



Focus Paper

Effects of international trade for the manufacturing sector

Identifying opportunities and risks for the employment market

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What impact do imports and exports have on national economies? How do nations and economies control economic and, thereby implied, social developments? In particular in times of almost unlimited globalization permanent changes regarding the trade balance are a decisive factor. With industrial nations on the one hand, and emerging and developing countries on the other the question is who benefits from and who suffers setbacks?

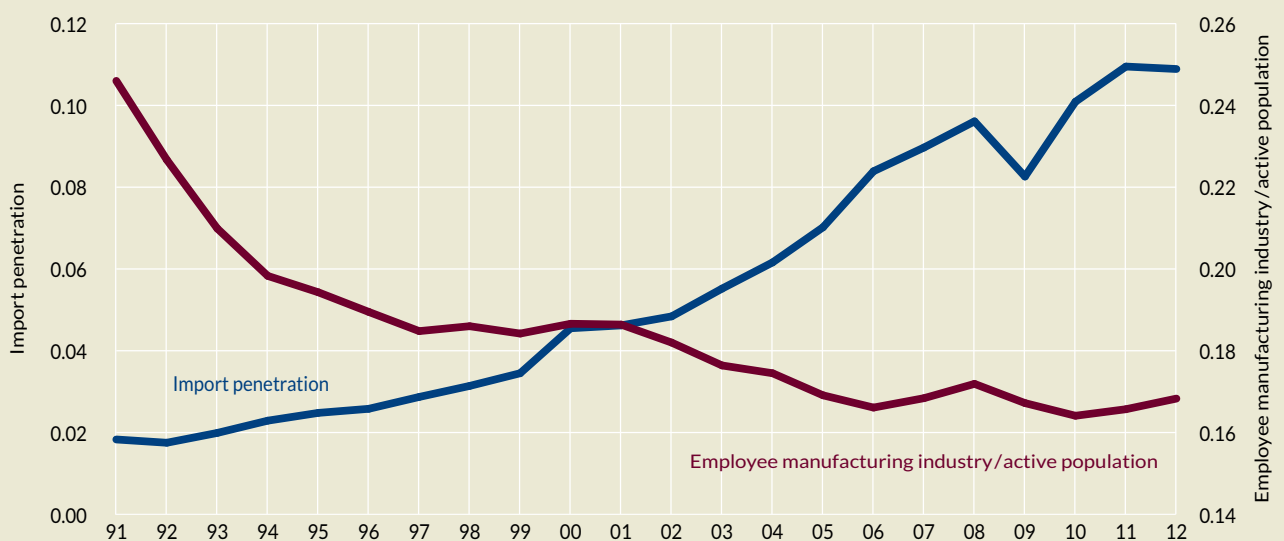
Causes and interactions are seemingly as limitless as the world market. In order to take a look at the bigger picture detailed analyses allow shedding light on crucial aspects. The focus of this study is as to what direct effects international trade has on the manufacturing sector in Germany. Wages and employment opportunities show to what degree

the country as well as individual regions and sectors react to foreign trade.

Foreign trade rate has almost doubled

The growing significance of foreign trade plays an increasingly important role for the Federal Republic of Germany. Foreign trade figures illustrate the extent to which this is happening, measured from the ratio of foreign trade in goods and services to GDP. From 1991 to 2014 it has almost doubled from 45.2 to 84.8 per cent. By way of comparison, in 2013 the rate of U.S. foreign trade amounted to only 30 per cent. With the increasing importance of foreign trade, Germany is more and more susceptible to global change

FIGURE 1: Import penetration of selected emerging countries and employment



Source: Own calculation based on the United Nations Commodity Trade Statistics. According to Autor et al. (2013b).

TABLE 1: German trade volume between 1991 and 2008 (in € billion)

Year	China		Eastern Europe		Latin America		Rest of the world	
	Imports	Exports	Exports	Exports	Imports	Exports	Imports	Exports
1991	8.05	2.83	19.11	22.67	10.75	8.79	410.36	429.67
2000	15.39	7.85	52.62	48.79	8.16	12.04	380.38	432.34
2008	63.22	36.58	147.98	171.72	24.22	24.78	642.56	835.86
Growth: 1991-2008	685.72%	1,194.86%	674.26%	657.33%	125.38%	181.78%	56.58%	94.54%

Source: Own calculation based on the United Nations Commodity Trade Statistics. Prices in 2005. According to Dauth et al. (2014)

and also given the role of the German economy as the largest economy within the European Union. Above all, the high increase of German foreign trade rate is a useful framework when examining the impact on the manufacturing sector and for this study the foreign trade with China, Eastern Europe and Latin America will be examined.

Reduction of 2.7 million workers within the manufacturing sector

In the past 20 years, there has been a significant decline in employment in the German manufacturing sector. This is illustrated by a decrease in absolute employment as well as a continuous decrease of persons in employment protected by social security. In 1991 almost a quarter of the total workforce was active within the manufacturing sector and by 2012 it had fallen to 16.8 per cent, which constitutes a drop of more than 2.7 million workers. At the same time, imports from developing countries have increased dramatically (measured by the ratio of imports to GDP). Since 1990

it has increased almost fivefold, by nine percentage points, to 10.9 per cent in 2012 creating substantial competitive pressure. With imports up the number of workers within the manufacturing sector is down, which is the clear message from the market.

Enormous increase in trade with China

The evolution of German foreign trade shows that there has been an increase in trade with low-wage countries since the early 1990s. This has been especially characterized by the market-oriented process of the Chinese economy, the collapse of the Soviet Union and, since 2000, the development of Latin American countries.

Between 1991 and 2008, imports from China and Eastern Europe rose by almost 700 per cent, and those from Latin America increased by 125 per cent. The supply of goods from other countries to Germany increased at a much more moderate rate. Comparatively speaking, they were 57 per cent lower over the same period. In the same period German exports also increased by 180 per cent to Latin America, 660 per cent to Eastern Europe, and 1200 per cent to China. A tenfold increase.

Although trade with China shows the highest growth rates, Germany's foreign trade with Eastern Europe has the highest volume. German imports from Eastern Europe were worth €148 billion in 2008, with the export market amounting to €171.7 billion. Both imports from China (€63.2 billion) and Latin America (€24.2), as well as exports to China (€36.6) and Latin America (€24.8) were significantly below the volume of trade with Eastern Europe.

Differentiation of the industry sectors

If one really wants to scrutinize the impact of foreign trade on the manufacturing sector in Germany and its employees further differentiation is required. Firstly, with regard to the regional economic structure, because within the 16 federal states there are large differences when it comes to the importance and value of the manufacturing sector. On the other hand, the individual sectors must be considered separately as the import and export figures can vary substantially. For a better understanding this study categorizes industries by so-called NACE industries and provides an overview of the respective structure in four areas

Trade-sensitive industries:

These have a high import share and a low export share. Trade-sensitive industries include: textiles and clothing, leather and leather goods, furniture, jewelry, musical instruments, sports and toys. Overall within all federal states, there were more imports than exports between 1995 and 2007 for these industries. This was accompanied by a drop in wages in the corresponding industries. The lower quarter was hit the hardest, losing out considerably over the total period.

Low-volume trade industries:

These have a low importance both in terms of imports as well as exports. The low-volume trade industries include food and beverages, tobacco, wood, cork and manufacture of plaiting materials, paper and cardboard goods, publishing and print products, coking products, refined petroleum products, fissile material and nuclear fuel. In addition, with the low-volume trade industries, imports dominated in the period from 1995 until 2007 – and the corresponding industry wages also sank to the average. The greatest losses in terms of percentiles were in the upper quarter and the median, whereas the weakest quarter hardly changed.

Trade-gaining industries:

These have a low priority in terms of import, but a high value in exports. The trade-gaining industries include chemical products, glass and glassware, ceramics, processing of stone and earth, metal products, mechanical engineering. Here the exports clearly exceed the imports – and this is the same all across Germany. This development is reflected in rising average wages between 1995 and 2007. What is particularly striking is the strong increase in the highest quartile. In the median, however, wage rises were considerably more moderate; for the weakest quarter, they more or less remained at the same level.

High-volume trade industries:

These are the heavyweights in terms of imports as well as exports. The high-volume trade industries include rubber and plastic products, office equipment, data processing equipment, electrical engineering, precision mechanics and optics, and vehicle construction. Over the entire period imports and exports were almost balanced for these sectors, as were wage developments. However, over the course of this period starting in 2003 and 2004 there was a significant

TABLE 2: Exposure and gross monthly income

	Dependent variable: logarithmized individual gross monthly income					
	-1 FE	-2 FE	-3 FE	-4 2SLS	-5 2SLS	-6 2SLS
Δ Import Exposure	-0.009**	-0.013***	-0.013***	-0.028**	-0.062***	-0.062***
	-0,004	-0,005	-0,005	-0,012	-0,019	-0,019
Δ Export Exposure	0,005	0,008**	0,008**	0,017**	0,036***	0,036***
	-0,003	-0,003	-0,003	-0,008	-0,011	-0,011
Constant	6.773***	6.771***	6.618***			
	-0,065	-0,066	-0,09			
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Dummy sectors	No	Yes	Yes	No	Yes	Yes
Dummy Federal State	No	No	Yes	No	No	Yes
N	19 689	19 689	19 689	13 533	13 533	13 533
R ²	0,167	0,168	0,171	0,092	0,084	0,087
Cragg Donald F Statistics				281,409	122,102	120,357
F statistics	42,642	33,661	21,617	75,168	56,989	33,427

Standard errors are robust and are listed within parentheses. Only income > 0 is taken into account. Reduced number of observations of the 2SLS-estimation can be explained by the use of data from the instrumental group delayed for a period of time. Prices in 2005.
Level of significance: * p ≤ 0.1, ** p ≤ 0.05, *** p ≤ 0.01

increase in the top quartile of wages, but this payroll spike once again dropped in 2007 to the 1995 levels.

Imports keep wages in Germany down

But what are the precise effects of bilateral trade on wages? Comparing the different developments between imports and exports within each industry category on the basis of the region with the development of the monthly gross salary in individual sectors, the following result shows that, in principle, wages fall if imports exceed exports. Conversely, wages increase with a trade surplus. This means that, across all areas of the manufacturing industry, that the monthly

gross wages in relation to imports will fall by 1.3 per cent, and per €1,000 more per worker within the manufacturing sector. On the other hand, the gross salary will rise by 0.8 per cent per €1,000 of exports per employee.

The end result is that the expected salary of the average worker in the manufacturing sector declined by almost five per cent as a result of regional bilateral trade with China, Eastern Europe and Latin America during the period from 1995 to 2007.

The results are astounding when examining the trade with China. Across all areas of the manufacturing sector there is a reverse effect. With a growing export surplus, wages fall;

and with import volumes rising more quickly than export volumes, wages will also rise. This is a development that is obviously due to the working methods of the respective industries. Here, the rise in productivity imposed by the market leads to greater demand for qualified personnel and therefore a positive wage pressure.

Companies under competitive pressure

International trade does not only have an impact on wages, but also on the employment market within the manufacturing sector. Examining the development of the general sectoral employment shows a clear trend. For 12 of the 14 sectors in the manufacturing industries there was a decline in employment in the period from 1999 to 2012. Overall, German manufacturing as a whole saw just fewer than 900,000 job losses. This development illustrates the negative development resulting from a shift in employment and value creation in the industry and services sectors.

The biggest losses within the manufacturing sector were felt by the electronics industry (305,600 fewer employees), the paper industry (260,200 fewer employees) and the textile and clothing industry (106,100 fewer employees). For the last two sectors employment numbers have halved between 1999 and 2012. A possible cause for this development is the squeezing out of “low productivity” companies as a result of increased international competition.

The car-manufacturing industry recorded the largest increase in employment. Compared to 1999 employment increased by around 150,000 employees (an increase of 19 per cent). Only the manufacturing sector of furniture, jewelry, toys, etc. saw the number of employees increase with an increase of 35,000 employees. Interestingly, the latter sector is part of the trade-sensitive industries. These are characterized by import penetration. This is also reflected in the other categories: the average annual decline in sectoral

employment in the trade-sensitive industries amounted to minus four per cent, which is the largest percentage decrease by quite some margin. This is mainly due to the decline in employment in the textile and clothing sector and the leather industry. Both sectors recorded the highest losses with an average loss of minus 5.63 per cent and minus 4.18 per cent.

Large differences between the regions

An overview of the regions revealed great differences. The trade-gaining industries were mainly able to increase their share on a regional level compared to 1999, or at least only suffered minor losses in comparison with the other categories. The biggest decline in this category was recorded for the sector for the production of glass and glassware in Brandenburg and Thuringia, with a decline of 2 percentage points. The metal (plus 17 percentage points) and engineering industry (plus 12 percentage points) in Bremen, however, showed the highest growth.

High-volume trade industries show a higher variance within the results. The reason lies in the structure of foreign trade within these sectors. In addition to a high volume of exports, they are subject to a higher than average import penetration. The electronics industry had the largest decline in the high-volume trade industries. The decline is minus 1.50 percentage points, taking into account all of the federal states. The Saarland in particular (minus 4 percentage points), Baden-Wuerttemberg (minus 4.80) and Schleswig-Holstein (minus 5.90) are all affected by this development. The vehicle construction sector, however, has seen a positive outcome. This sector has the highest average growth of all sectors, with 3.80 percentage points. Hamburg in particular could benefit from this with a growth of 10.20 percentage points, as well as Bayern (growth of 7.50).

FIGURE 2: Share in regional manufacturing employment 1999-2012



Source: Own calculation based on the statistics of the Federal employment agency

The trade-sensitive industries have a comparatively low level of employment within regional manufacturing, with less than 10 per cent. Some provinces have recorded significant growth in this category. These are based on the positive developments within the sector for the production of furniture, jewelry and toys. On a regional level, Berlin (plus 6.30 percentage points), Schleswig-Holstein (plus 4.80) and Bremen (plus 4.50), really stand out. The textile industry in Saxony, with a decline of 3.30 percentage points, recorded the highest losses.

There is a general negative trend within the low-volume trade industries. Many sectors have lost out in importance in comparison to employment in regional manufacturing. The paper industry in particular had the highest average decline in all sectors, with a fall of 2.85 percentage points. Hamburg recorded the largest losses (minus 13.40 per cent points), followed by Berlin (minus 4.80) and Hesse (minus 3.90). There were relative increases in the food industry in particular. This industry could become especially important in Bremen, which saw an increase of 12 percentage points.

Trade relations with China play a significant part for employment market development within the various regions: namely, the more the import outweighs the export the greater the expected duration of unemployment. Thus the expected level of unemployment in the manufacturing sector rose by eight per cent for each change of €1,000 of per capita imports from China. In this way, trade relations with China can vary greatly, depending upon the region.

This most affects employees in the regional industries in Saarland (€720), Berlin (€700) and Lower Saxony (€670). These three provinces have, on average, shown the highest import exposure over the observation period. For the average factory worker in these regions, the increase in Chinese imports led to an increase in the individual duration of unemployment: to 6.10 per cent in Saarland, 5.91 per cent in Berlin, and 5.65 per cent in Lower Saxony. This is because of

TABLE 3: Trade exposure and employment level effect

	Dependent variable: Duration of unemployment		
	2SLS (1)	2SLS (2)	2SLS (3)
∅ Import Exposure	0.138 ***	0.082 ***	0.075 ***
	-0,026	-0,017	-0,017
∅ Export Exposure	-0.098 ***	-0.052 ***	-0.049 ***
	-0,02	-0,01	-0,01
High-Volume Trade			0,003
			-0,005
Low-Volume Trade			0,013 **
			-0,006
Trade-Sensitive Industries			0,032 ***
			-0,012
Control variables	No	Yes	Yes
N	6184	6184	6184
R ²	-0,087	0,078	0,087
F statistics	30,926	20,627	19,578
Kleinberg-PAAP F Statistics	24,506	75,811	64,358
Standard errors are in parentheses and are clustered by State and sector. (Upper classification). Metric variables are average values. Level of significance: * p ≤ 0.1, ** p ≤ 0.05, *** p ≤ 0.01			

TABLE 4: Local change of import and export exposure in € (average)

Federal state	Import exposure			Export exposure		
	China	Eastern Europe	Latin America	China	Eastern Europe	Latin America
Baden-Württemberg	500	670	120	290	1200	130
Bavaria	600	700	120	270	1200	120
Berlin	700	780	140	310	1370	140
Brandenburg	540	690	130	360	1430	160
Bremen	560	600	110	310	1170	160
Hamburg	330	390	80	190	700	70
Hesse	470	680	130	310	1230	140
Mecklenburg-West Pomerania	430	720	130	240	1120	110
Lower Saxony	670	950	180	390	1630	170
NorthRhine-Westphalia	590	720	130	330	1360	140
Rhineland-Palatinate	510	770	130	310	1290	130
Saarland	720	730	120	360	1390	150
Saxony	510	680	120	330	1310	130
Saxony-Anhalt	460	540	90	280	1020	90
Schleswig-Holstein	510	850	150	310	1450	160
Thuringia	490	610	110	240	1060	100
Total	540	690	120	300	1250	130

Source: Own calculation based on the United Nations Commodity Trade Statistics.

the development of the import of goods in machine manufacturing, the electronics industry and the textile and clothing industry. These sectors are particularly relevant for these three provinces in terms of employment. Here, too, the increased demand for highly qualified employees plays a role, while increased regional competition threatens low-skilled employees with job losses. Trade relations with Eastern Europe and Latin America, however, do not appear to be significant in terms of a separate analysis of trade flows.

Increase in productivity requires highly qualified workers

In general, imports of goods from developing countries increase individual unemployment and at the same time have a negative effect on wages. A separate analysis of trading partners, however, shows country-specific effects. While imports from China and Eastern Europe both have a negative impact on employment, Eastern European imported goods have a more positive effect on wages than their Chinese counterparts. Imports from Latin America are at a manageable level and seem to have no decisive effect on wages. In addition, the different sectors in the manufac-

turing industry play an important role. Employment in the trade-sensitive or low-volume trade industries leads to a rise in individual unemployment. At the same time, there is a positive wage effect in the trade-sensitive industries, while activity in the low-volume trade industries also negatively affects wages.

Trade with developing countries therefore launches processes within the manufacturing sector. Non-productive companies are pushed out of business as a result of increased international competition. Companies that want to maintain or even gain a market share need to increase their domestic and international competitiveness. This results in either a reduction of costs or an increase in productivity. Highly qualified employees with knowledge of the latest technological developments play an important role. For those who are low-skilled, however, chances of re-employment fall. This is an important message for the education and training market.

But, conversely, could jobs be created and wages increased if the number of imports were simply to be lowered? This is surely not the case as throughout Germany and across all sectors of the manufacturing industry exports offset to a large extent the negative effects of imports. The available evidence regarding the effects of foreign trade on wages and employment opportunities provide an important tool when it comes, for example, to the promotion and establishment of new companies. Thereby the regional economic development can be aided, in particular for the weaker regions of Germany, by choosing the respective sectors of the manufacturing industries.

About the method:

This study uses regression analysis regarding the impact of cross-border trade with China, Eastern Europe (21 countries, including Russia, Poland, Romania, Hungary and Bulgaria) and Latin America (20 countries, including Argentina, Brazil, Chile and Mexico) for wages and employment in Germany. The effects are calculated whilst taking into account the different bilateral trade flows and the regional economic structure of the 16 federal states. The analysis is carried out by using trade flows of other high-wage countries as instrumental variables (5 countries, including Sweden and the United Kingdom). The data is based on the years 1995 to 2007. The sample group of persons is male, full-time and permanent part-time persons working in the manufacturing sector (between 17 and 55 years of age).

Literature

Autor, D. H., D. Dorn and G. H. Hanson. “The China syndrome: Local labor market effects of import competition in the United States”. *American Economic Review* 113 (4) 2013. 2121 – 2168.

Bertelsmann Stiftung (Hrsg.). *Wachsende Lohnungleichheit in Deutschland – Welche Rolle spielt der internationale Handel*. Gütersloh 2015.

Dauth, W., S. Findeisen and J. Suedekum (2014). “The Rise of the East and the Far East: German labor markets and trade integration”. *Journal of the European Economic Association* 12 (6) 2014. 1643 – 1675.

Lurweg, M. and N. Uhde. “International trade and individual labour market perspectives: A micro-level analysis of German manufacturing workers”. SOEPpapers on Multidisciplinary Panel Data Research No. 297. Berlin 2010.

Ronge, M. *Beschäftigungseffekte des internationalen Handels auf regionaler Ebene*. Not published. Eckernförde and Kiel 2014.

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