DOI: 10.1007/s10272-008-0251-1

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Has the International Fragmentation of German Exports Passed Its Peak?

In the second half of the nineties the import content of German exports (intermediate inputs for the production of exports and imports destined for immediate re-export) increased considerably. The following article examines whether this trend has continued up to the present.

Regional and national competition, particularly with low-wage countries in the enlarged European Union, has changed the framework for the integration of the German economy into the international division of labour. On the one hand, pressure on prices and labour costs in Germany have increased, particularly with regard to labour-intensive production. On the other hand, due to the enlargement of the European Union, market access offers German companies new opportunities for choosing the most favourable supplier of products and services required for production processes. National suppliers react to the price competition by diversifying their production internationally. Large and medium-sized businesses invest directly in low-wage countries and move part of their production abroad (outsourcing); others buy parts and components from foreign component suppliers (offshoring). In the international literature, this process is referred to as fragmentation.[1] It involves the division of production processes into individual sections in which parts of the products ("fragments") are manufactured. The production of fragments can be moved abroad. Production and service processes are thus increasingly penetrated by imports. The loss of production and employment in some sectors is contrasted by gains in others due to improving competitive capacities. The impact on the national economy, for instance on the balance of trade, on employment and on wages remains ambiguous, however.

In addition to prefabricated products, preliminary and intermediate products are also traded internationally due to the fragmentation of manufacturing processes. The import penetration of production has been the subject of public discussion, particularly in connection with Germany's position as an export champion. Due to the growing acquisition of intermediate inputs from abroad for subsequent processing in Germany in order to export the resulting goods in turn, the significance of exports as a motor for production and employment may be overestimated. The welfare gains resulting from increasing exports are possibly bought by means of welfare losses from the crowding out of local production by imports. In this case, the national value-added process might in the end consist only of trade activities. The catchword "Germany – a Bazaar Economy" properly describes such a tendency.[2] Others, amongst them the German Council of Economic Advisers, contradict this thesis.[3]

The theoretical literature does not provide any clear answers.[4] Similarly ambiguous is the empirical evidence of the impact of the international integration of product markets on the German labour market. Negative consequences in the short term on employment and income contrast with advantages if the jobs lost are replaced by higher-skilled ones with improved income perspectives.

The import content of Germany's exports, after remaining steady at approximately 25 per cent in the 1980s and into the first half of the 1990s, then escalated upwards to almost 40 per cent.[5] That raises the question whether this tendency has continued in

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[1] The discussion in the international technical literature was caused by case studies in developing countries. Cf. Robert Feenstra: Integration of Trade and Disintegration of Production in the Global Economy, in: Journal of Economic Perspectives, Vol. 12, No. 4, 1998, pp. 31-50; Ronald W. Jones, Henryk Kierzkowski: A Framework for Fragmentation, in: Sven W. Arndt, Henryk Kierzkowski (eds.): Fragmentation. New Production Patterns in the World Economy, Oxford 2001, pp. 17-34.

[2] Cf. H.-W. Sinn: The Pathological Export Boom and the Bazaar Effect: How to Solve the German Puzzle, in: The World Economy, Oxford 2006, pp. 1160 ff.

[3] German Council of Economic Advisers: Erfolge im Ausland – Herausforderungen im Domestically, Jahresgutachten 2004/2005, Wiesbaden 2004, pp. 467 ff.

[4] Cf. for instance Paul A. Samuelson: Where Ricardo and Mill Rebut and Confirm Arguments of Mainstream Economists Supporting Globalization, in: Journal of Economic Perspectives, Vol. 18, No. 3, 2004, pp. 135-146; Jagdish Bhagwati, Arvind Panagariya and T. N. Srinavasan: The Muddles over Outsourcing, in: Journal of Economic Perspectives, Vol. 12, No. 4, 2004, pp. 93-114.

[5] Cf. Federal Statistical Office of Germany: Importabhängigkeit der deutschen Exporte 1991, 1995, 2000 und 2002, Wiesbaden, August und September 2004; H.-U. Brautzsch, U. Ludwig: Verliert der deutsche Export an gesamtwirtschaftlicher Antriebskraft?, in: Wirtschaft im Wandel, No. 15, 2004, pp. 435-441.

Model for Calculating Export-induced Output and Imports

The calculation of export-induced imports occurs in two steps. First, total export-induced output is calculated. This is done by multiplying the Leontief inverse by the vector of export goods produced domestically:

$$x^{ex} = (I-A^{d})^{-1} \cdot ex^{d}$$

The resulting overall export-induced imports are then calculated by multiplying the vector of the total export-induced output by the matrix of coefficients of the direct input of imported intermediate goods per unit gross output:

$$im^{ex} = A^{im} \cdot x^{ex}$$

The elements of the vector of total export-induced imports im^{ex} show how many intermediate imported goods of group i are necessary for the total export output.

The notations mean:

x^{ex}	vector of total export-induced output
I	identity matrix
A^{d}	matrix of coefficients of the direct input of intermediate goods domestically produced per unit of gross output
ex^{d}	vector of export goods produced domestically
im^{ex}	vector of total export-induced imports
A^{im}	matrix of coefficients of the direct input of inter mediate imports per unit of gross output

the current decade. A second question concerns the purpose of the imports: are they determined for immediate re-exportation or do they enter the national production process of export goods? Finally, it must be asked whether these events are singular: is it only Germany amongst the industrially developed West European countries which is affected by this development, or are other nations also affected? These issues can be answered by means of tables and the standard static open model of input-output-analysis (cf. box).

The import content of exports remained largely unchanged at approx. 25 per cent from the beginning of the eighties until the beginning of the nineties (Table 1). This was followed by an increase which accelerated in the second half of the nineties. In 1995, the import content of exports in Germany reached almost 30 per cent; in 2000, it had risen to 38 per cent. It then declined until 2003, returning to 38 per cent in 2004.

When interpreting this trend, however, it has to be considered that the change in the import content of exports can be traced back either to the additional use of imported intermediate inputs in terms of volume – in reaction to a shift in prices between local and imported inputs – or to price changes in export goods. The separation of these parameters cannot be achieved by means of the input-output model, as the transactions in the input-output table are rated at current prices. However, comparative calculations including information on constant prices do not indicate a reversal of the propositions.[6]

Decrease in Imported Inputs after 2000

An undifferentiated illustration of the import content of exports obstructs our view of two background proc-

[6] Cf. H.-U. Brautzsch, U. Ludwig: Der Importgehalt der Exporte im Lichte von jeweiligen und konstanten Preisen, in: Neuere Anwendungsfelder der Input-Output-Analyse, Conference Transcript: Beiträge zum Halleschen Input-Output-Workshop 2006, Halle (Saale) 2007, pp. 140-172.

Table 1
German Exports and their Import Content between 1980 and 2004[a]
(at current prices)

	1980	1985	1991	1995	2000	2004	Index 2000 vs. 1995	Index 2004 vs.1980
				€ bn				
[1] Exports	188.7	283.3	374.1	421.9	660.2	823.0	1.56	4.36
[2] Export goods produced domestically	181.1	268.0	347.5	379.3	568.5	692.2	1.49	3.82
[3] Re-exports	7.6	15.3	26.6	42.6	91.7	130.8	2.15	17.21
[4] Export induced imports	47.0	76.0	99.9	125.2	252.4	318.6	2.01	6.78
[5] Intermediate goods	39.4	60.7	73.3	82.6	160.7	187.8	1.95	4.77
[6] Re-exports	7.6	15.3	26.6	42.6	91.7	130.8	2.15	17.21
				in %				
[7] Import content of exports ([4]/[1])	24.9	26.8	26.7	29.7	38.2	38.7		
[8] Intermediate goods ([5]/[1])	20.9	21.4	19.6	19.6	24.3	22.8		
[9] Re-exports ([6]/[1])	4.0	5.4	7.1	10.1	13.9	15.9		
memo:								
[10] Import content of exports produced domestically ([5]/[2])	21.8	22.6	21.1	21.8	28.3	27.1		

[a] The figures for the years 1980 and 1985 refer to the Federal Republic of Germany before reunification.

Source: Federal Statistical Office of Germany; Eurostat; own calculations.

esses that – due to their significance for the national value-added process – have completely different effects: imports for re-exportation and the imports of intermediate goods for subsequent processing.

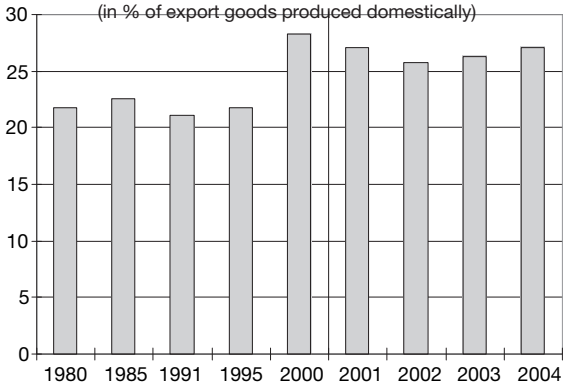
Exports consist partly of goods which result from production and value-added processes in Germany and partly of goods which are imported for immediate re-exportation.[7] The latter are goods the trading of which alone provides a profit and they are therefore directly imported for re-export. However, they can also be goods that are required for the completion of export sales, but which currently are not produced efficiently domestically. Re-exports therefore represent a kind of "items in transit" in terms of bookkeeping. They hardly influence the national value-added process. Accordingly, it has to be differentiated between export-induced imports which enter the national production process as intermediate inputs and are finally manufactured into export goods, and imports for re-export. If we do not differentiate between them and regard all export-induced imports as imported goods which enter the local production and value-added processes, the import content of exports will be statistically overrated and misinterpreted in terms of economic policy.

The differentiated treatment of the two components of export-induced importation shows that in Germany imported intermediate inputs do in fact constitute a large part of export-induced imports, but that the significance of imports for re-exportation has increased dramatically (cf. Table 1). Thus, the import quota of goods destined for re-exportation almost quadrupled between 1980 and the year 2000 while the quota of intermediate goods for the production of export goods rose from 21 per cent in 1980 to about 24 per cent in the year 2000 and then declined to slightly under 23 per cent in 2004. Re-exports thus essentially influenced the dynamics of the import content of exports. The difference between the quotas fell from 17 percentage points in 1980 to seven percentage points in 2004.

The relevant question for growth and employment is how the trend in the use of imported intermediate inputs in the production of export goods developed. The proper reference figure here is the value of exported goods that were produced domestically. The import content of export goods produced domestically re-

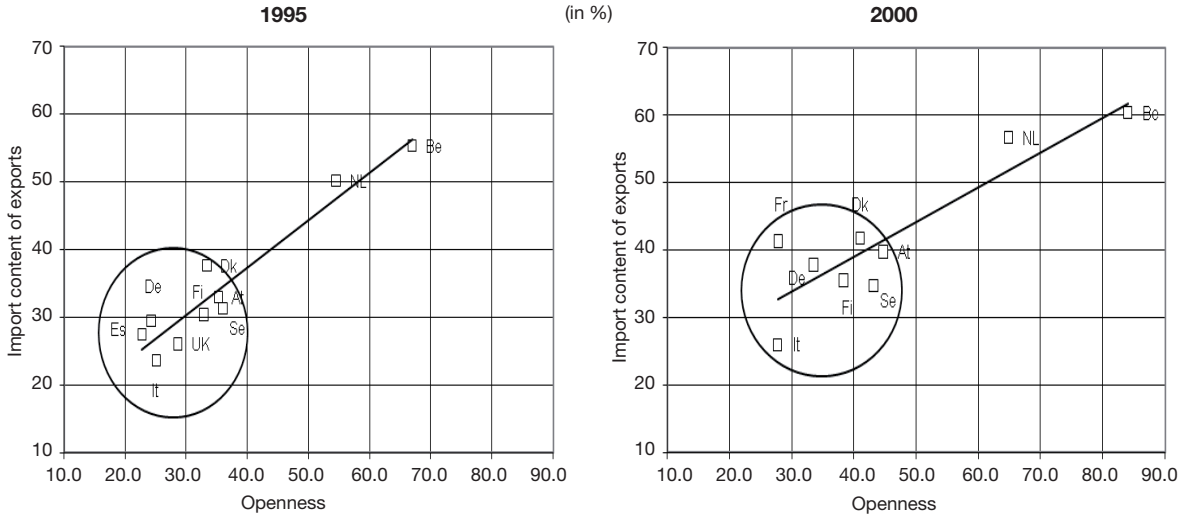
[7] Numerical data on re-exports are enclosed in the column "exports" in the import matrix of the input-output table.

Figure 1
Import Content of German Exports 1980-2004 (without re-exports)



Source: Federal Statistical Office of Germany; own calculations.

Figure 2
Openness[1] and Import Content of Exports in Selected West European Countries in 1995 and 2000



[1] Average of exports and imports to GDP in %; at current prices.

Source: Federal Statistical Office of Germany; Eurostat; own calculations.

Table 2
Openness[1] und Import Content of Exports Produced Domestically in Selected West European Countries in 1995 and 2000
(in %)

	Germany		France		Netherlands		Belgium		Denmark	
	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000
Openness[1]										
Total	23.7	33.2	n.a.	28.1	56.5	67.3	65.6	83.2	35.6	43.6
Excl. re-exports	23.5	30.3	n.a.	21.5	51.7	48.1	54.7	67.1	31.8	41.6
Import content of exports produced domestically	21.8	28.3	n.a.	20.6	33.9	37.5	41.7	46.7	30.0	33.5

[1] Average of exports and imports to GDP in %; at current prices.

Source: Federal Statistical Office of Germany; Eurostat; own calculations.

mained almost unchanged at 22 per cent of the export value between the beginning of the eighties and the mid-nineties. It continued to increase in the second half of the nineties, namely by about seven percentage points. However, it is about ten points below the usually mentioned quota of 38 per cent. After 2000, a slight decline in the import content of export goods produced domestically can be observed (cf. Figure 1). The strong growth of the import content of export goods produced domestically observed in the second half of the last decade was thus interrupted, at least temporarily.

Growth of Import Content in Europe

In most West European states for which input-output tables exist that differentiate between the application of local and imported goods, the import content of exports, calculated including re-exportation, has a dimension similar to the German one (Figure 2, Table 2).[8] The differences apparently correspond to the openness[9] of the national economy, with the exception of the UK and Italy. A much higher import content compared to all other countries was measured for the Netherlands as well as Belgium.

In the second half of the nineties, the import content of exports considerably increased not only in Germany, but also in other states of the EU. Equally, the openness of the national economy increased substantially in the course of the intensification of the international division of labour. However, the import content of exports in Sweden and Finland fell behind that of Germany. The value, which was measured for France for the first time in 2000, is above the German level. In Figure 2 the shift of the scatter plot towards top right shows the increase in the import content.

If the share of re-exports in the total import content of exports is compared among the countries surveyed, it can be seen that in Germany and Denmark this share is considerably lower than in France, Belgium and the Netherlands. In France for instance – which regarding size and economic potential is comparable to Germany – the share of re-exports in total exports in 2000 exceeded the value of imported intermediate inputs by almost six percentage points (cf. Table 3). The quota of imports for re-exportation was considerably higher than that of imported intermediate inputs which are used for the production of export goods. In Germany, inversely, the quota of imported intermediate inputs is almost double that of imports for re-export. Due to the significance of re-exportation in France the import content on exports in total is higher than in Germany.

[8] On the part of Eurostat, most countries are not furnished with input-output tables for the years after 2000; accordingly, an international comparison can only be drawn for this period.

[9] The openness of the national economy implies the relationship between average exports (including re-exports) and imports (including re-exports) and the gross domestic product in per cent. Concerning the correlation with domestic integration, re-exports would have to be deducted from exports as well as imports, as they do not affect the national value-added process. Thus, the openness of the national economy would be lower than if re-exports were included (cf. Table 2). As only some countries have plausible data on re-exports, for international comparisons only the openness indicator can be applied which includes re-exports.

Table 3
Exports and Export-induced Imports in Selected West European countries
(in %)

	Germany		France		Netherlands		Belgium		Denmark	
	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000
Export-induced imports	29.7	38.2	n.a.	41.4	50.2	56.7	55.3	60.5	37.7	41.8
Intermediate goods	19.6	24.3	n.a.	15.2	25.6	26.0	1.9	34.7	26.1	29.3
Re-exports	10.1	13.9	n.a.	26.2	24.6	30.7	23.4	25.8	11.6	12.5
memo:										
Import content of exports produced domestically	21.8	28.3	n.a.	20.6	33.9	37.5	41.7	46.7	30.0	33.5

Source: Federal Statistical Office of Germany; Eurostat; own calculations.

Adjusted for re-exports, however, it is eight percentage points below the German figure. These results are not surprising as the openness of the French national economy is similar to that of Germany.

The import content of exports is significant higher in both the Netherlands and Belgium than in Germany and France. A decisive factor here is the high share of re-exports in the Netherlands, which may result from its importance as a transit state for commercial and passenger transport. The share of imported intermediate inputs in the production of export goods is also explicitly higher than in Germany and France.

For both France and Belgium it cannot be analysed whether – similarly to Germany – the increase in the import content of export production diminished after the year 2000, or whether even a decline took place, because there are no updated input-output tables available for these countries.[10] In the Netherlands, the import content of export production was 36.6 per cent in 2001, one percentage point lower than the preceding year.

In the final analysis, the fear that Germany could increasingly be transformed into a bazaar economy cannot be confirmed empirically by this study. It seems that the import penetration of export production in Germany after the year 2000 has not increased so far.

[10] In fact, Eurostat provides updated input-output tables for Denmark, but no tables that show the estimation of transactions at current prices.