prof. Jörg Beutel
FH Konstanz
Postfach 100543
D-78405 Konstanz

For detailed information on adapting the IOT for Japan to the ESA:

Prof. Kohei Yoshinaga
Kansai University
3-35, Yamate-cho 3 chome, Suita-shi
Osaka
564 Japan

Methodological aspects

Although the time period for producing the Input-Output Tables (IOT) has been reduced in the Member States, the complexity and considerable requirements of the input material still lead to a certain delay. To permit reasonably up-to-date analysis by means of the IOT, Eurostat is now producing current projections of harmonized Input-Output Tables using a new methodology (Euro procedure).

This method prevents arbitrary changes in important input coefficients which occasionally occur with the most common RAS method, and a few shortcomings of projection methods such as MODOP, LPM or the Statistical Correction Method. EURO includes all the elements of the IOT and thus all the quadrants in an activity analysis approach. The column vectors are taken as base activities and subjected to a standard procedure.

The underlying idea of EURO is to use official Eurostat statistics for the EU as an exogeneous basis for iteration. The row and column vectors for intermediate uses and final demand are derived as endogeneous variables instead of taking them over as exogeneous variables from unspecified sources.

The main advantages of EURO are: robust projections, limited requirements of the input data material, integrated projection of all four quadrants, no arbitrary changes in the input coefficients, row and column vector of intermediate parameters are a component of the result, estimate of final demand by means of an iterative procedure and consistency of the supply and demand aspects.

The simple structure of the EURO procedure and the theoretical assumptions on which it is based does, however, bring disadvantages. One limitation is that the structure of final demand cannot be determined with econometric functions. In addition, the effects of relative price changes and other influences such as technical progress and productivity are reflected in an incomplete manner. In an econometric model, intermediate consumption would be derived from a cost minimization approach.

As the main goal of the IOT projected by EURO is to close the considerable gap between the five-yearly harmonized IOT, at least in part, the existing methodological deficiencies must be accepted in order to update national tables by means of the latest ESA results available. The projection would then be in an acceptable time frame.