

# Jobs Gained and Lost through Trade – The Case of Germany

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**by**

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## **Abstract**

The nature of international trade has changed significantly. For centuries, trade concentrated on the exchange of finished goods. It now increasingly involves bits of value that are added at different locations to combine into one final product. Therefore, trade in functions or tasks are of growing importance and exports of final goods are no longer an appropriate indicator of the international competitiveness of countries.

The process of globalisation has an impact on domestic labour markets. Due to the increasing integration of the world economy, some jobs are gained and others lost in any open economy. Concerns about German workers losing jobs to foreign competition dominate many political debates. Many people fear that being integrated in the world economy is disadvantageous for Germany.

In this paper, we use input-output analysis to explore the relationship between trade and both job creation and job destruction in Germany over the period 1995-2006. We present two main findings. First, in an autarkic situation, around 7.0 per cent of total German jobs would not have existed at all in 2006. The job effect of trade was positive in every reporting year. Second, the manufacturing sector contributed most to this positive job effect, but also in the service sector, many jobs were retained through trade.

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## Introduction

The nature of international trade has changed significantly. For centuries, trade concentrated on the exchange of finished goods. Now it increasingly involves bits of value that are added in different locations to one final product. Therefore, trade in functions or tasks are of growing importance and the exports of final goods are no longer an appropriate indicator of the international competitiveness of countries.

Furthermore, high communication and transportation costs have led to a concentration of production for a long time. However, revolutionary advances in transportation as well as information and communication technology increasingly facilitate the geographical separation of specific tasks. If instructions can be communicated instantaneously, unfinished goods moved quickly, and the output of many different tasks delivered electronically, firms can exploit factor price disparities between different countries without sacrificing the gains from specialisation. This leads to an increased offshoring of tasks, not only in manufacturing industries, but most notably in business services as well as in computer and information services.<sup>1</sup> However, it is important to bear in mind that not all trade in goods and services is related to offshoring, and it is not possible to identify the share of trade in goods and services that is directly related to this phenomenon.<sup>2</sup>

Without doubt, the process of globalisation has a significant impact on the domestic labour market. Due to the increasing integration of the world economy, jobs are gained and lost in any open economy. Concerns about German workers losing jobs to foreign competition, especially to emerging and developing economies, have reached high levels and dominate many political debates. Critics fear that being integrated in the world economy is disadvantageous for Germany.

The number of German firms engaging in offshoring has indeed increased over time. According to a study conducted by the Federal Statistical Office in 2008,<sup>3</sup> 33.4 per cent of those firms which engaged in offshoring activities until 2006, did so before 2001, 41.3 per cent from 2001 to 2003 and 65.1 per cent from 2004 to 2006. Auxiliary functions are more likely to be offshored than core business activities. This finding emphasizes the notion that trade in tasks is of growing importance. In contrast to traditional trade theory, the offshoring of auxiliary functions is most pronounced in skill-intensive services.<sup>4</sup>

In this paper, we use input-output analysis to explore the relationship between trade and both job creation and job destruction in Germany.<sup>5</sup> The work is based on two premises. First, the offshoring of jobs is regarded as another form of import activity,

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<sup>1</sup> See Grossman and Rossi-Hansberg (2008).

<sup>2</sup> See van Welsum and Reif (2005).

<sup>3</sup> See Statistisches Bundesamt (2008).

<sup>4</sup> Traditional trade theory argues that the exports of a capital-abundant country like Germany will be from capital-intensive industries, and that labour-abundant countries will import such goods, exporting labour-intensive goods in return – and not the other way round.

<sup>5</sup> The idea stems from a paper published by the Federal Reserve Bank of New York, which analysed the job effects of globalisation for the United States. See Groshen, Hobijn and McConnell (2005).

rather than as a completely new phenomenon. Second, not only the jobs *lost* to imports are measured, but also the jobs *created* through the production of German exports. The objective is to obtain a measure of the net effect of trade on Germany's employment. This measure is referred to as "German jobs embodied in net exports" and its development is examined for the period 1995-2006.

We have two main findings. First, in an autarkic situation, around 7.0 per cent of total German jobs would simply not have existed in 2006. This result shows that being integrated into the world economy is advantageous for Germany. Moreover, the job effect of trade was positive in every reporting year. Second, the manufacturing sector contributed most to this positive job effect of trade. Also in the service sector, many jobs were retained through trade. Interestingly, mainly through the trade relations of the export-oriented service sectors, that are most exposed to international trade and where one might expect losses, jobs were retained in Germany.

### **Job Effects of Trade: A Literature Review**

A substantial body of both theoretical and empirical research has been undertaken on the relationship between trade and employment.<sup>6</sup>

Traditional trade theory suggests that, if resources are reallocated in accordance with the principles of comparative advantage, they can be used more effectively and create gains from trade for everyone involved. These comparative advantages can be due either to relative technology differences (as stated in Ricardian models) or different factor endowments (as stated in Heckscher-Ohlin models). The competitiveness of each sector, at the global level, is therefore determined by the existence of comparative advantages.

On the one hand, the reshuffling of production factors can lead to job losses, due to firm closures in comparatively disadvantaged sectors, which can be identified as import-competing sectors. Displaced workers suffer phases of unemployment or inactivity. On the other hand, new companies are established in highly competitive sectors and existing firms invest in increased production and therefore augment labour demand. These are the exporting sectors. An increase in trade is therefore associated with both job destruction *and* job creation.

In neoclassical models, the level of economic activity and thus employment can fluctuate in the short run, but in the long run, the labour market will clear, in the absence of distortions. Workers who have been laid-off, automatically move into new jobs meaning that trade cannot lead to increased unemployment. The equilibrium wage is determined by the intersection of supply and demand. Therefore, trade can affect workers through a mere change (a decrease or an increase) in equilibrium wages. This restrictive assumption of full employment has often been criticized.<sup>7</sup>

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<sup>6</sup> See Jansen and Lee (2007) for an overview.

<sup>7</sup> See, for example, Hoekman and Winters (2005).

The suitability of traditional trade models for predicting the job effects of trade is limited for two additional reasons.<sup>8</sup> First, traditional trade models do not consider the possibility of FDI. In contrast to trade with finished goods, FDI induces preceding capital flows to the destination country. Second, traditional trade models concentrate on trade with finished goods, whereas trade in intermediate goods and the offshoring of services gain in importance. One can assume that trade in intermediates may even have a greater impact on employment than trade in final goods. This is due to the fact that labour demand in an open economy is affected not only in import-competing industries, but in all industries using foreign inputs to produce final goods.<sup>9</sup>

Theoretical research on the job effects of trade has developed over time. Some models treat labour as a homogeneous factor, others allow for different skill levels among workers. Feenstra and Hanson (1996) study an economy in which a single manufactured good is produced from a continuum of intermediate inputs, which are in turn produced by skilled workers, unskilled workers and capital. One country (the “South”), produces and exports a range of intermediate inputs up to a critical ratio of skilled to unskilled labour, while the other country, (the “North”), produces the remaining inputs. The inputs produced by the North are skilled-labour intensive, such as R&D and marketing, whereas unskilled-labour intensive activities are offshored to the South. Feenstra and Hanson show that any increase in the capital stock of the South relative to the North, or neutral technological progress in the South, will result in higher relative wages of skilled workers in both countries, due to a shift in more skilled-labour intensive production activities to the South.

Grossman and Rossi-Hansberg (2008) develop a theoretical model to consider how improvements in offshoring affect the wages of different types of labour. They identify a productivity effect, resulting from improvements in the technology for trading tasks. A decline in the cost of task trade directly augments the productivity of the factor whose tasks become easier to offshore. The authors conclude that all domestic parties can gain, due to improved opportunities for offshoring, if the ensuing adjustment in relative prices or its impact on factor prices is not excessive.

Different models predict different effects of trade on employment. Therefore, the effects of trade on employment need to be tested empirically. Following Molnar, Pain and Taglioni (2007), empirical studies on the labour market effects of trade can be classified into three groups: trade in finished goods, trade in intermediate goods (also known as “material offshoring”) and offshoring of services.

### *Trade in finished goods*

According to studies on the effect of international trade on aggregate employment, trade can lead to adjustment costs, because workers are forced to move between different sectors and occupations. Some studies conclude that net imports and aggregate employment in goods-producing industries in the importing economy are

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<sup>8</sup> See Schöller (2007).

<sup>9</sup> See Hijzen, Görg and Hine (2004).

negatively correlated.<sup>10</sup> However, trade is not the only determinant of employment changes; the influence of technological change is considered to exert an even more significant impact on employment structures.

Hoekman and Winters (2005) point out that the effects of trade on wages and employment depend on labour market institutions, the efficiency of capital markets, social policies and the mobility of factors across sectors. Employment is expected to return to its long-run sustainable level, if relative factor prices and relative factor demands are able to adjust fully, and if labour markets are not segmented in the importing economy. Nevertheless, trade has an impact on the relative price of factors that are used intensively in import-competing sectors – their price will be lower than before. If the adjustment process is hampered by market restrictions, the adjustment of relative factor prices will be reduced, and factor demands will decrease in the long-run. This will result in increasing unemployment.

According to the OECD (2005), the different levels of market regulation in Europe and the United States can be regarded as one reason for the observed difference in labour market outcomes. Empirical evidence suggests that re-employment rates following displacement are considerably lower in Europe than in the United States. Yet, earnings changes between the old and the new job vary less widely in Europe than in the United States.

### *Trade in intermediate goods*

The current globalisation process is characterized by the emergence of global value chains. That is, production processes are becoming increasingly geographically fragmented. Not only are final goods traded internationally, but in particular, trade in intermediate goods and services has increased significantly over time. It is important to bear in mind that labour demand is not only affected in import-competing industries, but in all industries that use foreign inputs to produce final goods.<sup>11</sup> That's why Feenstra and Hanson (2003) argue that trade in intermediates may have a greater impact on aggregate employment than trade in final goods.

According to findings from the OECD (2007), the share of imported intermediates in total output has increased in most OECD economies, although the degree of material offshoring varies significantly.<sup>12</sup> Between 1995 and 2000, material offshoring grew in 13 out of 17 economies.<sup>13</sup> Even if the rate of increase of material offshoring seems to have slowed down during the second half of the 1990s and service offshoring has gained in importance, intermediate goods still account for most of the trade in intermediates.

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<sup>10</sup> See Baldwin (1995), Greenaway and Nelson (2001) and OECD (2005).

<sup>11</sup> See Hijzen, Görg and Hine (2005).

<sup>12</sup> The selected OECD economies are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Italy, Netherlands, Norway, Portugal, Spain, Sweden, the United Kingdom and the United States. Material offshoring is most pronounced in Belgium, with a share of total output of 15.6 per cent, and least pronounced in the United States, with a share of just 2.8 per cent.

<sup>13</sup> Material offshoring decreased in Denmark, Greece, Norway and in the United Kingdom.

There are many empirical studies dealing with the employment effects of trade in intermediate goods. Falk and Wolfmayr (2005) distinguish between materials imported from low-wage countries and those imported from high-wage countries into seven EU member States (Austria, Denmark, Finland, Germany, Italy, Netherlands and Sweden). The authors conclude that imported materials from low-wage countries exert a significant negative impact on total employment in the economies in question. This effect is most pronounced in manufacturing industries. Falk and Wolfmayr estimate that the increase in imported materials from low-wage countries has decreased employment by at least 0.26 percentage points per year over the period 1995-2000. Conversely, the share of imported inputs from high-wage countries has a positive impact on aggregate employment. Therefore, imports from high-wage countries and domestic employment seem to be complements rather than substitutes.<sup>14</sup>

Some studies have found evidence that the international sourcing of intermediate goods may affect the skill structure of labour demand in the home country. For instance, Hijzen, Görg and Hine (2005) investigate the link between international sourcing and the skill structure of labour demand in the United Kingdom.<sup>15</sup> The authors find that narrow outsourcing<sup>16</sup> has a negative effect on the demand for all types of labour. However, the impact of international sourcing on aggregate employment is stronger the lower the level of skills. Therefore, international sourcing can explain part of the changing skill structure in the United Kingdom. The other important reason for the trend towards the use of more skilled labour is technological change induced by research and development activities.

According to Geishecker (2004), international outsourcing is of very little importance for determining the relative demand for low-skilled workers in German manufacturing industries as a whole. In only four industries (electrical engineering, chemicals, office machinery/computers and paper and pulp) international outsourcing had a negative impact on the relative demand for low-skilled labour between 1978 and 1993. In these four industries, between 14 per cent and 47 per cent of the decrease in the low-skilled cost share could be explained by increased imports of intermediate inputs.

Marin (2004) finds evidence suggesting that German multinationals tend to offshore skill and R&D intensive activities to Eastern Europe. Almost 60 per cent of total investment in Eastern Europe is allocated to manufacturing industries. According to the author's econometric analysis, offshoring activities have helped to create jobs in Germany. Offshoring has enabled German firms to save 65 to 80 per cent of their labour costs, helping them to remain competitive in a highly competitive environment.

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<sup>14</sup> In a later study, Falk and Wolfmayr concentrate on the employment effects of service outsourcing. But they find again a significant negative impact of imported materials from low-wage countries on manufacturing employment in Austria, Finland, Germany, Italy and the Netherlands. See Falk and Wolfmayr (2008).

<sup>15</sup> They estimate relative demand functions for skilled workers, based on a translog cost function.

<sup>16</sup> Only the imported intermediates in a given industry, from the same industry abroad, are taken into account.



### *Offshoring of services*

Compared to the offshoring of goods, that of services is a comparatively new phenomenon. Rapid technological advances in information and communication technologies increasingly facilitate trade in services. The service categories that are most exposed to international trade are business services and computer and information services.

During the US election campaign of 2004, the labour market effects of increased service offshoring were discussed intensively. The theoretical debate was dominated by Paul Samuelson and Jagdish Bhagwati. Samuelson (2004) bases his arguments on a Ricardian model demonstrating that the labour market effects of offshoring can be negative, if the trade partner were able to realise productivity gains in a formerly non-competitive sector. A share of the comparative advantage that was previously limited to the home economy could thus be sacrificed.

Bhagwati (2004) uses a specific-factor model indicating that service offshoring is always advantageous for the country of origin and leads to welfare gains. This is due to the fact that imported service goods are essential for the production of final goods. If the production factors which initially lose from trade, are financially compensated for their losses, all production factors can win.

There are quite a few empirical studies on the labour market effects of service offshoring. Van Welsun/Reif (2005) suggest that around 20 per cent of total employment in selected OECD countries could potentially be affected by international sourcing of IT and ICT-enabled services. Nevertheless, they come to the conclusion that in the long run, the positive effects of service offshoring outweigh the negative effects. This can be explained by the fact that those countries facing rapid increases in service exports (like India and China) also have rapid increases in service imports at the same time.

For the United States, Jensen and Kletzer (2006) estimate that the share of workers in tradable professional and business service industries exceeds the share of workers in tradable manufacturing industries. Workers employed in tradable sectors have higher skills and significantly higher wages than those in non-tradable sectors. Jensen and Kletzer suggest that ongoing technological change augments the share of tradable services. The United States should, therefore, concentrate on the production of services where they have a comparative advantage.

Initially, public and political debate on service offshoring was concentrated in Anglo-Saxon countries. The geographical and cultural proximity to the middle and eastern European countries, which are now part of the European Union, is the main reason why the increased tradability of services is now also discussed intensively in Germany. Moreover, data shows how important both the offshoring and onshoring of services has become for the country.<sup>17</sup>

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<sup>17</sup> In 2006, Germany was the largest absolute offshorer of computer and information services and the second largest offshorer of business services (behind the United States). At the same time, Ger-

Schöller (2007) estimates that service offshoring exerts a potentially negative impact on manufacturing employment. Between 1991 and 2000, approximately 42,800 jobs were destroyed, due to an increase in service offshoring intensity. However, the positive employment effects resulting from an increase in real output could counteract these negative effects.

Studies on the employment effects of service offshoring for the United States and United Kingdom arrive at a different conclusion.<sup>18</sup> In both countries, no negative correlation could be found between the offshoring intensity of services and aggregate employment in the manufacturing sector. A possible explanation of the different employment effects is that German companies that offshore services, do not create new jobs, even if they achieve offshore-induced efficiency gains.

## Methodology

In order to determine the job effects of international trade flows, we apply an input-output approach.<sup>19</sup> Using input-output tables is advantageous for three main reasons. First, input-output tables offer insights into the globalization of value chains, through providing data on the value of intermediate goods and services that have been imported from companies external to the country of the sourcing company. Second, they also provide information on the growing importance of services for production processes and, due to the availability of import data, the increasing offshoring of service activities can be measured. Third, indirect effects associated with impacts on other sectors are accounted for.<sup>20</sup>

The input-output matrix provided by the Federal Statistical Office (Destatis) encompasses 71 sectors.<sup>21</sup> We apply a wide definition and add all mining and quarrying industries to the primary sector. In addition to these industries, major businesses in this sector include agriculture, agribusiness, fishing and forestry. The secondary sector encompasses those economic sectors that create a finished, usable product by transforming raw or intermediate materials provided by the primary sector. Major businesses in this sector include manufacturing and construction. The tertiary sector of the economy involves the provision of services to businesses as well as to final consumers. Therefore, the economy is divided into 8 primary sectors, 36 secondary sectors and 27 tertiary sectors.<sup>22</sup>

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many was the third largest onshorer of business services and the fourth largest onshorer of computer and information services. Source: UNCTAD Handbook of Statistics (2008).

<sup>18</sup> See Amiti and Wei (2005) and Amiti and Wei (2006).

<sup>19</sup> See Groshen, Hobijn and McConnell (2005), De Backer and Yamano (2008) and Lurweg, Oelgemöller and Westermeier (2009). For further information on input-output tables and the methodology of the input-output analysis, see also Bleses (2007) and Kowalewski (2009).

<sup>20</sup> See De Backer and Yamano (2008).

<sup>21</sup> The input-output matrix can be downloaded free of charge at [www.destatis.de](http://www.destatis.de) (Federal Statistical Office, Fachserie 18, Reihe 2).

<sup>22</sup> Due to the aggregation of some secondary and tertiary sectors, our analysis encompasses 59 sectors. For the specific sectors, see the appendix (Table A.1). The 59 sectors are in accordance with the 59 sectors at the two-digit level of the European System of Accounts (ESA) 95. At the two digit



The input-output matrix also includes data on German imports and exports, classified by trading partners and sectors. Our analysis covers the period 1995 to 2006. For this period, we have annual input-output tables.<sup>23</sup>

The key element of our analysis is the following equation:

$$LC * (I - A)^{-1} * TM = \text{German jobs embodied in net exports}$$

$(I-A)^{-1}$  is the inverse Leontief matrix (see Figure 1).<sup>24</sup> The values  $l_{ij}$  of this matrix, the so called inverse input coefficients, show how many units of intermediate production of sector  $i$  are needed to produce one unit of final demand for goods of sector  $j$  directly and indirectly. The production is therefore described as a function of final demand. The values in a column correspond to the direct and indirect requirements of a specific sector, in order to deliver an increase of one unit of output to final demand.<sup>25</sup>

Figure 1 Inverse Leontief Matrix (Extract from the 2005 Input-Output Matrix)

### 2.3 Inverse Koeffizienten\*) 2005 Inländische Produktion\*\*)

Lfd. Nr.	CPA <sup>¶</sup>	Verwendung  Aufkommen	Input der Produktionsbereiche <sup>¶</sup>						
			Erzg. v. Produkten der Landwirtschaft und Jagd	Erzg. v. Produkten der Forstwirtschaft	Erzg. v. Produkten der Fischerei und Fischzucht	Gew. v. Kohle und Torf	Gew. v. Erdöl, Erdgas, Erbring. diesbez. DL	Gew. v. Uran- und Thoriumerzen	
			CPA <sup>¶</sup> Lfd.Nr.	01	02	05	10	11	12
			1	2	3	4	5	6	
		Output nach Gütergruppen (Zeile 1 bis 71):							
✓ 1	01	Erzeugnisse der Landwirtschaft und Jagd.....	1.19646	0.01911	0.00037	0.00292	0.00027	0.00000	
✓ 2	02	Forstwirtschaftliche Erzeugnisse und DL.....	0.00214	1.17738	0.00034	0.00215	0.00339	0.00000	
✓ 3	05	Fische und Fischereierzeugnisse.....	0.00006	0.00000	1.05651	0.00000	0.00000	0.00000	
✓ 4	10	Kohle und Torf.....	0.00192	0.00035	0.00137	1.09901	0.00142	0.00000	
✓ 5	11	Erdöl, Erdgas, DL für Erdöl-, Erdgasgewinnung.....	0.00031	0.00008	0.00017	0.00059	1.03065	0.00000	
✓ 6	12	Uran- und Thoriumerze.....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
✓ 7	13	Erze.....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
✓ 8	14	Steine und Erden, sonstige Bergbauerzeugnisse.....	0.00173	0.00122	0.00360	0.00208	0.00029	0.00000	
✓ 9	15.1 - 15.8	Nahrungs- und Futtermittel.....	0.09365	0.00170	0.00071	0.00064	0.00031	0.00000	
✓ 10	15.9	Getränke.....	0.00019	0.00004	0.00002	0.00009	0.00009	0.00000	
✓ 11	16	Tabakerzeugnisse.....	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
✓ 12	17	Textilien.....	0.00032	0.00014	0.10993	0.00025	0.00007	0.00000	
✓ 13	18	Bekleidung.....	0.00013	0.00071	0.00000	0.00026	0.00001	0.00000	
✓ 14	19	Leder und Lederwaren.....	0.00004	0.00001	0.00001	0.00079	0.00001	0.00000	
✓ 15	20	Holz, Holz-, Kork-, Flechtwaren (ohne Möbel).....	0.00230	0.00341	0.00394	0.00916	0.00131	0.00000	
✓ 16	21.1	Holzstoff, Zellstoff, Papier, Karton und Pappe.....	0.00141	0.00116	0.00106	0.00237	0.00093	0.00000	

Source: Federal Statistical Office.

For example, the inverse input coefficient in row 1, column 2 shows how many units of intermediate production, produced domestically in sector 1 (agriculture), are directly and indirectly needed to provide one unit of goods, produced domestically in sector 2 (forestry), for final consumption.

To calculate the employment effects resulting from the export demand and the import supply of the foreign trade sector, the direct and indirect production effects have to be calculated. Therefore, the inverse Leontief matrix is multiplied by the trade matrix

level, the "Classification of Products by Activity" (CPA) corresponds with the "General Industrial Classification of Economic Activities within the European Communities" (NACE).

<sup>23</sup> The system of national accounts was changed in 2005 retrospectively as of 2000. Therefore, the comparability of the results before and after the year 2000 is limited.

<sup>24</sup> The inverse Leontief matrix is published each year by the Federal Statistical Office (Input-Output-Rechnung, Tabelle 2.3).

<sup>25</sup> To calculate the employment loss due to imports of goods and services, we used the input coefficients from the Input Coefficients Table (Domestic Production) and multiplied them by the imports.

*TM*. *TM* is a diagonal matrix having, as entries, the real net exports or real net imports of each of the 59 sectors of the economy.<sup>26</sup> If only certain sectors (e.g. the manufacturing sectors) are to be analyzed, the exports and imports of the other sectors are set at zero. By multiplying the inverse Leontief matrix by the trade matrix, we obtain a measure of the change in production that would be needed to replace real net imports by domestic production or for the change in production that is needed to produce real net exports in a specific sector.<sup>27</sup>

In order to compute the employment effects of international trade, the matrix of additional production is multiplied by the diagonal matrix of labor coefficients *LC*. The labour coefficient for each sector illustrates how many jobs are needed to produce one unit of output. Therefore, the labour coefficient for a specific sector *i* is calculated as follows: employment<sub>*i*</sub>/output<sub>*i*</sub>. The input-output matrix provides data on employment (persons in employment) and output for each sector.<sup>28</sup> By multiplying the diagonal matrix *LC* by  $(I-A)^{-1} \cdot TV$ , we obtain a measure for the number of jobs needed to produce, for example, net exports in a specific sector.

The analysis is limited by the assumptions that underlie the input-output tables.<sup>29</sup>

- We assume constant-factor input shares, in order to calculate the input requirements for each industry. Therefore, there are no increasing economies of scale.
- The data does not account for qualitative differences between traded and non-traded goods.
- It is assumed implicitly that the technologies for import and export goods and services are identical. This is due to the fact that the manufacturing technologies of the country are assumed to be constant, when calculating the jobs embodied in imports and exports.
- Furthermore, imports and domestic production are assumed to be perfectly interchangeable, without any costs.
- Dynamic gains of trade, defined as trade-related changes in the long-run rate of productivity growth, are not taken into account. Four possible channels through which trade can have a positive impact on productivity levels can be

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<sup>26</sup> The values of imported intermediate inputs and imported goods for final consumption were adjusted to the prices of 2005 using the price index for imported goods. The values of exports were adjusted to the prices of 2005 using the price index for exported goods (Federal Statistical Office, Fachserie 17, Reihe 8).

<sup>27</sup> We have just considered the imports that become part of the production process in Germany and not those that are directly re-exported. Those imports that are directly re-exported are not responsible for job losses in Germany. Therefore, total imports are composed of imported intermediate goods and services and imported goods and services for final domestic demand. For the same reason, we also subtracted the re-exports from the value of exports.

<sup>28</sup> We calculated the output of each sector by subtracting the final uses of imported products (Input-Output-Rechnung, Tabelle 1.2) from the total uses of products (Input-Output-Rechnung, Tabelle 1.1). The values were adjusted to the prices of 2005 using the consumer price index for Germany (Federal Statistical Office).

<sup>29</sup> See De Backer and Yamano (2008).

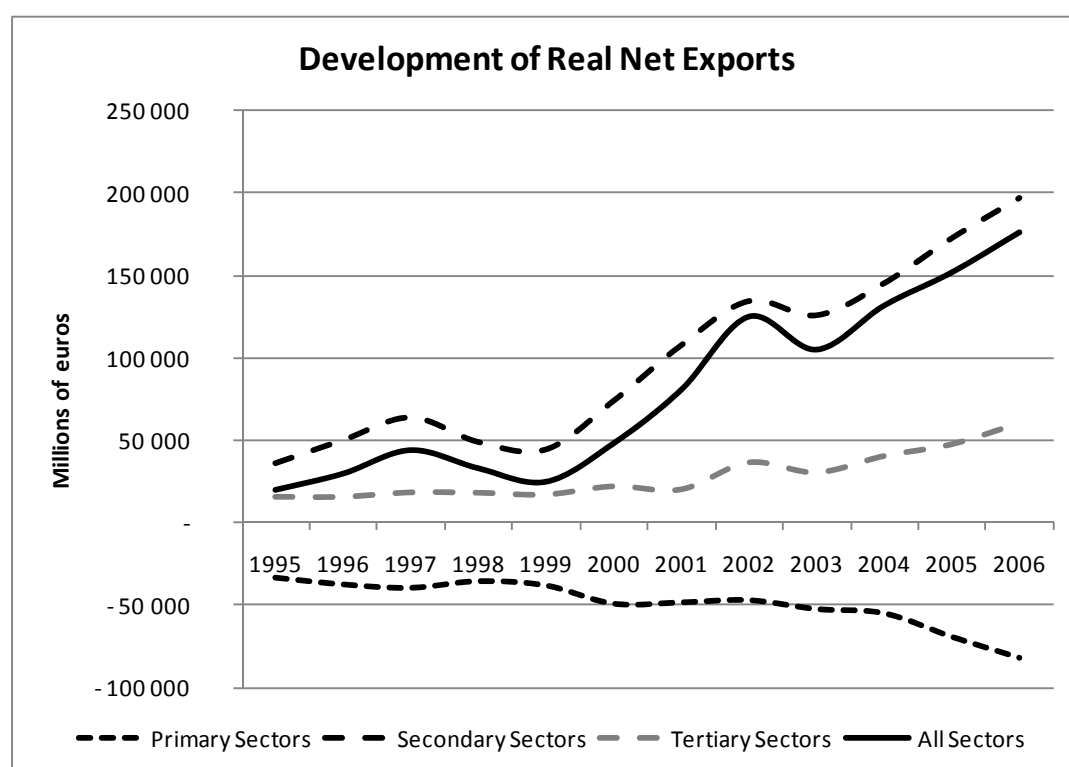
identified: more efficient resource allocation, a greater division of labour, greater returns on investment and technology spillovers.<sup>30</sup>

Due to these rather restrictive assumptions, the results must be interpreted with caution.

## Results

In 2006, real net exports were positive for all sectors except for the primary sectors (Figure 2). The greatest surplus occurred in the secondary sectors, with exports exceeding imports at a level of 197 billion Euros. More surprisingly, the exports of the tertiary sectors exceeded the imports at a level of 61 billion Euros. Particularly the net exports of the export-oriented service sectors, which are most exposed to international trade, were positive.<sup>31</sup> This can be explained by the fact that many of the countries that are mentioned frequently in the offshoring debate (such as India, China and the Eastern European countries) have indeed experienced a rapid growth of these exports, but they are also facing a rapid growth of their imports of these services. In 2006, Germany was the largest importer of computer and information services, but at the same time, the fourth largest exporter of these services. Ultimately, Germany was a net exporter of these internationally traded services.<sup>32</sup>

**Figure 2 Development of Net Real Exports**



Source: own calculations, Data: Federal Statistical Office.

<sup>30</sup> See Nordås, Miroudot and Kowalski (2006).

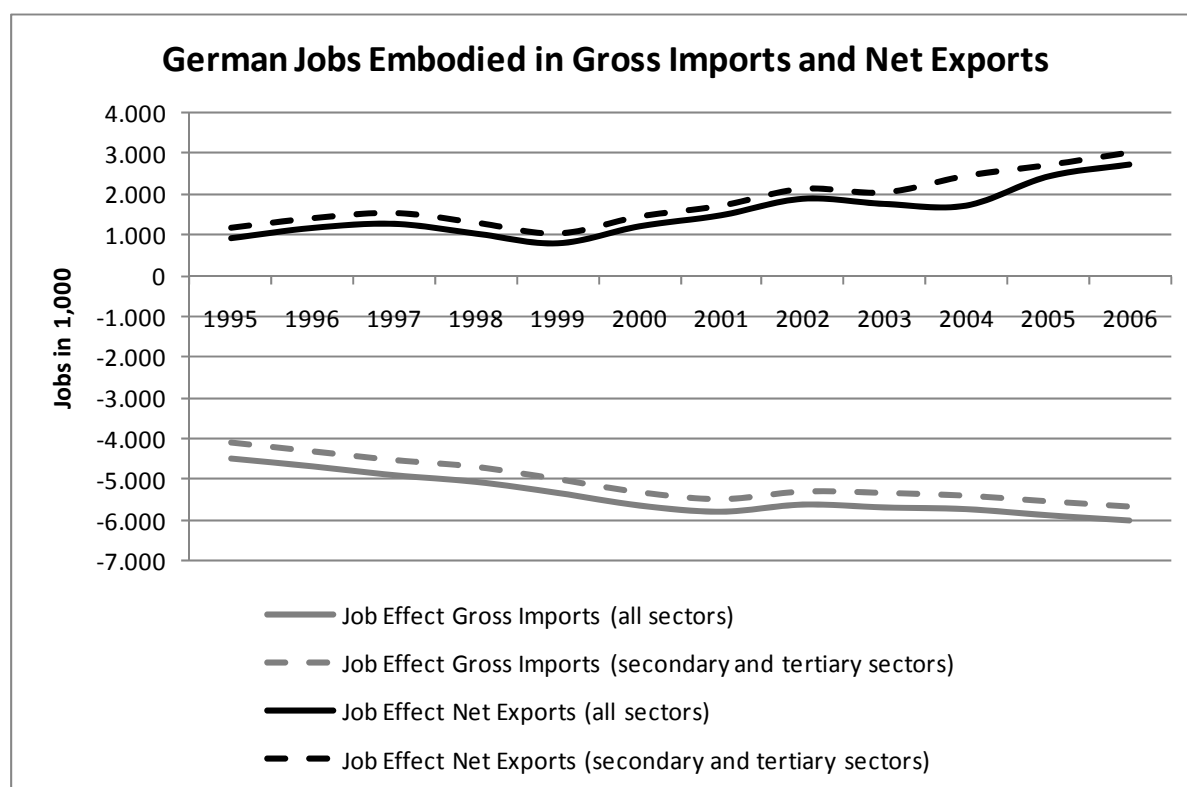
<sup>31</sup> The export-oriented service sectors produce business services in a broad sense (for the sector classification, see the appendix, Table A.2).

<sup>32</sup> See UNCTAD Handbook of Statistics 2008.

Because we wanted to analyze the economy as a whole, we included the primary sectors in our analysis. Nonetheless, their importance is fairly limited for our purposes, given that these sectors do not generally do offshoring. Consequently, the measure of German jobs embodied in real gross imports and real net exports is shown once for the entire economy, with its three main sectors, and once just for the secondary and tertiary sectors (Figure 3).

The positive job effect of German exports has exceeded the negative job effect of German imports in every reporting year.<sup>33</sup> In 2006, about 2.7 million jobs were needed to produce total German real net exports. This fact demonstrates that being integrated into the world economy is advantageous for Germany. If only the jobs embodied in the net exports of the secondary and tertiary sectors are considered, the effect is even larger, with about 3.0 million jobs being retained due to international trade. This can be explained by the fact that the primary sectors normally run a trade deficit.

**Figure 3 Employment Effects of Gross Imports and Net Exports**



Source: own calculations, Data: Federal Statistical Office.

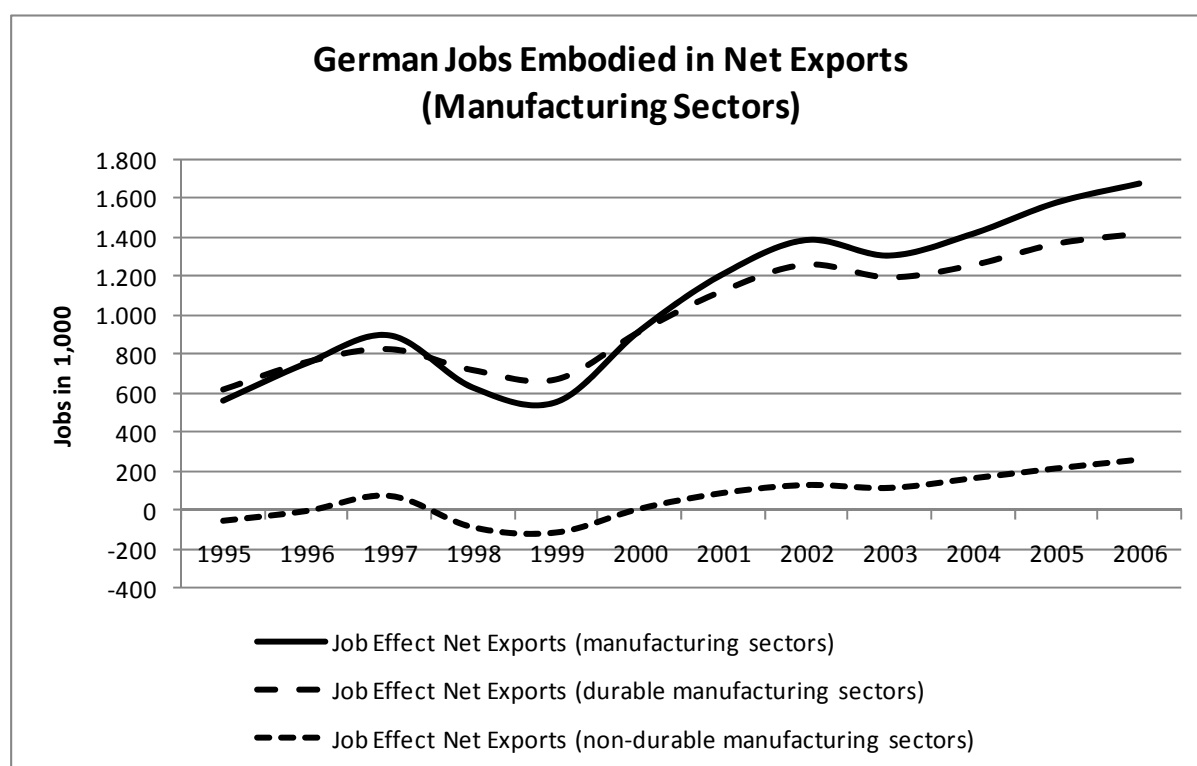
The employment effect of trade is now shown separately for the manufacturing and service sectors.<sup>34</sup> Figure 4 indicates that the net exports of the manufacturing industries are job intensive. Due to the net exports, around 1.7 million German jobs are retained, evidence of the high international competitiveness of the German manufacturing sectors.

<sup>33</sup> For the results, on a sectoral basis, see the appendix (Table A.7).

<sup>34</sup> Manufacturing sectors: sequential numbers 9-30 (CPA 15-36), service sectors: sequential numbers 35-59 (CPA 50-95). See the appendix, Table A.1.

In our analysis, we differentiated between durable and non-durable manufacturing industries. The distinction is based on whether the goods can be used only once for the purposes of production or consumption (non-durable manufacturing industries) or whether they can be used repeatedly, or continuously (durable manufacturing industries).<sup>35</sup> Interestingly, the non-durable manufacturing industries ran a deficit until 1999 and started to contribute to the positive job effects of the entire sector in 2000. Therefore, the positive job effects of trade were achieved mainly by the durable manufacturing industries. The highest job effects were achieved by the sectors “Machinery and equipment” (around 674,000 jobs created through the production of net exports), “Motor vehicles, trailers and semi-trailers” (413,000 jobs), “Chemicals and chemical products” (245,000 jobs) and “Fabricated metal products” (162,000 jobs).

**Figure 4 Employment Effects of Trade (manufacturing sectors)**



Source: own calculations, Data: Federal Statistical Office.

Due to the export surplus of the service sectors, around 1.4 million jobs were retained in Germany in 2006 (Figure 5). Again, we divided the sector into two parts: the “exporting service sectors” are typical offshoring sectors. They comprise tradable business activities in a broad sense: wholesale trade, post and telecommunications, financial intermediation except insurance and pension funding, activities related to financial intermediation, renting of machinery and equipment, computer and related activities, research and development as well as other business activities.<sup>36</sup>

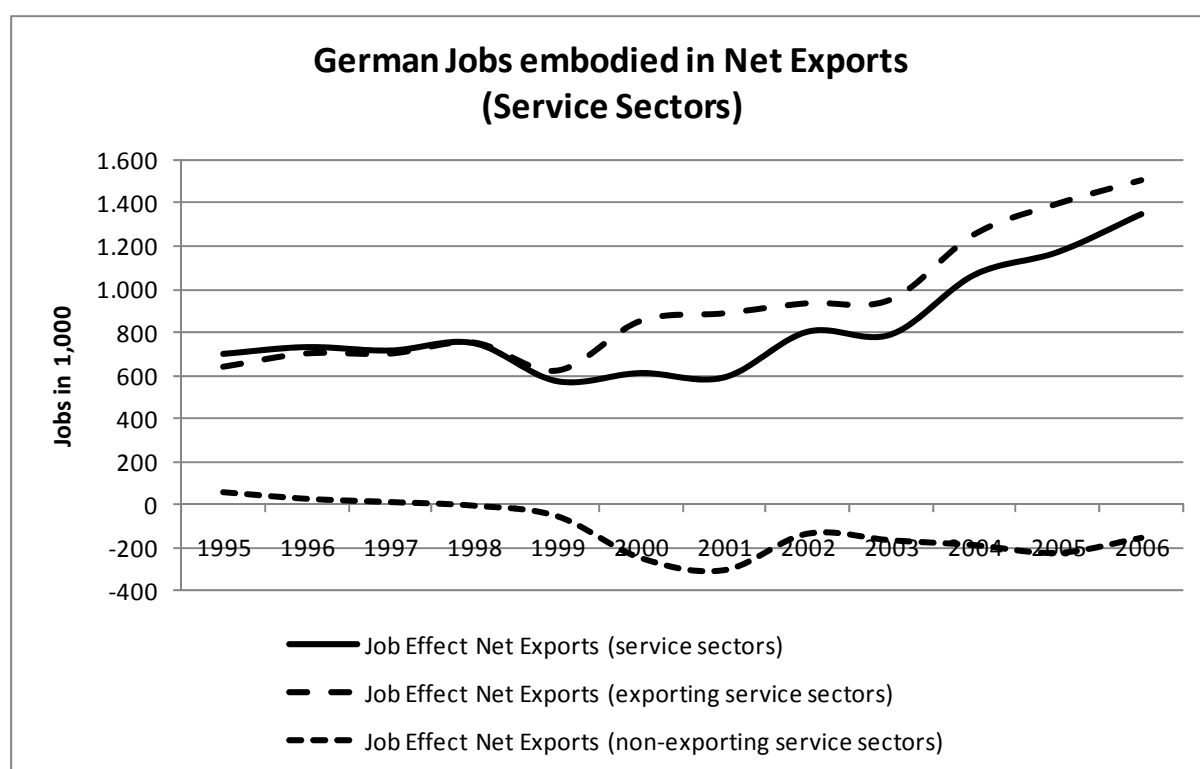
<sup>35</sup> An example of durable manufacturing industries is the sector “machinery manufacturing”. Examples of non-durable manufacturing industries are the sectors “food manufacturing” and “clothing manufacturing”. For the specific sectors, see the appendix (Table A.2).

<sup>36</sup> The aggregation is based on Kalmbach et al. (2005).

Consumer-related and social services are among the “non-exporting service sectors”. Consumer-related services in general do not represent typical offshoring services, because they have to be performed physically close to a specific domestic location. Examples of consumer-related services are the repair of motor vehicles, the retail trade, passenger rail transport and accommodation and food-service activities. Social services are usually not tradable, because they have to be delivered personally. Such services include public administration and defense, education as well as human health-related activities.<sup>37</sup>

The net exports of the exporting service sectors are job-intensive. In 2006, they accounted for around 1.5 million German jobs. This figure underlines the importance of trade in services for the domestic labour market. The positive job effects were almost completely achieved by the two sectors “Wholesale trade and vehicles” (around 1,100,000 jobs created through the production of net exports) and “Other business services” (421,000 jobs). In contrast to the exporting service sectors, the trade-induced job effects of the non-exporting service sectors were negative in 2006: around 150,000 jobs were destroyed.

**Figure 5 Employment Effects of Trade (service sectors)**



Source: own calculations, Data: Federal Statistical Office.

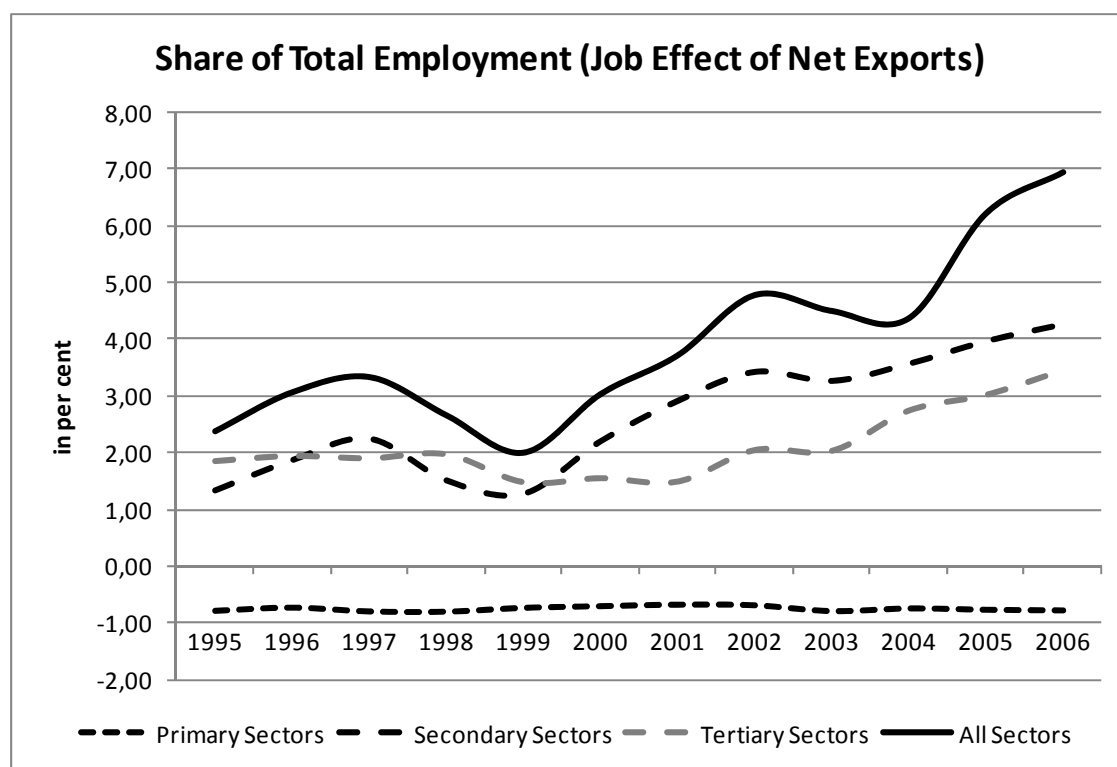
In order to gain an impression of the importance of trade-induced job gains relative to total employment in Germany, Figure 6 shows how many German jobs would be gained or lost, if the country were not to participate in international trade. This is shown for the entire economy and its three main sectors.

<sup>37</sup> For a detailed discussion of potentially offshorable jobs or tasks see Blinder (2007) and Levy and Murnane (2006). For the specific sectors, see the appendix (Table A.2).



In an autarkic situation, around 7.0 per cent of total German jobs would not have existed in 2006. The manufacturing sectors contributed most to this positive job effect of trade, with its real net exports retaining around 4.3 per cent of total employment. Around 3.4 per cent of total German employment was retained through the real net exports of the service sectors. Only due to the net imports of the primary sectors, were jobs lost to the extent of around 0.8 per cent of total employment. However, this result must be interpreted with caution, because, in many cases, the imports of the primary sectors cannot be produced domestically. This is due to the non-availability of raw materials inland (e. g. crude oil, natural gas) or unfavourable climatic conditions (e.g. for the production of bananas and pineapples).

**Figure 6 Trade-induced Job Gains as a Share of Total Employment**



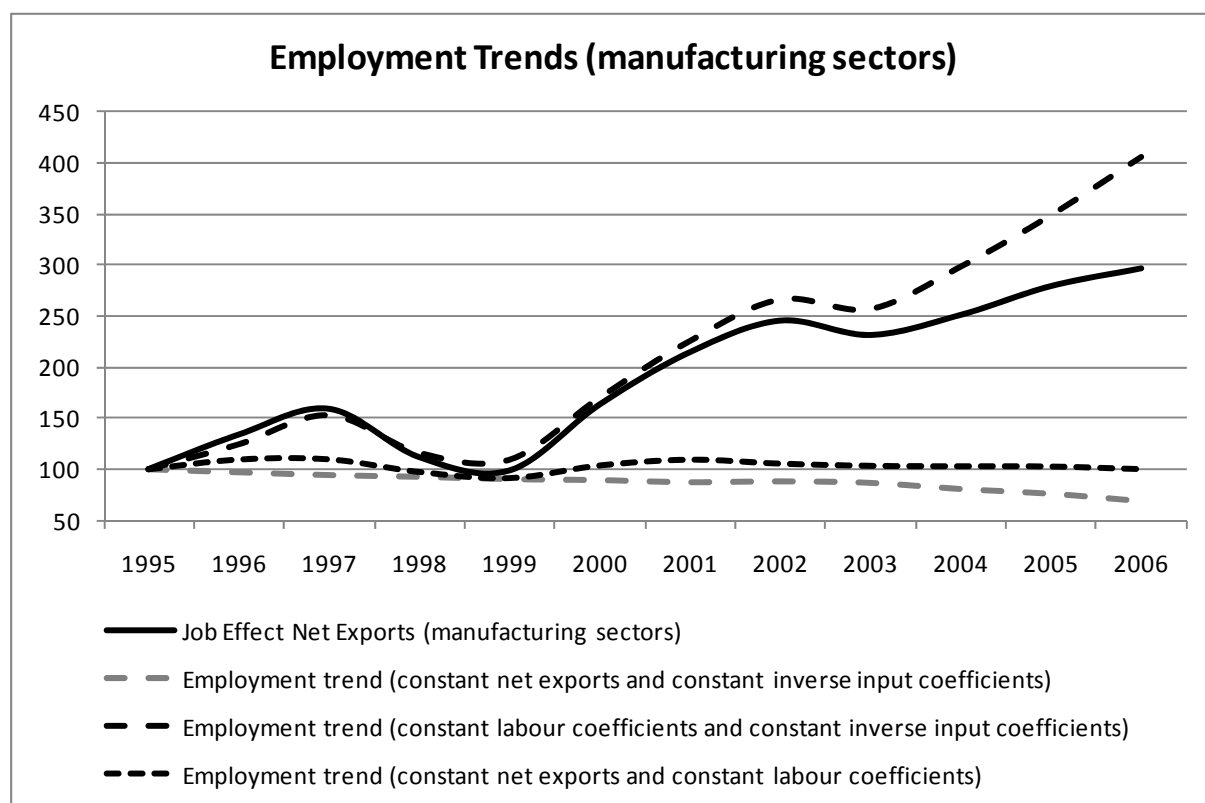
Source: own calculations, Data: Federal Statistical Office.

Our calculation is based on three components: inverse input coefficients, real net exports and labour coefficients. In a final step, we calculated the employment trends in the German economy, assuming that two of the three variables would have remained stable at the 1995 level. The underlying question is: How do labour coefficients, inverse input coefficients and real net exports influence employment trends?

If only the real net exports of the manufacturing sectors had changed since 1995 (assuming constant inverse input coefficients and constant labour coefficients), the employment trend in Germany would have been even more favourable (Figure 7). This can be explained by the fact that the labour coefficients have decreased continuously. Fewer jobs were needed in 2006 to produce one unit of output, compared to 1995, because labour is increasingly being substituted by capital, due to technological progress. The inverse input coefficients have remained almost stable since 1995 and, therefore, have not influenced the employment trend significantly.

An examination of the employment trends, resulting from the service sector trade relations, reveals a similar picture. The trade-induced employment trend would have been more favourable, if the inverse input coefficients and labour coefficients had remained stable at the 1995 level (Figure 8). However, in contrast to the manufacturing sectors, the inverse input coefficients have influenced the employment trend negatively in this case. Fewer units of intermediate production of a given sector were directly and indirectly needed to produce one unit of final demand for services from another sector in 2006 compared to 1995. A possible explanation is that imports of intermediate inputs increasingly substitute for domestic production.<sup>38</sup>

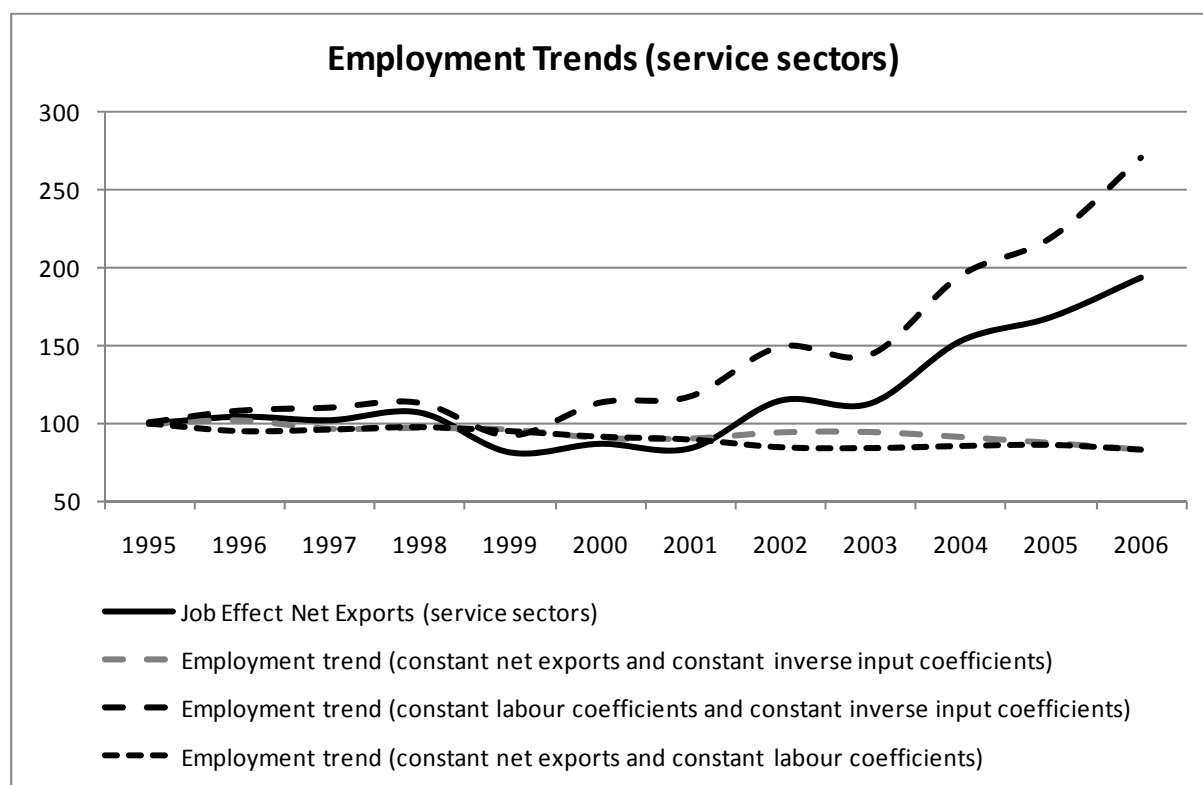
**Figure 7 Employment Trends (manufacturing sectors)**



Source: own calculations, Data: Federal Statistical Office.

<sup>38</sup> We used the inverse input coefficients (domestic production) to calculate the job effect of real net exports.

Figure 8 Employment Trends (service sectors)



Source: own calculations, Data: Federal Statistical Office.

## Concluding Remarks

Input-output analysis has been used to explore the relationship between trade and both job creation and job destruction in Germany over the period 1995-2006. The results show that being integrated into the world economy has been increasingly advantageous for the domestic economy. In 1995, trade in goods and services led to job gains in the amount of 900,000 jobs. In 2006, the trade-induced job gains reached a level of around 2,700,000. This figure is equivalent to around 7.0 per cent of total German employment compared to 2.4 per cent in 1995. The positive job effects of trade were achieved mainly by the net exports of the manufacturing sector, but the service sector also contributed significantly to the job gains. The driving forces behind these gains were the durable manufacturing industries (e. g. machinery and equipment) and the export-oriented service sectors (e. g. wholesale trade and vehicles). Only the net imports of the primary sectors were responsible for trade-induced job losses.

However, even though the trade relations of the German economy lead to positive job effects, the high level of openness makes Germany vulnerable to fluctuations in worldwide economic activity. In 2009, the German economy faced a dramatic reduction in GDP and an increasing rate of unemployment due to a worldwide decline in overall economic production. Nonetheless, protectionism is not the answer. As soon as the world economy picks up, the German economy, and above all, the manufacturing sector, will recover and jobs created.

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## Appendix

Table A.1 Sector classification I

Sequential Number	Classification of Products by Activity (CPA)	Sector Name
<b>Primary Sectors</b>		
1	1	Agricultural products, hunting products
2	2	Forestry products
3	5	Fish and fishing products
4	10	Coal and lignite
5	11	Crude petroleum and natural gas
6	12	Uranium and thorium ores
7	13	Metal ores
8	14	Stones, sand and clay, minerals, salt, other mining products
<b>Secondary Sectors</b>		
9	15	Food products and beverages
10	16	Tobacco products
11	17	Textiles
12	18	Wearing apparel, products of dressing and dyeing of fur
13	19	Leather, luggage, saddler, harness and footwear
14	20	Wood and products of wood and cork, straw and plaiting materials (excl. furniture)
15	21	Pulp, paper and paper products
16	22	Publishing and printing products
17	23	Coke, refined petroleum products and nuclear fuel
18	24	Chemicals and chemical products
19	25	Rubber and plastic products
20	26	Other non-metallic products (glass, ceramics, bricks, tiles, cement, lime, plaster, concrete, stone products, etc.)
21	27	Basic metals
22	28	Fabricated metal products, except machinery and equipment
23	29	Machinery and equipment n.e.c.
24	30	Office machinery and computers
25	31	Electrical machinery and apparatus, n.e.c.
26	32	Radio, television and communication equipment and apparatus, electronic components
27	33	Medical, precision and optical instruments, watches and clocks
28	34	Motor vehicles, trailers and semi-trailers
29	35	Other transport equipment
30	36	Furniture and products n.e.c. (jewelry, musical instruments, sports goods, games and toys, etc.)
31	37	Recovered secondary raw materials
32	40	Electricity, gas, steam and hot water

33	41	Collected and purified water, distribution services of water
34	45	Construction work
<b>Tertiary Sectors</b>		
35	50	Trade, maintenance and repair service of motor vehicles, etc.
36	51	Wholesale trade and vehicles etc.
37	52	Retail trade services, except of motor vehicles etc.
38	55	Hotel and restaurant services
39	60	Land transport and transport via pipeline service
40	61	Water transport service
41	62	Air transport service
42	63	Supporting and auxiliary transport services; travel agency services
43	64	Post and telecommunication services
44	65	Financial intermediation services, excl. insurance and pension funding services
45	66	Insurance and pension funding services
46	67	Services auxiliary to financial intermediation
47	70	Real estate services
48	71	Renting services to machinery and equipment
49	72	Computer and related services
50	73	Research and development services
51	74	Other business services
52	75	Public administration and defense services; compulsory social security services
53	80	Education services
54	85	Health and social work services
55	90	Sewage and refuse disposal services, sanitation and similar services
56	91	Membership organization services n.e.c.
57	92	Recreational, cultural and sporting services
58	93	Other services
59	95	Private households with employed persons

Table A.2 Sector classification II

Sequential Number	Classification of Products by Activity (CPA)	Sector Name
<b>Durable manufacturing industries</b>		
14	20	Wood and products of wood and cork, straw and plaiting materials (excl. furniture)
20	26	Other non-metallic products (glass, ceramics, bricks, tiles, cement, lime, plaster, concrete, stone products, etc.)
21	27	Basic metals
22	28	Fabricated metal products, except machinery and equipment
23	29	Machinery and equipment n.e.c.
24	30	Office machinery and computers
25	31	Electrical machinery and apparatus, n.e.c.
26	32	Radio, television and communication equipment and apparatus, electronic components
27	33	Medical, precision and optical instruments, watches and clocks
28	34	Motor vehicles, trailers and semi-trailers
29	35	Other transport equipment
30	36	Furniture and products n.e.c. (jewelry, musical instruments, sports goods, games and toys, etc.)
<b>Non-durable manufacturing industries</b>		
9	15	Food products and beverages
10	16	Tobacco products
11	17	Textiles
12	18	Wearing apparel, products of dressing and dyeing of fur
13	19	Leather, luggage, saddler, harness and footwear
15	21	Pulp, paper and paper products
16	22	Publishing and printing products
17	23	Coke, refined petroleum products and nuclear fuel
18	24	Chemicals and chemical products
19	25	Rubber and plastic products
<b>Exporting service sectors (business services)</b>		
36	51	Wholesale trade and vehicles etc.
43	64	Post and telecommunication services
44	65	Financial intermediation services, excl. insurance and pension funding services
46	67	Services auxiliary to financial intermediation
48	71	Renting services to machinery and equipment
49	72	Computer and related services
50	73	Research and development services
51	74	Other business services

**Non-exporting service sectors (consumer-related and social services)**

35	50	Trade, maintenance and repair service of motor vehicles, etc.
37	52	Retail trade services, except of motor vehicles etc.
38	55	Hotel and restaurant services
39	60	Land transport and transport via pipeline service
40	61	Water transport service
41	62	Air transport service
42	63	Supporting and auxiliary transport services; travel agency services
45	66	Insurance and pension funding services
47	70	Real estate services
52	75	Public administration and defense services; compulsory social security services
53	80	Education services
54	85	Health and social work services
55	90	Sewage and refuse disposal services, sanitation and similar services
56	91	Membership organization services n.e.c.
57	92	Recreational, cultural and sporting services
58	93	Other services
59	95	Private households with employed persons

Table A.3 Real brut imports (Part 1)

Seq. Number	CPA	1995	1996	1997	1998	1999	2000
1	01	17.038	17.993	18.727	18.837	18.568	16.971
2	02	415	350	414	475	529	537
3	05	483	469	430	391	470	415
4	10	779	804	943	985	904	1.008
5	11	15.713	19.240	19.757	15.594	18.836	31.940
6	12	0	0	0	0	0	0
7	13	0	0	0	0	0	2.551
8	14	3.387	3.219	3.467	3.765	3.672	1.576
9	15	25.677	26.339	27.697	28.403	29.532	27.934
10	16	598	449	626	741	788	753
11	17	11.593	11.504	11.958	12.391	12.430	12.065
12	18	14.354	14.535	15.070	15.456	14.745	14.424
13	19	5.534	5.732	6.111	5.900	6.333	6.124
14	20	5.450	5.003	5.607	5.877	5.807	5.555
15	21	10.867	9.595	9.921	11.153	11.755	13.455
16	22	3.372	3.480	3.919	4.427	4.770	4.935
17	23	8.507	10.193	11.567	11.080	11.842	18.354
18	24	32.416	31.287	33.877	40.809	43.687	46.446
19	25	10.779	10.960	12.053	13.283	14.162	14.233
20	26	7.168	6.748	7.111	7.524	7.645	7.209
21	27	27.279	22.859	26.478	28.809	28.509	31.914
22	28	10.166	10.273	11.049	12.355	13.194	13.063
23	29	22.632	23.265	23.846	28.344	30.198	32.081
24	30	13.516	13.648	15.398	18.841	21.848	22.660
25	31	11.905	11.294	12.328	15.747	16.691	19.323
26	32	15.668	14.660	15.465	17.996	20.250	24.740
27	33	7.785	8.402	8.945	10.644	10.792	12.067
28	34	36.192	37.299	40.451	44.191	49.435	45.397
29	35	7.070	8.876	11.608	12.574	13.528	15.589
30	36	10.275	10.756	11.381	12.215	12.662	12.856
31	37	0	0	0	0	0	0
32	40	759	822	744	902	828	758
33	41	0	0	0	0	0	0
34	45	3.205	2.796	2.970	3.257	3.788	3.603
35	50	0	0	0	0	0	0
36	51	2.479	2.635	2.969	3.183	3.695	3.426
37	52	110	114	138	163	105	107
38	55	6.081	6.241	6.229	6.580	6.983	6.798
39	60	5.517	6.182	6.711	7.300	7.739	8.413
40	61	889	856	884	969	1.089	1.409

41	62	3.317	3.310	3.400	3.694	3.806	3.645
42	63	3.919	4.898	5.104	5.465	5.802	6.419
43	64	3.713	3.740	4.470	4.684	5.519	5.499
44	65	2.154	2.478	2.560	2.653	2.899	2.936
45	66	1.246	2.032	1.820	1.938	2.351	1.104
46	67	4.092	4.368	4.933	5.270	6.151	5.687
47	70	2.469	2.773	3.391	4.085	4.976	5.460
48	71	0	0	0	0	0	0
49	72	1.202	1.586	2.462	3.117	4.162	4.990
50	73	2.465	3.031	3.324	4.008	4.298	4.453
51	74	8.174	8.789	10.005	10.866	11.766	13.006
52	75	1.069	1.021	863	960	1.225	754
53	80	0	0	0	0	0	0
54	85	0	0	0	0	0	0
55	90	89	102	126	152	188	207
56	91	0	0	0	0	0	0
57	92	2.204	2.802	3.417	3.580	5.000	5.367
58	93	171	196	242	292	361	398
59	95	0	0	0	0	0	0



Table A.3 Real brut imports (Part 2)

Seq. Number	CPA	2001	2002	2003	2004	2005	2006
1	01	15.966	15.638	17.120	16.459	16.214	17.169
2	02	488	416	399	393	450	472
3	05	412	409	376	406	441	322
4	10	1.467	1.311	1.216	1.891	2.277	2.588
5	11	31.246	30.740	35.532	36.937	50.603	60.998
6	12	0	0	0	0	0	0
7	13	2.525	2.373	2.162	3.183	3.687	4.881
8	14	1.484	1.475	1.481	1.578	1.643	1.597
9	15	27.938	28.068	30.684	31.598	31.803	33.148
10	16	721	678	740	745	529	591
11	17	10.979	10.192	10.632	10.430	9.961	9.778
12	18	13.812	13.169	12.845	12.523	11.917	12.034
13	19	5.959	5.465	5.469	5.212	5.260	5.322
14	20	4.526	4.319	4.584	4.623	4.430	4.933
15	21	12.949	12.435	13.218	13.132	12.663	13.438
16	22	4.879	4.540	4.775	4.512	4.686	4.648
17	23	17.164	15.746	16.310	17.261	26.934	27.014
18	24	50.248	49.072	45.770	48.427	51.243	56.626
19	25	13.307	13.222	14.794	15.441	15.898	16.568
20	26	6.769	6.181	6.462	6.543	6.317	6.665
21	27	29.689	28.417	30.093	37.919	42.243	57.097
22	28	12.851	12.362	13.418	14.222	14.556	16.396
23	29	32.334	29.730	32.094	34.027	35.112	38.249
24	30	22.962	20.835	18.835	16.420	17.694	18.943
25	31	19.218	18.073	19.064	19.646	19.017	19.852
26	32	26.069	23.528	23.540	27.219	28.281	31.658
27	33	12.647	11.284	11.490	11.815	11.329	12.802
28	34	46.512	48.676	54.823	60.879	58.186	57.617
29	35	12.296	8.471	10.057	12.910	14.741	23.224
30	36	12.017	11.944	12.127	12.717	13.216	12.135
31	37	0	0	0	0	0	0
32	40	2.200	4.149	4.886	5.407	6.644	6.641
33	41	0	0	0	0	0	0
34	45	3.886	2.969	2.873	2.849	2.762	2.826
35	50	0	0	0	0	0	0
36	51	3.552	3.361	3.162	3.382	3.559	3.869
37	52	92	82	62	62	62	51
38	55	6.661	5.613	5.429	5.701	7.046	5.483
39	60	8.731	8.616	9.036	9.503	10.132	10.872
40	61	1.645	1.509	1.634	1.980	2.370	2.459
41	62	3.634	3.556	3.451	3.519	3.847	3.377
42	63	6.519	7.507	7.029	7.372	8.094	9.827
43	64	6.041	6.063	5.497	5.753	5.969	6.800
44	65	3.180	3.034	3.150	3.220	3.374	3.746

45	66	1.433	1.632	3.415	4.462	3.935	1.930
46	67	5.868	5.544	5.214	5.582	5.884	6.451
47	70	6.759	6.486	6.516	6.628	6.669	7.351
48	71	0	0	0	0	0	0
49	72	6.289	6.528	6.723	6.761	6.891	7.065
50	73	5.470	5.813	4.521	4.422	4.660	4.622
51	74	14.275	13.293	12.335	12.497	13.762	14.805
52	75	677	670	692	435	623	550
53	80	0	0	0	0	0	0
54	85	0	0	0	0	0	0
55	90	256	246	248	251	253	284
56	91	0	0	0	0	0	0
57	92	6.029	3.846	3.944	4.119	4.329	5.157
58	93	493	472	475	483	486	544
59	95	0	0	0	0	0	0

Table A.4 Real brut exports (Part 1)

Seq. Number	CPA	1995	1996	1997	1998	1999	2000
1	01	3.192	3.270	2.873	3.106	3.362	3.740
2	02	274	192	249	344	399	430
3	05	154	237	179	161	179	165
4	10	343	333	266	218	208	215
5	11	131	171	242	295	236	785
6	12	0	0	0	0	0	0
7	13	0	0	0	0	0	0
8	14	814	823	826	837	904	891
9	15	16.154	17.333	18.157	18.425	18.789	20.100
10	16	875	1.114	1.023	1.187	1.483	1.560
11	17	8.075	8.170	8.589	8.604	8.510	8.592
12	18	2.584	2.444	2.639	2.496	2.462	2.408
13	19	1.347	1.279	1.413	1.393	1.486	1.580
14	20	1.816	1.923	2.272	2.575	2.858	3.310
15	21	9.734	9.533	9.973	10.590	11.198	13.610
16	22	4.993	5.688	5.630	5.927	6.310	6.936
17	23	3.082	3.394	3.624	3.618	4.487	6.867
18	24	46.736	47.482	53.616	55.103	57.147	64.136
19	25	13.136	14.014	15.296	16.056	16.902	18.505
20	26	5.710	5.855	6.343	6.501	6.844	7.224
21	27	24.448	23.395	26.871	26.895	25.668	31.012
22	28	13.690	14.683	15.576	16.202	17.024	18.210
23	29	59.675	63.614	68.244	71.785	71.192	76.780
24	30	4.314	3.826	4.753	4.774	4.368	6.805
25	31	18.179	18.383	20.204	22.226	22.367	25.191
26	32	10.771	11.062	13.554	13.683	16.335	21.115
27	33	11.347	12.195	13.424	14.912	15.621	17.796
28	34	64.641	68.900	78.362	88.493	95.588	103.340
29	35	10.765	9.401	12.948	12.682	14.581	15.282
30	36	6.547	6.748	7.069	7.258	7.985	8.658
31	37	0	0	0	0	0	0
32	40	438	701	633	729	707	669
33	41	0	0	0	0	0	0
34	45	158	107	118	109	89	111
35	50	1.771	1.862	2.137	2.487	2.712	2.982
36	51	23.803	26.337	28.812	30.612	31.527	34.938
37	52	144	97	119	106	106	114
38	55	2.562	2.634	3.012	3.154	3.292	3.767
39	60	3.617	4.041	4.488	4.837	5.155	5.562
40	61	5.256	5.703	6.429	6.615	7.116	9.388

41	62	3.995	4.122	4.413	4.860	4.940	5.016
42	63	3.946	3.558	3.751	4.773	5.181	5.569
43	64	1.697	1.737	1.877	1.770	1.891	1.705
44	65	3.634	4.814	5.564	5.806	8.604	6.887
45	66	1.088	2.355	1.795	849	2.772	858
46	67	571	427	474	896	1.035	1.121
47	70	700	570	583	657	611	687
48	71	0	0	0	0	0	0
49	72	1.636	1.889	2.708	3.509	3.774	5.311
50	73	2.925	2.738	4.357	4.301	4.138	4.571
51	74	8.877	9.278	10.157	10.984	11.387	12.759
52	75	438	402	400	382	372	0
53	80	0	0	0	0	0	0
54	85	0	0	0	0	0	0
55	90	0	0	0	0	0	0
56	91	0	0	0	0	0	0
57	92	496	417	467	636	703	1.045
58	93	39	29	31	33	30	32
59	95	0	0	0	0	0	0

Table A.4 Real brut exports (Part 2)

Seq. Number	CPA	2001	2002	2003	2004	2005	2006
1	01	3.611	3.592	3.408	3.220	3.434	3.588
2	02	382	334	313	358	433	504
3	05	139	143	146	155	257	62
4	10	195	231	206	206	194	225
5	11	336	430	1.136	1.168	949	671
6	12	0	0	0	0	0	0
7	13	0	0	0	0	0	0
8	14	919	961	1.016	1.065	1.111	1.188
9	15	21.465	21.353	23.418	24.441	26.112	28.246
10	16	1.780	1.628	1.288	1.325	1.663	1.657
11	17	8.557	8.537	8.174	7.957	7.677	7.726
12	18	2.618	2.863	2.704	2.700	2.720	2.657
13	19	1.686	1.873	1.630	1.718	1.614	1.730
14	20	3.487	3.791	3.797	4.364	4.879	5.424
15	21	12.936	13.175	13.522	14.091	15.091	16.356
16	22	7.506	8.451	9.170	9.889	10.978	11.783
17	23	6.659	7.498	7.814	9.806	15.015	19.940
18	24	67.624	65.424	64.960	69.063	73.945	83.811
19	25	19.119	20.303	21.567	23.549	24.536	26.859
20	26	7.456	7.626	7.795	8.363	8.433	9.419
21	27	31.337	31.221	31.312	38.370	43.209	56.374
22	28	19.147	19.856	20.953	22.734	24.786	28.249
23	29	81.396	81.672	82.812	92.360	98.638	110.020
24	30	7.355	6.879	6.620	5.523	5.450	7.669
25	31	25.681	25.462	25.885	28.380	30.326	33.229
26	32	21.380	20.810	19.902	21.452	22.219	22.011
27	33	19.648	20.157	20.437	22.714	24.335	27.124
28	34	113.101	119.524	123.121	130.293	138.315	142.487
29	35	19.002	17.155	14.711	15.890	16.052	21.589
30	36	8.941	8.813	8.959	9.662	10.025	11.251
31	37	0	0	0	0	0	0
32	40	1.908	4.140	5.072	6.427	7.129	9.831
33	41	0	0	0	0	0	0
34	45	107	105	133	91	66	97
35	50	3.228	3.600	3.714	3.903	4.036	4.563
36	51	36.704	34.372	33.286	41.098	44.210	52.234
37	52	102	121	85	104	181	203
38	55	3.726	3.767	3.791	4.105	4.290	4.694
39	60	5.879	5.948	6.015	6.308	6.827	8.082
40	61	10.490	9.709	10.215	13.001	14.763	16.136
41	62	4.913	5.749	5.105	5.348	5.860	6.089
42	63	5.467	6.326	6.427	6.530	7.610	8.560
43	64	2.115	2.271	2.527	2.786	2.867	3.668
44	65	8.745	10.122	2.961	2.250	4.518	4.492

45	66	-1.377	8.167	6.360	3.180	1.005	3.142
46	67	1.068	1.052	1.044	1.129	1.403	1.699
47	70	792	870	962	1.015	934	1.024
48	71	0	0	0	0	0	0
49	72	6.739	7.226	7.766	8.539	8.936	10.127
50	73	3.926	4.478	4.682	5.032	5.952	6.473
51	74	14.222	14.779	16.538	19.045	21.255	22.691
52	75	0	927	419	581	569	632
53	80	0	0	0	0	0	0
54	85	0	0	0	0	0	0
55	90	0	0	0	0	0	0
56	91	0	0	0	0	0	0
57	92	1.184	1.119	1.286	1.561	1.753	1.409
58	93	38	44	46	50	42	51
59	95	0	0	0	0	0	0

Table A.5 Employment (Part 1)

Seq. Number	CPA	1995	1996	1997	1998	1999	2000
1	01	1.013	906	895	900	890	881
2	02	47	47	41	41	40	39
3	05	8	7	5	6	5	5
4	10	120	109	100	90	82	77
5	11	5	5	5	5	4	4
6	12	0	0	0	0	0	0
7	13	0	0	0	0	0	0
8	14	59	57	46	44	44	44
9	15	878	866	875	886	891	905
10	16	13	12	11	11	11	11
11	17	177	164	155	152	147	146
12	18	128	117	104	99	88	82
13	19	38	37	35	34	31	31
14	20	244	237	221	214	207	206
15	21	158	153	153	152	152	150
16	22	598	587	587	587	498	511
17	23	22	20	19	18	21	20
18	24	420	405	390	376	374	371
19	25	387	376	379	388	387	397
20	26	342	324	305	302	302	300
21	27	310	297	289	294	281	283
22	28	865	837	826	843	856	853
23	29	1.120	1.089	1.067	1.072	1.075	1.083
24	30	68	62	65	57	49	50
25	31	526	506	491	498	488	500
26	32	172	157	149	146	155	166
27	33	355	339	351	341	332	330
28	34	575	606	618	647	674	691
29	35	129	124	115	113	122	126
30	36	361	350	339	334	326	314
31	37	12	14	14	16	16	18
32	40	279	267	258	250	236	217
33	41	59	57	55	53	52	51
34	45	3.248	3.145	3.021	2.926	2.869	2.779
35	50	837	862	892	931	972	1.012
36	51	1.829	1.820	1.812	1.803	1.782	1.804
37	52	3.525	3.536	3.561	3.584	3.628	3.701
38	55	1.395	1.429	1.460	1.518	1.594	1.652
39	60	1.063	1.040	1.001	1.028	983	1.007
40	61	25	24	23	23	23	21

41	62	42	41	41	41	44	47
42	63	417	416	419	429	513	529
43	64	615	578	540	524	511	518
44	65	790	785	780	778	776	783
45	66	240	237	235	236	235	235
46	67	214	211	220	230	237	248
47	70	358	367	399	432	457	466
48	71	75	78	81	86	92	98
49	72	282	293	305	336	385	460
50	73	135	141	142	152	155	157
51	74	2.494	2.641	2.773	2.969	3.237	3.502
52	75	3.016	3.007	2.960	2.917	2.897	2.850
53	80	1.995	2.039	2.056	2.083	2.113	2.148
54	85	3.224	3.342	3.414	3.481	3.574	3.665
55	90	164	162	155	147	145	144
56	91	453	462	462	470	486	494
57	92	568	591	606	638	671	714
58	93	540	532	537	558	574	599
59	95	569	585	605	622	635	649



Table A.5 Employment (Part 2)

Seq. Number	CPA	2001	2002	2003	2004	2005	2006
1	01	871	849	825	819	801	779
2	02	38	39	38	37	34	31
3	05	5	5	5	5	4	5
4	10	72	68	66	64	62	59
5	11	4	5	6	6	6	6
6	12	0	0	0	0	0	0
7	13	0	0	0	0	0	0
8	14	43	43	42	38	34	33
9	15	901	923	934	914	894	889
10	16	11	10	10	10	10	9
11	17	146	134	126	119	110	106
12	18	74	68	58	58	54	53
13	19	31	30	27	25	22	22
14	20	191	188	170	184	164	157
15	21	153	151	149	147	143	142
16	22	502	491	468	458	452	438
17	23	20	20	18	17	17	17
18	24	371	362	360	345	340	338
19	25	403	396	385	381	381	376
20	26	288	268	250	241	232	228
21	27	288	284	270	265	266	260
22	28	855	827	818	801	807	798
23	29	1.102	1.069	1.049	1.031	1.021	1.018
24	30	50	43	41	39	37	34
25	31	518	478	432	433	416	432
26	32	166	157	151	148	138	133
27	33	334	339	338	343	340	343
28	34	717	717	716	711	703	662
29	35	126	132	122	130	124	127
30	36	312	290	267	256	249	242
31	37	19	19	18	20	22	23
32	40	211	209	202	200	182	186
33	41	48	47	46	46	45	45
34	45	2.597	2.454	2.332	2.261	2.181	2.186
35	50	1.030	1.030	1.036	1.050	1.026	1.051
36	51	1.774	1.725	1.667	1.634	1.634	1.629
37	52	3.699	3.677	3.627	3.630	3.611	3.590
38	55	1.692	1.714	1.724	1.794	1.806	1.839
39	60	1.014	1.004	998	1.000	977	990
40	61	20	20	19	20	22	23
41	62	47	44	47	48	50	52
42	63	539	532	539	550	556	572
43	64	532	522	501	496	496	504
44	65	783	773	745	723	714	705

45	66	239	246	246	241	237	226
46	67	247	250	260	277	283	287
47	70	461	465	461	466	469	483
48	71	100	102	101	105	105	105
49	72	509	526	538	558	574	599
50	73	159	170	173	163	169	174
51	74	3.638	3.695	3.775	3.951	4.058	4.227
52	75	2.811	2.784	2.749	2.672	2.665	2.659
53	80	2.172	2.217	2.223	2.253	2.276	2.313
54	85	3.737	3.833	3.901	3.967	4.035	4.075
55	90	144	145	142	143	141	139
56	91	492	492	492	493	475	475
57	92	729	729	729	754	803	812
58	93	627	637	646	672	691	701
59	95	654	649	648	668	682	690

Table A.6 Real output (Part 1)

Seq. Number	CPA	1995	1996	1997	1998	1999	2000
1	01	62.355	65.302	66.716	60.869	60.022	61.261
2	02	4.321	3.911	4.129	4.167	4.281	4.010
3	05	698	588	620	664	731	691
4	10	13.769	8.899	8.180	6.964	5.961	5.867
5	11	17.246	19.110	18.366	13.685	16.236	32.507
6	12	0	0	0	0	0	0
7	13	0	0	0	0	0	2.734
8	14	12.766	13.330	14.556	12.402	11.919	10.385
9	15	149.285	150.472	155.640	146.441	145.708	148.688
10	16	5.785	4.597	4.523	4.558	5.248	5.323
11	17	26.606	25.759	25.807	24.948	23.650	23.816
12	18	15.426	14.037	14.323	14.394	12.987	13.449
13	19	5.349	5.334	5.610	5.220	5.046	4.961
14	20	31.135	28.925	30.490	28.648	29.079	28.915
15	21	42.897	41.568	44.352	42.011	43.840	48.835
16	22	54.450	55.385	55.373	56.487	58.559	60.294
17	23	31.819	34.099	35.312	30.047	32.874	53.978
18	24	165.641	189.849	222.980	183.122	185.747	204.071
19	25	61.009	59.882	63.260	64.020	64.237	67.004
20	26	53.615	49.852	48.847	47.473	48.477	48.294
21	27	117.072	120.612	141.990	117.097	105.935	128.080
22	28	97.640	94.021	94.114	98.923	101.258	106.994
23	29	160.820	161.903	166.049	174.245	172.488	184.550
24	30	16.632	14.661	18.030	18.283	15.295	27.395
25	31	80.583	78.123	82.009	87.678	93.421	96.686
26	32	34.994	34.992	38.192	32.040	37.578	58.967
27	33	34.568	35.622	37.432	39.454	39.859	44.956
28	34	176.644	185.042	203.481	212.067	230.584	252.440
29	35	20.704	25.706	25.850	26.576	32.944	34.523
30	36	34.209	33.431	34.020	36.529	36.912	37.828
31	37	1.554	1.540	1.957	2.034	1.990	2.999
32	40	70.200	72.965	72.031	67.448	64.813	58.285
33	41	7.914	8.215	8.703	9.744	9.895	9.272
34	45	286.173	275.915	265.242	253.677	253.829	247.448
35	50	47.273	47.651	48.988	53.242	55.937	55.222
36	51	183.215	175.563	178.390	185.264	182.947	190.854
37	52	142.238	144.061	141.653	143.734	148.835	155.957
38	55	77.479	68.340	67.983	68.114	70.223	78.069
39	60	65.135	63.113	64.449	63.829	65.941	72.810
40	61	8.543	9.138	9.743	9.883	10.508	13.485

41	62	17.470	17.497	18.660	19.255	20.005	23.374
42	63	63.884	65.126	66.316	69.893	77.516	82.855
43	64	60.185	58.207	61.120	65.509	72.911	78.231
44	65	93.706	99.505	102.561	101.833	120.188	112.232
45	66	53.196	55.776	57.717	58.618	62.422	61.859
46	67	20.549	21.735	23.143	24.116	28.809	28.270
47	70	313.480	324.123	322.249	326.166	329.613	327.416
48	71	43.823	46.906	47.428	48.558	49.298	53.524
49	72	32.906	35.112	38.473	44.982	48.228	53.180
50	73	18.328	19.830	20.554	19.895	21.619	26.763
51	74	234.565	240.300	246.722	252.138	270.249	281.508
52	75	180.293	180.401	177.090	178.074	183.628	180.183
53	80	100.002	102.123	103.221	105.319	108.001	109.802
54	85	175.743	184.773	186.029	188.514	193.672	197.033
55	90	29.734	30.681	30.322	30.222	30.488	29.122
56	91	21.463	22.268	22.171	22.332	23.458	23.697
57	92	56.388	58.817	62.316	67.268	72.421	74.940
58	93	35.860	36.238	36.281	36.094	37.346	38.173
59	95	5.729	5.912	6.100	6.304	6.575	6.710

Table A.6 Real output (Part 2)

Seq. Number	CPA	2001	2002	2003	2004	2005	2006
1	01	65.325	60.145	57.122	59.272	53.638	55.770
2	02	3.643	3.587	3.304	3.310	3.754	4.122
3	05	679	670	666	664	687	695
4	10	5.962	5.732	5.204	6.218	6.792	6.994
5	11	30.908	29.985	35.370	35.671	47.503	55.253
6	12	0	0	0	0	0	0
7	13	2.675	2.418	2.141	3.101	3.689	5.214
8	14	10.005	9.811	9.412	9.686	9.782	10.211
9	15	152.219	148.125	150.684	150.831	149.500	154.555
10	16	5.099	5.019	4.167	4.455	3.848	3.846
11	17	22.582	20.216	19.737	18.968	18.220	18.457
12	18	12.784	11.725	10.483	10.905	10.563	10.486
13	19	5.297	4.926	4.301	4.205	3.978	3.989
14	20	26.232	26.046	24.956	26.152	26.136	28.130
15	21	47.456	45.177	44.581	44.266	44.315	47.060
16	22	58.441	54.624	51.602	51.825	52.559	52.271
17	23	47.860	44.196	51.023	58.622	73.002	77.262
18	24	210.913	194.318	194.720	203.284	214.803	227.218
19	25	65.461	64.341	64.990	68.001	70.026	74.563
20	26	44.763	41.145	39.635	39.660	38.809	41.958
21	27	123.477	118.583	117.489	139.707	159.957	194.110
22	28	105.317	98.702	101.388	104.158	108.306	117.979
23	29	190.111	179.975	182.323	190.817	201.101	219.339
24	30	24.981	22.051	20.997	19.489	20.469	20.687
25	31	98.656	88.734	87.967	93.022	95.724	106.144
26	32	56.774	48.602	50.966	54.892	52.570	57.102
27	33	46.630	45.306	46.433	46.992	47.438	52.511
28	34	268.713	277.639	280.222	293.339	301.002	318.043
29	35	37.354	34.670	34.813	34.079	37.827	40.360
30	36	36.446	33.301	32.132	31.878	32.345	34.374
31	37	3.186	3.499	3.327	3.888	4.092	5.144
32	40	61.415	68.295	69.241	80.174	83.463	90.633
33	41	9.357	9.486	9.716	9.981	10.396	10.406
34	45	229.615	212.541	206.888	197.058	191.090	203.036
35	50	58.496	61.593	60.862	59.858	58.952	64.975
36	51	187.418	167.514	160.527	171.380	177.530	186.514
37	52	157.200	154.410	152.433	150.587	152.583	153.895
38	55	77.526	73.004	71.190	70.776	71.494	71.380
39	60	75.076	70.585	70.614	69.236	72.681	76.514
40	61	14.910	13.513	13.847	16.929	19.238	20.844

41	62	21.230	21.112	21.449	22.998	25.028	26.513
42	63	83.762	84.319	83.170	86.407	90.527	96.515
43	64	83.959	87.716	88.284	89.160	90.482	86.130
44	65	114.470	117.366	122.300	122.230	124.845	120.034
45	66	61.193	63.639	72.860	76.826	78.894	77.948
46	67	28.898	28.859	30.421	34.115	35.202	36.394
47	70	333.311	332.652	335.230	334.385	336.346	340.606
48	71	50.075	46.774	50.681	51.887	52.727	48.488
49	72	60.148	57.413	55.798	55.248	58.380	59.029
50	73	25.400	25.933	24.902	24.888	24.950	25.571
51	74	291.312	290.463	291.704	290.582	309.794	324.953
52	75	178.707	181.800	180.922	178.479	179.283	176.784
53	80	111.581	115.505	115.213	115.763	117.396	116.067
54	85	198.647	204.165	207.894	207.740	208.092	210.600
55	90	28.162	27.822	28.459	28.998	29.363	32.772
56	91	23.400	23.504	24.320	23.953	22.606	22.362
57	92	74.694	69.365	68.000	67.073	68.197	69.647
58	93	39.324	38.489	39.872	40.099	40.621	40.935
59	95	6.677	6.528	6.646	6.721	6.760	6.831

**Table A.7 Job effects of real net exports (Part 1)**

Seq. Number	CPA	1995	1996	1997	1998	1999	2000
1	01	-271	-245	-271	-276	-253	-249
2	02	-3	-4	-3	-2	-3	-1
3	05	-4	-3	-2	-2	-2	-2
4	10	-6	-8	-12	-13	-13	-13
5	11	-8	-9	-8	-7	-7	-6
6	12	0	0	0	0	0	0
7	13	0	0	0	0	0	0
8	14	-5	-5	-4	-4	-4	-4
9	15	-109	-108	-107	-102	-98	-98
10	16	1	2	1	1	2	2
11	17	-36	-37	-30	-29	-32	-31
12	18	-103	-105	-95	-91	-86	-74
13	19	-31	-31	-28	-29	-30	-31
14	20	-49	-42	-41	-39	-33	-25
15	21	-12	-5	0	-4	-4	1
16	22	29	37	33	28	27	31
17	23	-19	-24	-31	-15	-18	-51
18	24	198	234	290	120	91	218
19	25	27	33	41	36	36	41
20	26	-16	-11	-7	-9	-6	0
21	27	-33	-10	3	-19	-12	-7
22	28	63	75	80	72	70	86
23	29	501	582	568	523	459	516
24	30	-49	-52	-56	-73	-91	-47
25	31	76	86	90	72	59	61
26	32	-28	-21	-10	-29	-31	-15
27	33	40	38	43	38	43	47
28	34	134	158	197	232	252	335
29	35	23	1	4	-3	4	-1
30	36	-44	-47	-47	-49	-45	-37
31	37	0	0	0	0	0	0
32	40	-5	-2	-2	-3	-2	-1
33	41	0	0	0	0	0	0
34	45	-63	-57	-59	-60	-70	-64
35	50	22	23	27	32	32	64
36	51	614	695	708	774	704	902
37	52	2	0	-1	-2	0	0
38	55	5	4	12	11	-13	-68
39	60	104	106	94	104	106	-62
40	61	21	22	20	20	20	21

41	62	4	4	4	3	2	5
42	63	0	-16	-13	-13	-12	-15
43	64	-36	-34	-36	-46	-57	-57
44	65	-7	-8	-9	-12	-13	77
45	66	-1	3	0	-9	3	-2
46	67	-55	-54	-59	-63	-68	-61
47	70	-49	-57	-66	-82	-99	-98
48	71	-8	-8	-8	-8	-7	0
49	72	6	4	3	5	-5	4
50	73	4	-2	8	3	-1	1
51	74	122	109	94	100	69	-13
52	75	-13	-13	-9	-12	-16	-14
53	80	0	0	0	0	0	0
54	85	0	0	0	0	0	0
55	90	-12	-11	-12	-12	-11	-2
56	91	0	0	0	0	0	0
57	92	-23	-34	-41	-42	-60	-67
58	93	-3	-3	-4	-5	-7	-7
59	95	0	0	0	0	0	0



Table A.7 Job effects of real net exports (Part 2)

Seq. Number	CPA	2001	2002	2003	2004	2005	2006
1	01	-231	-236	-274	-255	-260	-263
2	02	-1	-1	-1	0	0	0
3	05	-2	-2	-2	-2	-1	-2
4	10	-18	-15	-15	-20	-22	-23
5	11	-9	-10	-13	-9	-12	-15
6	12	0	0	0	0	0	0
7	13	0	0	0	0	0	0
8	14	-4	-3	-3	-3	-3	-2
9	15	-79	-89	-101	-94	-74	-63
10	16	2	2	1	1	3	3
11	17	-22	-16	-23	-23	-19	-17
12	18	-65	-60	-57	-54	-49	-49
13	19	-28	-24	-26	-23	-22	-22
14	20	-11	-6	-8	-3	5	5
15	21	0	5	2	7	16	18
16	22	40	60	65	77	87	96
17	23	-40	-28	-38	-29	-49	-38
18	24	223	209	226	227	243	245
19	25	58	70	65	74	77	87
20	26	7	15	13	17	19	23
21	27	13	23	10	3	7	-5
22	28	103	121	121	128	148	162
23	29	557	589	599	637	637	674
24	30	-46	-38	-33	-29	-31	-26
25	31	68	74	64	78	96	109
26	32	-18	-11	-14	-21	-21	-30
27	33	56	73	73	88	102	103
28	34	393	403	373	364	420	413
29	35	27	40	20	14	6	-7
30	36	-27	-28	-27	-25	-25	-6
31	37	0	0	0	0	0	0
32	40	-3	0	2	12	5	34
33	41	0	0	0	0	0	0
34	45	-67	-50	-47	-46	-45	-44
35	50	68	75	76	81	84	90
36	51	913	836	806	991	1028	1113
37	52	0	1	1	1	3	4
38	55	-67	-45	-41	-41	-71	-21
39	60	-62	-58	-66	-68	-67	-54
40	61	22	20	21	23	24	29

41	62	4	7	6	7	7	10
42	63	-19	-22	-12	-16	-9	-22
43	64	-58	-57	-43	-42	-44	-41
44	65	103	134	-4	-19	22	14
45	66	-24	56	25	-11	-25	10
46	67	-63	-59	-55	-58	-57	-61
47	70	-123	-117	-115	-111	-111	-123
48	71	0	0	0	0	0	0
49	72	6	10	15	26	30	45
50	73	-11	-10	1	5	10	14
51	74	-3	81	231	351	408	421
52	75	-13	5	-5	3	-1	1
53	80	0	0	0	0	0	0
54	85	0	0	0	0	0	0
55	90	-2	-2	-2	-2	-2	-2
56	91	0	0	0	0	0	0
57	92	-76	-44	-43	-43	-45	-65
58	93	-9	-9	-9	-9	-10	-11
59	95	0	0	0	0	0	0