CHANGING SPECIALISATION AND INTERDEPENDENCY OF EC-ECONOMIES 1959-1975[1]

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ABSTRACT Lowering and abolishing internal tariffs and non-tariff barriers, establishing common external tariffs, common agricultural policy and other common industrial policies (i.e. European economic integration) should have a profound effect on economic interaction, both within and between the economies involved. This paper employs interregional input-output data to indicate whether or not and in what manner the interdependency within and between the economies of the six old EC-countries has changed over the years 1959, 1965, 1970 and 1975.

1. INTRODUCTION

Input-output tables have been used widely to investigate industrial structure and interaction, primarily at an intra-national and intra-regional level. Trade statistics have been used intensively to study the interaction between economies and the possible effects of lowering barriers to trade, almost exclusively at the international level. If both types of data sources are integrated, interregional or international input-output tables result.

The interesting question then arises whether such tables may be used fruitfully to study the interplay between intersectoral and international or interregional interdependencies. More specifically, one may ask if such tables may shed more light on the issue of the impacts of economic integration on trade and industrial structure, i.e. more light than may be shed by trade or sectoral composition data alone.

To answer this question, of course, requires data over different years. As changes in the industrial structure occur only in the long run, consistent tables would be needed for a relatively long period of time. At the interregional level within countries, trade data are notoriously absent or fragmentary. Hence, most interregional input-output tables cover only one year and either contain non-survey data or assume the same import coefficient to hold true for different consuming sectors in each region. Japan's interregional tables probably offer the only exception in this respect.

The situation at the international level (i.e. between countries) is not much better, except for the fact that trade data are generally more abundant and reasonably accurate. In Japan such data have been used to construct some bilateral full

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information input-output tables (see Ren Ruoen, 1993, for an overview). International input-output tables for more than two countries are rare and will mostly be of the limited information type, which uses the column trade coefficient assumption mentioned above (see Oosterhaven, 1984, for a classification of possible interregional tables). In Europe, the tables constructed by Schilderinck (1984) present a remarkable case, since they cover not only the five EC-countries, but also a four year spread over a long period of time (1959, 1965, 1970 and 1975). Moreover, their sectoral detail is considerable, with 30 sectors for 1959 and 1965 and 44 sectors for 1965, 1970 and 1975.

The next section briefly summarises the main characteristics of these tables and discusses their suitability for descriptive and explanatory analysis, with special attention to the possibility of testing international trade theory. Section 3 presents some first exploratory empirical outcomes based on the published data covering six sectors, followed in Section 4 with a summary of the EC-output multipliers. The final section concludes with some suggestions for further research that might be based on these data.

2. SCHILDERINCK'S TABLES

Data from different countries and statistics for different years are, unfortunately, mostly classified according to different rules. Analyses over time and space, however, require the use of comparable data. Hence, the first major problem in the construction of a comparable series of EC-intercountry input-output tables is one of nomenclature. Here we will discuss the major problems encountered (see Schilderinck, 1982, for a more detailed account).

For the classification of industries Schilderinck follows NACE-CLIO, the European input-output sector classification of Eurostat, which uses a redefinition of the general EC-classification of economic activities (NACE) in that each activity is defined in terms of a specific group of commodities according to the EC-classification for imports and exports (NIMEXE) (see Eurostat, 1979). For 1959 the West-German Eurostat table contains only 37 sectors which are not comparable with the 65 sectors in the 1959 tables for France, Italy, The Netherlands, Belgium and Luxembourg. Furthermore, the 1959 aggregation differs from that of 1965. Consequently, the 1959-interregional table not only contains fewer sectors (30) but the sector comparability with the 1965 table presents difficulty as well.

The Eurostat input-output tables contain matrices for competitive imports from other EC-countries and separately from non-EC-countries. Hence, the major empirical problem is the allocation of the imports among all EC-countries. For this allocation, Schilderinck used the Eurostat import data. Here a major problem follows from the fact that the 1959 and 1965 import data are not based on the NIMEXE-classification (with which the EC input-output tables are comparable) but on the CST-nomenclature, which itself was extensively revised in 1960.

Hence, the 1959 import data were first regrouped according to the new CST-classification and then both the regrouped 1959 and 1965 import data were reclassified to the NIMEXE-classification that was used for the 1970 and 1975

import data. Consequently, the comparability of the spatial division of the imports from other EC-countries between 1959, 1965 and 1970, /1975 may be incomplete.

Besides comparability, however, there is also a major problem of reliability with regard to this allocation. It has two aspects.

First, the import data do not reveal the industry or the type of final demand sector by which the imports are consumed. Hence, the column trade coefficient assumption is used. It implies, for example, the assumption that German manufacturing receives the same percentage of its EC-fuel imports from France, as Germany as a whole. The same overall percentage is applied to EC-fuel imports by German market services, German private consumers, etc. As a consequence, one cannot study differences in the intra-EC origin of imports along any row of Schilderinck's I-O tables.

Second, the use of import data means that the intra-EC exports in Schilderinck's tables are estimated with the aid of the import data from the other EC-countries. Hence, they do not have to correspond with the intra-EC exports from the Eurostat national tables. This means that in the tables of Schilderinck (1984), total output along the rows does not equal the value of total production down the columns of the tables. The difference is put in an 'expenditure balance' column. When this column is divided cell-wise by the estimated total of intra-EC exports from the same table, one gets an indication of the estimation error involved in the use of the column trade coefficient assumption.[2]

Besides this empirical inconsistency the expenditure balance also hides a major conceptual inconsistency. The Eurostat data on domestic transactions and foreign exports are measured in producers' prices, whereas the imports are measured in ex customs prices. Consequently, the export data trade and transport margins are shown separately, whereas they are added to the producers' price in the import data. For economic analyses it would of course have been preferable if the import data were also measured in producers' prices.

At the aggregate level of six sectors, the average absolute relative error for intra-EC manufacturing exports is 11.5 per cent (n = 20, 4 years x 5 EC-countries). For fuel and power the relative error is 21.5 per cent and for agriculture 39.8 per cent. Given the regulated character of EC-agriculture and the consequent administrative requirements, this deviation is surprisingly large. The other three sectors hardly export at all (see Figure 1) and therefore we find far larger (relative) estimation errors[3] of 116 per cent for building and construction, 140 per cent for market services

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[2] Schilderinck (1984) gives a regional subdivision of this total. For German agriculture this gives, for example, the difference between the use by German agriculture of inputs from all French sectors together and the total export of German agricultural products to France. As a completely different set of products is involved this subdivision does not provide very useful data. Only the row totals of the expenditure balance matrices are of relevance as they represent the totalised error from the intra-EC import coefficient assumption and the pricing inconsistency per sector per country.

[3] Schilderinck (1984) only relates the total estimation error (with pluses and minuses added together) of all sectors and all countries to the corresponding total production value. Naturally, this gives very small percentage errors that are misleading for two reasons. First,

(continued...)

and an unmeasurably large (relative) difference for non-market services. Consequently, analyses of the intra-EC pattern of exports for these last three sectors are not very useful.

Analyses of the spatial pattern of intra-EC imports, however, are not precluded by these errors because of the internal consistency of using intra-EC import shares per country to divide the EC-imports of that same country. The same holds true for calculating all kind of input-output multipliers, as long as they use only input coefficients (see Oosterhaven, 1988, 1989, for a critical evaluation of multipliers based on output coefficients). Even so, some care is required if the analysis concerns the last three sectors.

A final and minor difference in the treatment of data relates to the imputed interest of financial institutions. In 1959 this imputed interest is treated as an output that is consumed as part of the financial services used by industries, consumers and government. In the other years Eurostat allocates total imputed interest to the diagonal cell of the financial institutions sector and subtracts it again in the value added row. This of course makes input coefficients, multipliers etc. for this sector non-comparable between 1959 and the later years.

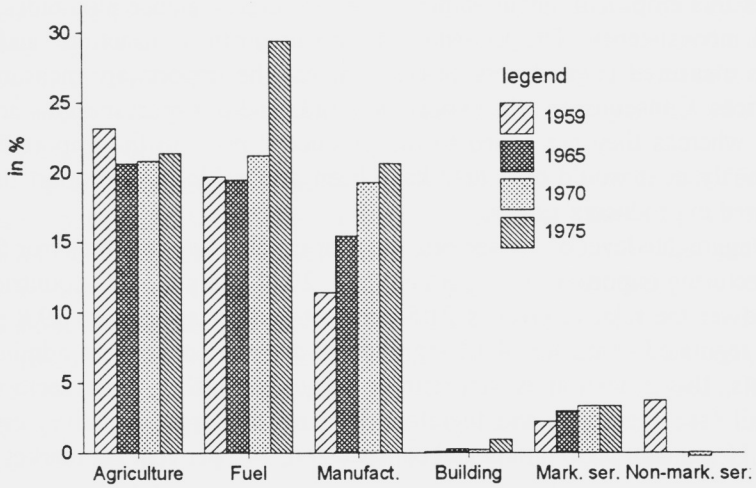

Figure 1. Openness Ratios for Imports

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[3](...continued)
the pluses and minuses partly balance, i.e. absolute errors should have been added, and second, the differences should not be related to total output but to total intra-EC exports to which they apply. The reason for our difference in treatment follows from the fact that Schilderinck conceptually only relates the zero-condition on the expenditure balances to the equivalence of total intra-EC exports and imports, disregarding the intra-EC export-estimation errors and the pricing inconsistency for each sector in each country.

3. SOME EXPLORATORY EMPIRICAL OUTCOMES

Notwithstanding the fact that the comparability of Schilderinck's tables is limited in some respects, these tables do represent a unique data base to analyse the sectoral and spatial interdependency of economic activities within the European Community. Below we will present some first results based on the aggregated tables with six sectors and five EC-countries from Schilderinck (1984).

Figure 1 shows the openness ratios for the average EC-country with regard to its total use of products from each of the six sectors, viz.

$$\left[1 - \sum_{r=1}^{EC} \left(z_{i\bullet}^{rr} / z_{i\bullet}^{\bullet EC}\right)\right] * 100\% \qquad (1)$$

where z_{ip}^{rs} = use by the intermediate or final sector p in EC-country s of products from sector i in EC-country r, and $\bullet$ = summation over the relevant subscript or superscript.

First, Figure 1 shows the well-known difference in spatial mobility of goods versus services, with import ratios of roughly 20 per cent for goods and less than 5 per cent for services. Second, it shows the clear increase in openness of the national EC-markets with respect to all products. The relative decrease in agricultural imports from 1959 to 1965 is surprising. The increase in fuel imports from 1970 to 1975 is mainly explained by higher oil prices and not by a larger relative volume of fuel imports. The strange, even negative, results for non-market services require further investigation, but will most probably be due to changes in the statistical treatment of government production.

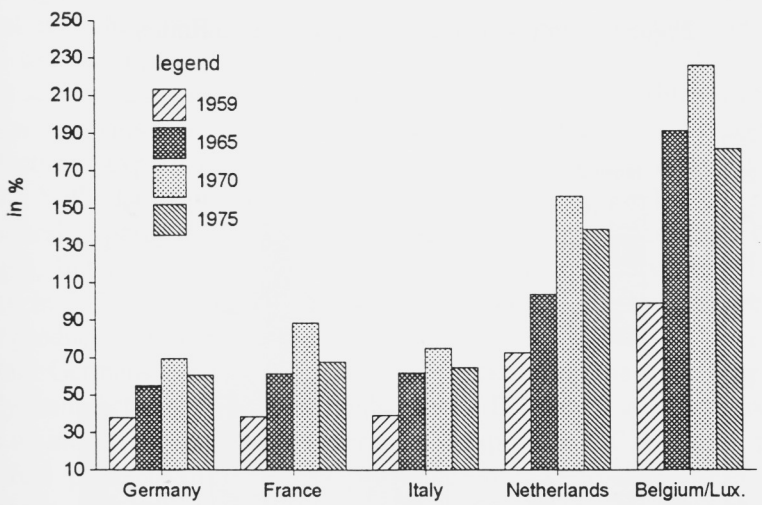

Figure 2. Internal vs External EC-Exports

The continuous increase in manufacturing import ratios, from 11.4 per cent in 1959 to 20.5 per cent in 1975, will be due to the abolition of intra-EC tariffs, the lowering of the external EC-tariffs, as well as to technological change leading to increasing scales of production. It is, however, interesting to note that this increase does not apply to all consuming sectors, as follows from the disaggregated analysis which is not shown here. Agriculture, manufacturing and non-market services show a surprising decrease in their relative imports of manufacturing products between 1970 and 1975. The overall increase in manufacturing imports between these years, obviously, relates primarily to the use of final manufacturing outputs by private consumers.

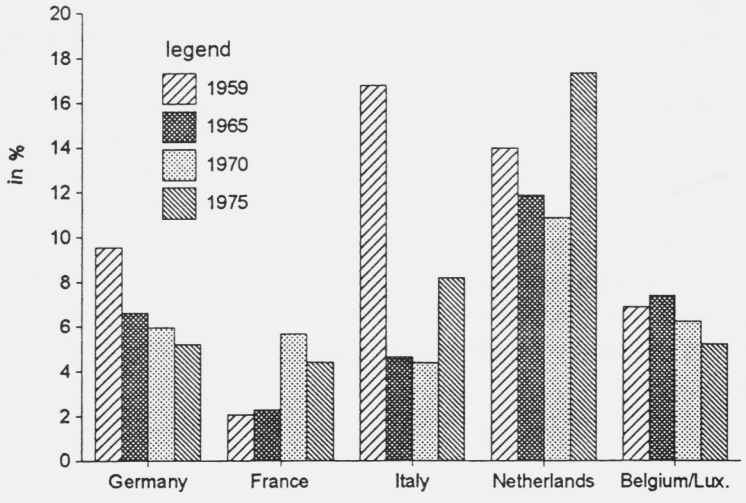

Figure 3. Intra-EC Export-Specialisation Ratios

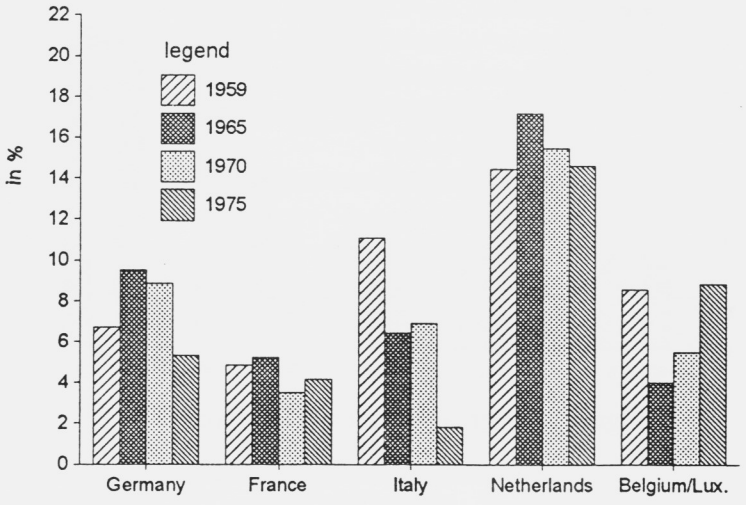

Figure 4. Extra-EC Export-Specialisation Ratios

Next, the question should be asked whether this increasing openness primarily relates to intra-EC trade or to trade with other countries (OC). Although, as argued in the last section, the data concerned are a little less reliable, we will look at the export data and investigate if different EC-countries behave differently. Figure 2 shows the ratio of intra-EC exports to extra-EC exports. The time pattern for all countries looks amazingly alike, with a strong growth in this ratio up to 1970 and a remarkable common fall between 1970 and 1975. The probable explanations are the strong increase in the value of the imports from the oil-producing countries and the extension of the EC in 1973, which might have led to a relative decrease of the intra-EC exports between the original five EC-countries.

According to traditional international trade theory, increasing trade will be based on the exploitation of comparative advantages and will undoubtedly lead to specialisation. The new international trade theory, however, which assumes increasing returns to scale, heterogeneous products and imperfect competition is less clear in its predictions, although most authors in most theoretical cases predict an increase in intra-industry trade (see, for example, Helpman and Krugman, 1985), which means that specialisation might increase as well as decrease. Figures 3 and 4 show the changes in specialisation for intra-EC and extra-EC (i.e. OC) exports separately:

$$\sum_i \mid e_i^{rs} / e_\bullet^{rs} - e_i^{EC,s} / e_\bullet^{EC,s} \mid * 0.5 * 100\% \qquad (2)$$

where e = exports and s = EC in Figure 3 and OC in Figure 4. Hence, specialisation is measured by means of the summed absolute differences in export shares between the country under consideration and the EC as a whole.

The mixed outcomes are the results of very different underlying developments. Italy's high specialization in 1959 is caused solely by a 17 percentage point larger share of agriculture in total exports to the EC, whereas its specialisation in exports to OC is caused primarily by a 6 percentage point over-specialisation in exports of market services and only 4 percentage points in agriculture, which it loses by 1965. Italy's re-specialisation in intra-EC exports is mainly due to the strong increase in its manufacturing exports (5 percentage points larger than the EC-average).

The Netherlands provides an other remarkable case. In 1959 it specialised in agricultural exports to the EC (a 10 percentage point larger share than the EC-average), but in exports to OC it specialised in market services (+12 percentage points). In 1975, however, its specialisation is entirely due to its export of fuel and power products (+13 per cent to the EC and +11 per cent to OC).

Only Germany consistently specialised in exporting the same type of products, namely manufacturing. The same holds true for Belgium (including Luxembourg) as far as its intra-EC exports are concerned. Its exports to OC, however, partly shifted from fuel products in 1959 (+9 percentage points) to non-market services (+5 percentage points) in 1975.

The obvious question that arises next is whether or not export specialisation goes hand in hand with or even causes specialisation in total output. Figure 5 shows the following specialisation ratios:

$$\sum_i | VA_i^r / VA_\bullet^r - VA_i^{EC} / VA_\bullet^{EC} | * 0.5 * 100\% \quad (3)$$

Hence, they measure the summed absolute percentage point differences in value added shares between the country at hand and the EC as a whole.

Figures 3, 4 and 5 show no systematic relationship. Figure 5, contrary to Figure 3 and 4, shows clear upward or downward trends in each country except for Germany. Specialization ratios calculated on the cells of the whole intercountry table and ratios calculated along the rows of the table (not shown in this paper) do not show a clear pattern. These (dis)aggregated results must relate to the fact that the traditional international trade theory becomes less relevant as its main assumptions (constant returns to scale, homogeneous products and perfect competition) increasingly become outdated and the product mix in international trade become less and less predictable.

The mirror image of national specialisation is the spatial concentration of production in only one or a few countries. In this case one may calculate concentration ratios for total sectoral value added (Figure 6) and one could calculate such ratios for an individual sector for each of the cells along its row (e.g. manufacturing, see Figure 7). The latter ratios are calculated as:

$$\sum_r | z_{ip}^{r,EC} / z_{ip}^{EC,EC} - VA_i^r / VA_i^{EC} | * 0.5 * 100\% \quad (4)$$

where VA_i^r = gross added measured at market prices of sector i in country r. Hence these ratios show if the production of manufacturing outputs consumed by sector p is more spatially concentrated than that of manufacturing as a whole.

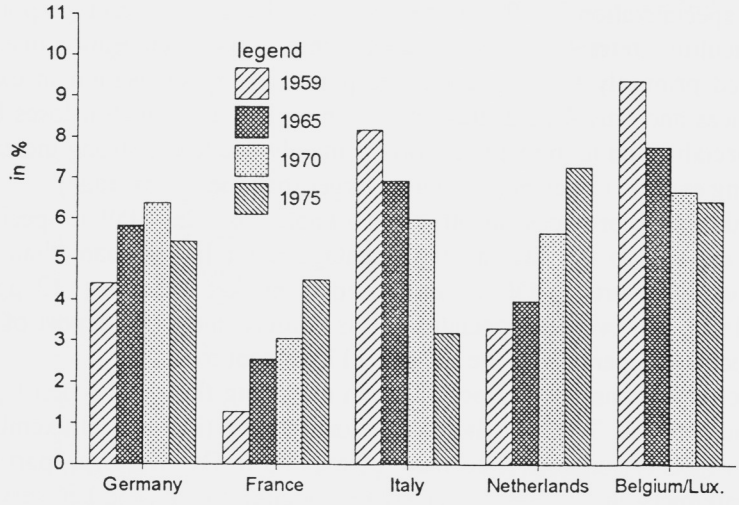

Figure 5. Country Specialisation Ratios for Gross Value Added at M.P.

In Figure 6, the spatial concentration of a sector as a whole is compared with that of the corresponding economies as a whole. The decreasing spatial concentration of agriculture stems directly from the fact that its share in total production decreases most in those countries where it was largest. This does not imply that agricultural products are traded less (see Figure 1). In the case of fuel production, however, we see an increasing spatial concentration between 1970 and 1975 that goes hand in hand with an increase in trade (see Figure 1).

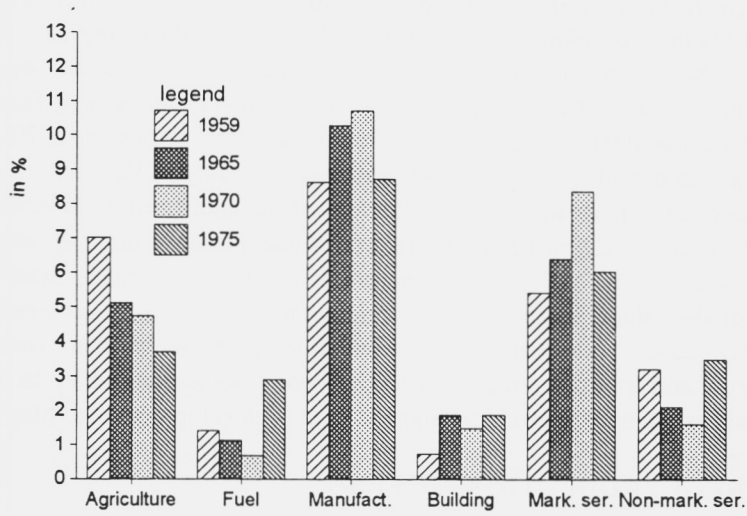

Figure 6. Sectoral Concentration Ratios for Gross Value Added at M.P.

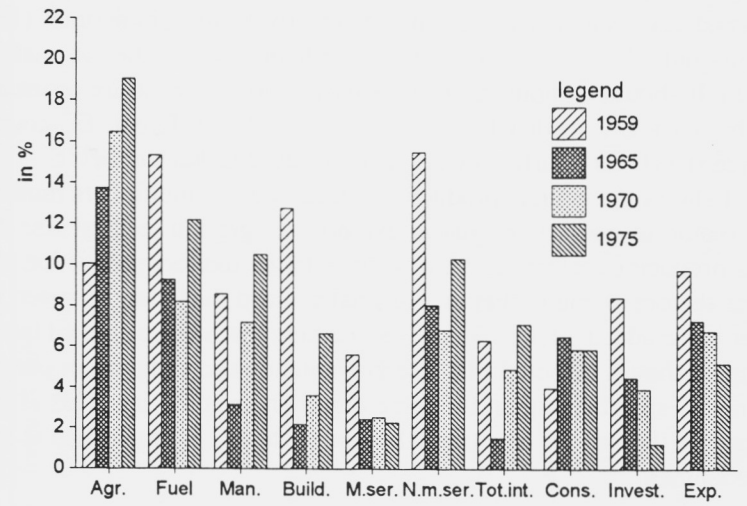

Figure 7. Manufacturing Concentration Ratios for Sales at Cell Levels

The development in the other sectors is less clear. It is remarkable that the manufacturing sector and the market services both show relatively high levels of spatial concentration, whereas manufacturing products are traded far more than market services (see again Figure 1). Besides international trade, one certainly has to consider the level of development (and possibly also some sectoral classification conventions) as a cause of differences in spatial concentration of production. More developed economies have more services and therefore one finds a spatial concentration of production according to differences in GNP per capita without much trade.

Most of the concentration ratios of individual manufacturing outputs (see Figure 7) show a U-curve development over time, whereas manufacturing as a whole (see Figure 6) shows an inverted U-curve development. At present we have no explanation for this phenomenon. Even more remarkable is the fact that the production of manufacturing exports gets less concentrated between 1970 and 1975, whereas trade in manufacturing products increases (see Figure 1).

The conclusion from this brief exploration of the data from Schilderinck's tables seems to be twofold. Empirically, several as yet unexplained outcomes are observed. In some cases, in view of the specific nature of the data concerned, especially along the rows of the tables, these outcomes may warn us not to jump to conclusions. In some other cases, however, these interesting data show that concentration, specialisation and trade do not exhibit an easy one-to-one relationship to each other. Factors such as the market structure and the level of development also play a role.

4. INDIRECT PRODUCTION EFFECTS

As yet, we have not used these data for the purpose for which they were originally assembled, i.e. to measure the strength and the development of the economic interdependency among sectors and among countries within the European Community. The Leontief-matrix for the complete intercountry EC-tables with five countries and six sectors may be studied directly from Schilderinck (1985). This paper shows only the column totals of the whole matrix (i.e. the national production multipliers). It should be noted that the latter multipliers, contrary to usual practice, include the intra-EC feedback effects between the different EC-countries (see Oosterhaven, 1981, for a further discussion on these feedback effects).

Table 1 shows the indirect production effects (i.e. the multipliers minus the direct effect) by sector, by country, by year. First, note the general sectoral size differences. The goods producing sectors (1, 3 and 4) have larger indirect production effects than the services sectors (5 and 6). Per unit of final demand the latter, however, might well have larger value added effects, which is something that will be studied later.

Second, it should be noted that The Netherlands and Belgium in particular have larger intra-EC spill-overs than the three other larger countries. This is primarily a size effect. For the smaller countries, the rest of the EC is larger than is the case for the other countries.

Table 1. Indirect Production Effects Per Unit of Final Demand x 1000

	Germany				France				Italy				Netherlands				Belgium/Lux.			
	1959	1965	1970	1975	1959	1965	1970	1975	1959	1965	1970	1975	1959	1965	1970	1975	1959	1965	1970	1975
1. Agriculture, forest. & fish.																				
EC-total	606	876	1097	1077	439	836	662	757	549	495	529	583	982	830	912	926	614	774	995	1025
Domestic	573	824	1006	982	424	799	599	684	537	474	478	517	839	689	716	727	485	584	748	703
Import-EC	34	52	91	95	15	37	63	73	13	21	52	66	142	141	197	199	129	190	247	322
2. Fuel and power products																				
EC-total	841	669	590	762	426	399	388	522	428	204	248	604	530	387	384	517	566	430	331	544
Domestic	809	639	523	661	385	367	349	424	400	188	217	506	381	271	286	371	455	333	234	251
Import-EC	32	30	67	100	41	31	39	98	28	16	31	99	149	116	98	147	111	97	97	293
3. Manufacturing products																				
EC-total	938	977	1134	1137	838	971	911	875	1104	949	900	1023	1016	889	911	922	994	944	859	914
Domestic	864	883	994	1020	779	885	778	741	1028	853	756	875	748	581	527	543	738	601	440	440
Import-EC	74	95	140	118	59	87	133	134	76	96	144	148	268	308	384	379	256	344	420	474
4. Building and construction																				
EC-total	728	899	894	1086	736	818	814	687	807	753	764	848	855	872	888	872	799	855	803	868
Domestic	698	842	811	989	688	751	708	587	771	698	680	768	615	591	512	554	622	590	497	533
Import-EC	30	57	83	97	48	67	106	100	37	55	85	80	240	281	377	318	177	265	307	335
5. Market services																				
EC-total	434	605	761	669	349	496	575	523	362	482	496	624	511	451	600	522	245	407	400	445
Domestic	417	576	704	620	340	465	529	474	344	461	461	576	375	334	404	402	193	311	284	314
Import-EC	17	30	56	49	10	31	45	49	18	21	35	48	137	117	197	121	52	96	116	131
6. Non-market services																				
EC-total	668	608	587	649	671	504	508	489	376	354	334	455	481	427	427	394	374	366	369	357
Domestic	636	533	521	590	644	475	473	450	363	335	312	418	396	340	307	325	303	264	242	245
Import-EC	32	74	66	59	27	30	35	39	13	18	23	37	85	87	120	69	71	103	126	112

Thirdly, it should be noted that these intra-EC spill-over effects for practically all national sectors show a continuous increase in time. Hence, it may indeed be concluded that the interdependency between the EC-countries is increasing, in most cases relatively strongly.

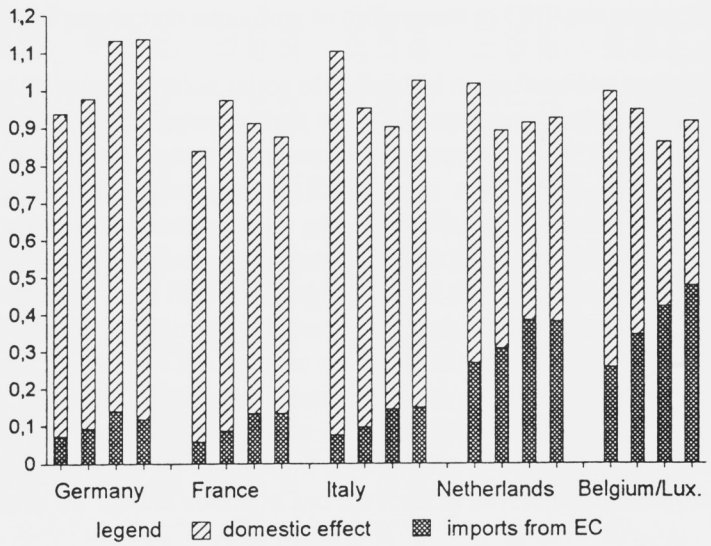

Figure 8. Indirect Production Effects for Manufacturing Products

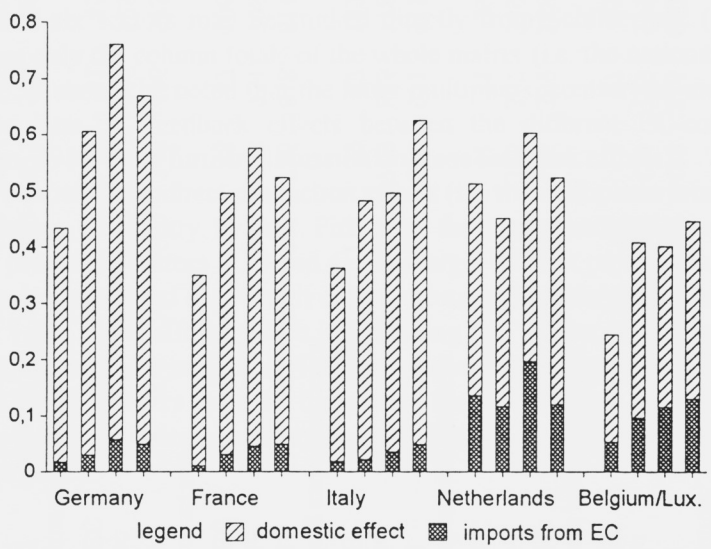

Figure 9. Indirect Production Effects for Market Services

There are, however, some exceptions that mainly relate to The Netherlands. The Dutch fuel & power industry shows a decrease in the spill-over effect from 1959 to 1970, but this decrease and the subsequent increase between 1970 and 1975 may also be observed in the indirect domestic effect. Both changes may be explained by the demise of the coal industry and the rise of the exploitation of natural gas. Parallel increases and decreases in domestic and intra-EC effects are also found for Dutch market services. In this case, a simple explanation is not yet available.

Fourth, if we look at the overall EC indirect effect over time, no clear pattern emerges. This implies that in several cases an increase in intra-EC spill-over effects will be found that will be counter-balanced by a reduction of the domestic indirect effects. Hence, the idea of a Fortress Europe certainly is not confirmed with these data from 1959 to 1975. The development per sector over time is also not clear.

Total indirect EC-effects from agriculture do show a general increase, but there are several exceptions. The size of the indirect effects from French agriculture in 1959 and from Italian agriculture in all years appear to be rather small. The increase in both the indirect domestic effects and the EC-imports due to German and Belgium agriculture is rather remarkable.

The Dutch U-curves for fuel and power are found back in the other EC-countries, but only for the total-EC indirect effects. Certainly, the Dutch story does not apply to the other four countries, but the increase from 1970 to 1975 will be due to the oil price rise noted earlier.

Manufacturing (Figure 8) changes much less than the first two sectors. The increase in the indirect effects from German manufacturing stands out. The larger part of these increases relate to indirect domestic effects. More time will be needed to analyse these effects and to explain why France, for example, shows a decrease in its indirect domestic as well as in its total EC-effects for manufacturing after 1965. The building and construction sector shows similar change.

As opposed to manufacturing and building, the changes in the indirect effects from market services in Germany and France look very similar (see Figure 9). Finally, the differences in size of the indirect effects of non-market services seem to decrease. Given the measurement problems of public production further investigation is also needed here.

Naturally, the differences in the indirect effects per sector per country are not too striking if they are considered only at the aggregated level of six sectors. A more disaggregated analysis may show more revealing differences and may clarify some of the unexplained differences found above.

5. CONCLUSION

This paper reports on some first explorations of a set of intercountry input-output tables for the five old EC-countries for 1959, 1965, 1970 and 1975 (Schilderinck, 1984). The tables provide unused and new possibilities for analysis. It appears, however, that old or new trade theory alone will be insufficient to explain changes in trade and industrial structure. Furthermore, it became clear that some care is needed in using such data because of changes in statistical practices and because of the use of the column trade coefficient assumption to construct these tables.

Finally, studying interdependency coefficients at the level of the six aggregated sectors shows a consistent increase in intra-EC spill-over effects, whereas domestic interindustry interaction shows rather diverse patterns of development.

The next phase of investigation will have to proceed along two lines. First, further exploration of the tables at the disaggregated level of 30 and 44 sectors is necessary. Second, an extension of the series with tables for 1980 (e.g. those of Langer, 1987) and 1985 will be needed. Before such an extension is undertaken, however, an evaluation of alternatives to the column trade coefficient assumption, such as gravity approaches, reconciliation techniques or extended RAS-procedures, is necessary as well as a solution to the producers' / ex customs prices inconsistency (see Boomsma, Van der Linden and Oosterhaven, 1991).

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