Chapter 6

Trade and Labour Market Outcomes in Germany

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The German economy is characterised by a high degree of foreign exposure through exports and imports. This chapter considers the link between trade and labour market outcomes in Germany. To that end, we combine individual-level data from the German Socio Economic Panel for the period 1999 to 2007 with industry-level data on various aspects of trade – exports, imports and offshoring. We consider their effects on wages and the probability of moving into unemployment. Our econometric analysis suggests that there is little impact of trade-related variables on individual-level wages, whereas there appears to be some impact with respect to employment. We find some important differences between manufacturing and services sectors, in particular with regard to exporting and offshoring.

6.1. Introduction

Germany is one of the most important countries for world-wide trade. According to figures available from the World Trade Organization, it was the second largest exporting economy and the third largest importer in the world in 2009.[1] The importance of trade is also evident when putting it in perspective with the size of the economy. With an openness indicator (trade relative to GDP) of more than 80% in 2006, Germany is also a very open economy. In comparison, the United States had a ratio of less than 30%, while France and the United Kingdom were around 55 to 60% in the same year (OECD, 2008b).

The dependence of the German economy on international trade has spurred much research into the potential consequences, in particular in terms of labour market outcomes (e.g. Geishecker and Görg, 2008, Winkler, 2009, van Suntum *et al*., 2010). The recent financial and economic crisis has turned the lime light back onto this issue. Initially, given the rapid decreases in world-wide exports, countries dependent on exports were expected to suffer significantly during the crisis (Baldwin and Evenett, 2009). In Germany, at least, this did not happen. A number of possible explanations for this have been put forward in the literature. For example, Boysen-Hogrefe and Groll (2010) and Gartner and Merkl (2011) argue that wage moderation before the crisis is an important explanatory variable. Because of this, firms were able to adjust employment only marginally during the crisis. Möller (2010) also puts forward other explanations, including the fact that firms were reluctant to let go off highly qualified staff during what was perceived as a temporary slump, given skill shortages and high training costs for new workers. Also, both studies mention the generous provision of short-time work (*Kurzarbeit*) as an important factor in mitigating negative employment effects.

In this chapter, we leave aside the current preoccupation with the recent crisis and take a broader view to investigate the link between trade and employment in Germany over the period 1999 to 2007. We consider not only exports and imports but also look at labour market consequences of trade in intermediate goods – commonly referred to as international outsourcing or offshoring. We also consider some labour market policies related to trade and focus particularly on one that has importantly changed work arrangements in Germany, namely, temporary contracts. We investigate whether trade has had different implications for temporary compared to permanent workers.

6.2. Trade and labour markets: an overview

Trade developments

This section looks at what happened to trade in Germany between 1999 and 2007. The analysis is based on data from German Input-Output tables from 1999 to 2007, available from the Federal Statistical Office (*Statistisches Bundesamt*).[2] The data is also used in the econometric analysis on the link between trade and labour markets further below.

1. *See* the *International Trade Statistics 2010*, at: *www.wto.org/english/res_e/statis_e/its2010_e/its10_toc_e.htm.*

2. More recent input-output tables at the same level of detail are not yet available for Germany, hence the cut-off at 2007. We use these data rather than trade statistics because we are also interested in computing measures of international outsourcing, for which we also need input-output data. This is discussed further below.

A look at the aggregate data shows that the first decade in the new millennium was a period of strong growth in the German trade performance. As shown in Figure 6.1 the aggregate export intensity of the manufacturing sector increased from about 30 to 38% between 1999 and 2007. Over the same period, imports grew also, but at a much slower rate, leading to a strongly increasing net export ratio for Germany.[3]

A similar development is evident for the services sector, albeit at a much smaller scale. Services sector exports increased from 5% to about 8% of output between 1999 and 2007, while imports increased from about 4% to 5% over the same period. Again, this contributed to an increasingly positive trade balance for Germany.

The aggregate figures, however, hide a strong degree of sectoral heterogeneity in the trade performance. In order to gain further insight into this issue, Tables 6.1 and 6.2 present export and import ratios by industry for 1999 and 2007, for the manufacturing and services sector respectively. In manufacturing, especially transport equipment (NACE 35), motor vehicles (34), machinery and equipment (29) are industries with consistently high export ratios. This is in line with the popular view that Germany has a strong export performance in particular in machinery, automobiles and related industries (see also Godart and Görg, 2011).

One noteworthy point in a comparison between 1999 and 2007 is that at the end of the period, the lowest export ratio in a sector is 19% (food, NACE 15). In 1999, by contrast, there are a few industries with export ratios well below this mark, such as wood (NACE 20) at 10%, publishing and printing (22) at 11% or food (15) at 13%. This again indicates the strong export growth in the German economy in the manufacturing sector. There is no two-digit industry that experienced any substantial decline in the export ratio over the period under investigation.[4]

Imports grew similarly in all manufacturing industries. The most important importer industries are office machinery (NACE 30), wearing apparel (18) and leather (19) where imports account for between roughly two-thirds and three-quarters of output. At the other end of the spectrum are publishing and printing (22), fabricated metals (28) and non-metallic minerals (26), where the import ratio is well below 20% of output.

3. This is consistent with firm level evidence by Vogel *et al*. (2009), who show that the number of manufacturing firms not involved in exporting or importing has declined from 67% to 61% between 2001 and 2005. This shows that the increase in exports and imports is not just due to an expansion along the intensive margin, but also at the extensive margin, as more firms enter into exporting and importing activity.

4. The export ratio in Transport Equipment (NACE 35) declined slightly from 51% to 49%.

Figure 6.1. Export and import intensities in German manufacturing

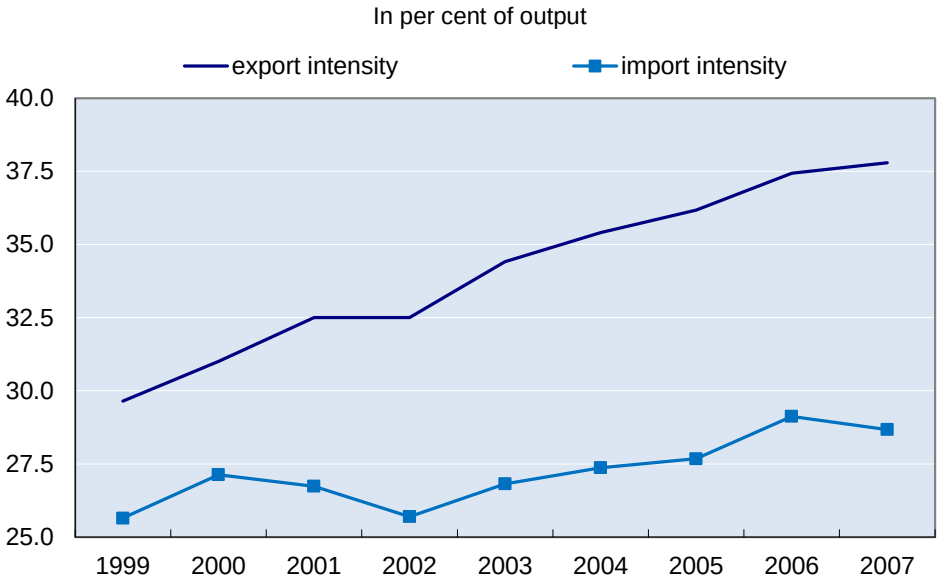


Figure 6.2. Export and import intensities in German services industries

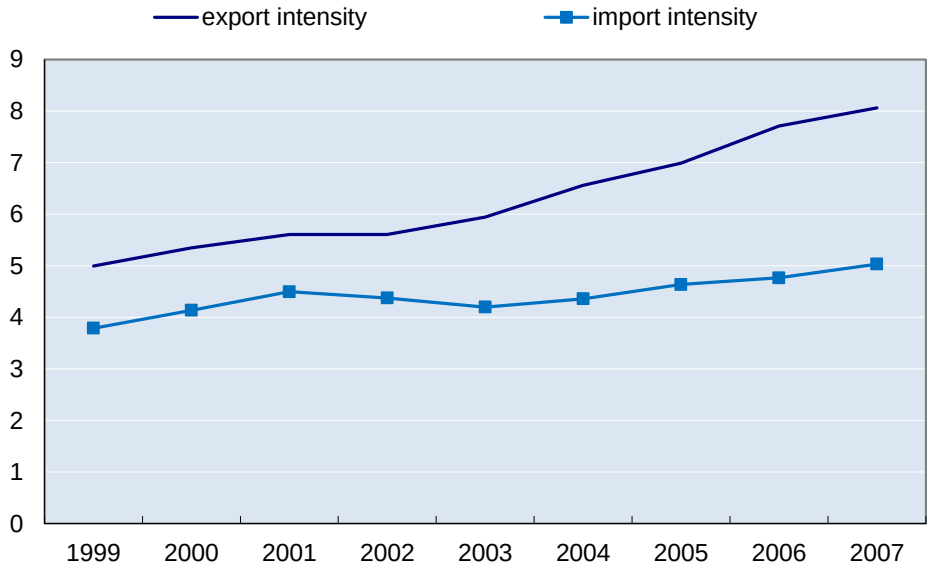


Table 6.1. Export and import intensities in Germany, 1999 and 2007, by manufacturing industry, percentage of output

Industry	Import intensity	Import intensity	Export intensity	Export intensity
	1999	2007	1999	2007
15: Food products and beverages	18.983	21.579	13.162	19.125
16: Tobacco products	15.186	27.038	27.790	**51.994**
17: Textiles	47.211	**50.056**	36.847	**42.648**
18: Wearing apparel; dressing and dyeing of fur	62.183	**68.419**	22.580	35.377
19: Leather, luggage, handbags, saddlery, harness, and footwear	65.991	**69.182**	23.643	37.436
20: Wood and wood products, except furniture	20.103	19.359	10.925	22.672
21: Pulp, paper, and paper products	28.131	**31.741**	28.212	36.686
22: Publishing, printing, and reproduction of recorded media	8.754	11.310	11.762	25.047
23: Coke, refined petroleum products, and nuclear fuel	32.350	**30.350**	13.094	22.483
24: Chemicals, chemical products and man-made fibres	25.502	**32.973**	33.834	**42.317**
25: Rubber and plastic products	23.011	27.206	28.292	**39.552**
26: Other non-metallic mineral products	16.567	18.818	15.708	25.810
27: Basic metals	27.253	**33.444**	25.933	31.225
28: Fabricated metal products, except machinery and equipment	13.736	16.599	18.127	25.544
29: Machinery and equipment n.e.c.	19.180	21.416	42.001	**49.146**
30: Office machinery and computers	72.179	**70.650**	31.107	**49.201**
31: Electrical machinery and apparatus n.e.c.	21.053	26.131	27.727	**37.845**
32: Radio, television and communication equipment and apparatus	45.984	**49.068**	40.978	**40.048**
33: Medical, precision and optical instruments, watches and clocks	28.777	**31.886**	39.830	**51.691**
34: Motor vehicles, trailers and semi-trailers	20.533	20.048	39.382	**44.544**
35: Other transport equipment	47.511	**47.619**	51.157	**49.579**
36: Furniture; manufacturing n.e.c.	29.793	**38.004**	21.102	35.981

Note: Bold print indicates export or import intensive industries, respectively.

Table 6.2. Export and import intensities in Germany, 1999 and 2007, by services industry, in % or output

Industry	Import intensity	Import intensity	Export intensity	Export intensity
	1999	2007	1999	2007
[40] Electricity, gas, steam and hot water supply	1.257	6.580	1.129	**9.032**
[41] Collection, purification and distribution of water	0.000	0.000	0.000	0.000
[45] Construction	1.466	1.552	0.036	0.078
[50] Sale, maint, repair motor vehicles; retail car gas	0.000	0.000	5.044	7.295
[51] Wholesale trade, commission trade, ex. motor vehicles	1.996	2.353	17.930	**27.305**
[52] Retail, Ex. Motor vehicles, Motorcycles; Repair	0.082	0.076	0.087	0.092
[55] Hotels and restaurants	9.121	**8.157**	4.529	6.473
[60] Land transport; transport via pipelines	10.962	**12.346**	7.690	7.311
[61] Water transport	10.016	**16.922**	68.953	**72.270**
[62] Air transport	17.289	**12.348**	23.632	**23.468**
[63] Supporting, Aux. Transport Activities; Travel agencies	7.392	**10.953**	6.952	**10.739**
[64] Post and telecommunications	7.414	**8.258**	2.674	4.150
[65] Financial intermediation, ex. insurance, pension funding	2.368	3.750	7.400	4.975
[66] Insurance and pension funding, ex. compulsory socsec	3.721	3.535	4.620	6.170
[67] Activities auxiliary to financial intermediation	21.061	**19.393**	3.731	6.949
[70] Real estate, property activities	1.491	2.367	0.193	0.294
[71] Renting of machinery, equip wo. oper., pers,HH goods	0.000	0.000	0.000	0.000
[72] Computer and related activities	8.384	**12.745**	8.007	**17.979**
[73] Research and development	18.674	**18.801**	18.934	**26.598**
[74] Other business activities	4.294	5.004	4.377	7.387

Note: Bold print indicates export or import intensive industries, respectively.

We use the information in the table to classify industries as export- or import-intensive in 2007.[5] An industry is classified as export-intensive when its share of exports exceeds the average export share across all industries. The averages are calculated separately for manufacturing industries (15 to 36) and service industries (40 to 74) in order to account for the different trade levels in these two groups. Import-intensive industries are also classified along these lines. We mark these industries in the table using bold print for the export and import data. For example, all industries with NACE codes between 29 and 35 (generally high-tech industries) are considered export-intensive, as are NACE industries 24 and 25, and 16 and 17, 30, 32, 33 and 35 are also considered import intensive.

The trade performance of individual industries is much more diverse in the services sector. Perhaps not surprisingly, a number of sectors have virtually no trade or only very low export and import ratios (e.g. water (NACE 41), construction (45), retail (52), real estate (70) and renting of machinery (71)). By contrast, water transport (NACE 61) has an export ratio of

5. As Godart and Görg (2011) show, export-intensive industries are of particular importance for economic activity in Germany, in terms of total employment and net value added. Moreover, since many of these industries are also characterised by large import shares, they are subject to a high degree of international competition. Hence, they may arguably be likely to display stronger trade-related labour market effects.

almost 75% in 2007. Other sectors with high export ratios are research and development (73), air transport (62) and wholesale trade (51), although exports only account for about 25% of output in those industries. On the import side, research and development (73), auxiliary financial intermediation (67) and water transport (61) have the highest import penetration ratios.

An important facet of today's world economy is that trade is no longer concentrated in final goods only. Instead, the recent wave of globalisation is characterised by the strong emergence of vertical specialisation and offshoring of production (Yi, 2003). While the exact magnitude of offshoring is difficult to measure, empirical work in international trade generally gauges its importance by looking at imports of intermediate goods. Following Feenstra and Hanson (1999), many studies, including Geishecker and Görg (2008) for Germany, use input-output tables to estimate the importance of intermediate goods trade for certain industries. We follow this approach here and calculate these figures for manufacturing and services industries separately.

In each case, we calculate a measure of narrow offshoring, which is defined as the amount of intermediate inputs used by the domestic 2-digit industry *j*, which is imported from the same industry *j* abroad. This is scaled by total output of the domestic industry *j*. Note that *j* can be any manufacturing (*m*) or services industry (*s*). This measure can be considered as the offshoring of core competencies that could have been carried out by the industries themselves (Feenstra and Hanson, 1999).

We also calculate for each 2-digit manufacturing industry (*m*) the amount of services offshored by the industry, as total services imports by manufacturing industry *m* over total output of industry *m*. This is, thus, similar to Amiti and Wei (2005) who investigate the increasing importance of services offshoring in manufacturing industries. Similarly, we also calculate, for each 2-digit manufacturing industry the amount of materials offshoring as imports from all other manufacturing industries, including the own industry *m*. These three types of offshoring, thus, encompass the various possibilities of offshoring from the own industry, other manufacturing industries, and services industries.[6]

Similar to manufacturing we also calculate three measures of offshoring for 2-digit services industries (*s*). The first one is narrow offshoring, which is defined as described above. The second is other services offshoring, which includes intermediate imports from services industries, including the own industry *s*. Finally, there is materials offshoring as imports of intermediate inputs from manufacturing industries.

Figure 6.3 shows the aggregate data for the German manufacturing sector. Note that all three offshoring measures in manufacturing industries have risen between 1999 and 2007. Notable, however, is the level difference, with inputs imported from manufacturing industries being much more important than services offshoring.[7] The picture is less clear for the services sector in Figure 6.4. Offshoring of services (narrow or other) has clearly risen considerably, while material offshoring has fluctuated somewhat, but was at roughly the same level in 1999 and 2007. Not surprisingly, services offshoring is much more important in the services sector than in manufacturing industries.

6. The exact definitions of our offshoring measures are described in the appendix.

7. This is consistent with evidence at the industry level for the United Kingdom by Amiti and Wei (2005) and firm-level evidence for Ireland by Görg *et al.* (2008).

Figure 6.3. Materials and services outsourcing in German manufacturing

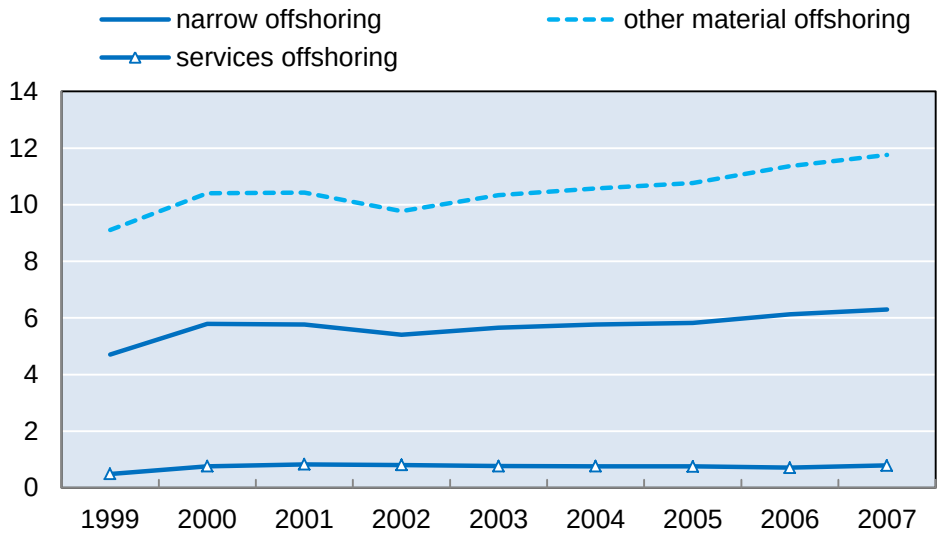
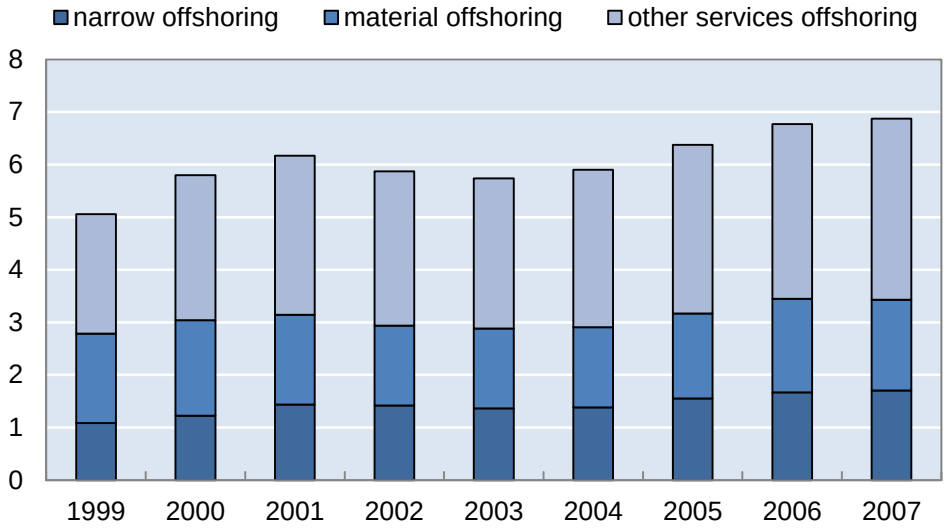


Figure 6.4. Materials and services outsourcing in German services industries



Tables 6.3 and 6.4 look at sectoral heterogeneity.[8] A number of manufacturing sectors use narrow offshoring more intensively than the aggregate figure of roughly 6% in 2007. These are mainly high-tech sectors such as communication equipment (NACE 32), office machinery (30), motor vehicles and transport equipment (34 and 35) and chemicals (24), but also other industries such as basic metals (27), which would not generally be regarded as high-tech. The growth of materials offshoring has been most pronounced in communication equipment with an increase from 3% to almost 13% of output between 1999 and 2007. As regards services offshoring, most manufacturing industries have levels below one%, with the exception of tobacco (16), chemicals (24) and non-metallic minerals (26).

8. In order to save space, we do not report figures on the third category of offshoring, "other" materials respectively services. These are strongly positively correlated with the narrow offshoring measures and, hence, do not add much to the discussion.

In the services sector, the industries most heavily engaged in offshoring of services activities are electricity and gas (NACE 40), telecommunications (64) and auxiliary financial intermediation (67). A number of industries do not engage in any offshoring of services at all, such as water (41), services related to motor vehicles (50), retail (52), water and air transport (61, 62), insurance (66) and renting of machinery (71). Hence, this shows that the level of offshoring of core competencies of the industry (captured by the narrow offshoring measure) is not as pronounced yet as was shown by narrow offshoring in manufacturing industries.

Materials offshoring is also at relatively low levels with one important exception: the air transport industry imports material inputs accounting for roughly 20% of total output in 2007. This dwarfs all other services sectors.

Table 6.3. Offshoring intensities in Germany, 1999 and 2007, by manufacturing industry, in % of output

Industry	Services offshoring	Services offshoring	Materials offshoring	Materials offshoring
	1999	2007	1999	2007
15: Food products and beverages	0.261	0.373	2.644	3.963
16: Tobacco products	0.975	1.505	1.788	0.351
17: Textiles	0.199	0.237	5.141	4.366
18: Wearing apparel; dressing and dyeing of fur	0.126	0.121	4.630	5.935
19: Leather, luggage, handbags, saddlery, harness, and footwear	0.059	0.062	8.183	7.885
20: Wood and wood products, except furniture	0.727	0.524	3.949	3.581
21: Pulp, paper, and paper products	0.413	0.658	6.039	7.659
22: Publishing, printing, and reproduction of recorded media	0.547	0.965	0.154	1.227
23: Coke, refined petroleum products, and nuclear fuel	0.405	0.219	4.462	1.835
24: Chemicals, chemical products and man-made fibres	1.192	1.901	7.908	7.996
25: Rubber and plastic products	0.509	0.993	0.829	1.447
26: Other non-metallic mineral products	1.276	1.781	1.790	2.186
27: Basic metals	0.369	0.534	7.068	10.950
28: Fabricated metal products, except machinery and equipment	0.445	0.705	1.371	1.949
29: Machinery and equipment n.e.c.	0.398	0.681	4.946	5.998
30: Office machinery and computers	1.137	0.762	1.316	7.353
31: Electrical machinery and apparatus n.e.c.	0.392	0.633	5.086	5.031
32: Radio, television and communication equipment and apparatus	0.286	0.605	3.307	12.984
33: Medical, precision and optical instruments, watches and clocks	0.394	0.630	2.545	3.752
34: Motor vehicles, trailers and semi-trailers	0.294	0.803	5.968	7.666
35: Other transport equipment	0.272	0.254	11.346	8.035
36: Furniture; manufacturing n.e.c.	0.143	0.344	5.081	6.204

Table 6.4. Offshoring intensities in Germany, 1999 and 2007, by services industry, in % of output

Industry	Services offshoring	Services offshoring	Materials offshoring	Materials offshoring
	1999	2007	1999	2007
[40] Electricity, gas, steam and hot water supply	0.082	5.273	1.972	1.894
[41] Collection, purification and distribution of water	0.000	0.000	1.979	2.099
[45] Construction	0.251	0.278	5.431	6.395
[50] Sale, maint, repair motor vehicles; retail car gas	0.000	0.000	4.319	3.988
[51] Wholesale trade, commission trade, *example* motor vehicles	1.996	1.328	0.565	0.486
[52] Retail, *example* motor vehicles, motorcycles; repair	0.000	0.000	1.215	1.513
[55] Hotels and restaurants	0.000	0.046	6.594	4.945
[60] Land transport; transport via pipelines	0.998	1.114	1.283	1.379
[61] Water transport	0.000	0.000	1.243	1.801
[62] Air transport	0.005	0.003	12.284	20.863
[63] Supporting, aux. transport activities; travel agencies	0.363	0.232	0.401	0.470
[64] Post and telecommunications	4.900	6.802	0.656	1.007
[65] Financial intermediation, *example* insurance, pension funding	0.846	0.333	0.145	0.203
[66] Insurance and Pension Funding, *example* Compulsory SocSec	0.002	0.000	0.261	0.252
[67] Activities auxiliary to financial intermediation	1.077	5.685	0.023	0.125
[70] Real estate, property activities	0.515	2.367	0.080	0.056
[71] Renting of machinery, equipment wo. oper., pers,hh goods	0.000	0.000	0.073	0.067
[72] Computer and related activities	3.947	2.879	1.002	1.172
[73] Research and development	1.044	0.831	1.713	2.408
[74] Other business activities	2.697	2.637	0.775	0.475

Labour market developments

Having described trade developments we now direct our attention to the labour market. We first present aggregate trends in total employment, employment by skill group, and wages over the period 1999 to 2009. Then, we present labour market outcomes by industry. This allows us to compare labour market trends between import-, export-, and offshoring-intensive industries, and, hence, to link labour market and trade developments.[9]

Aggregate trends 1999-2009

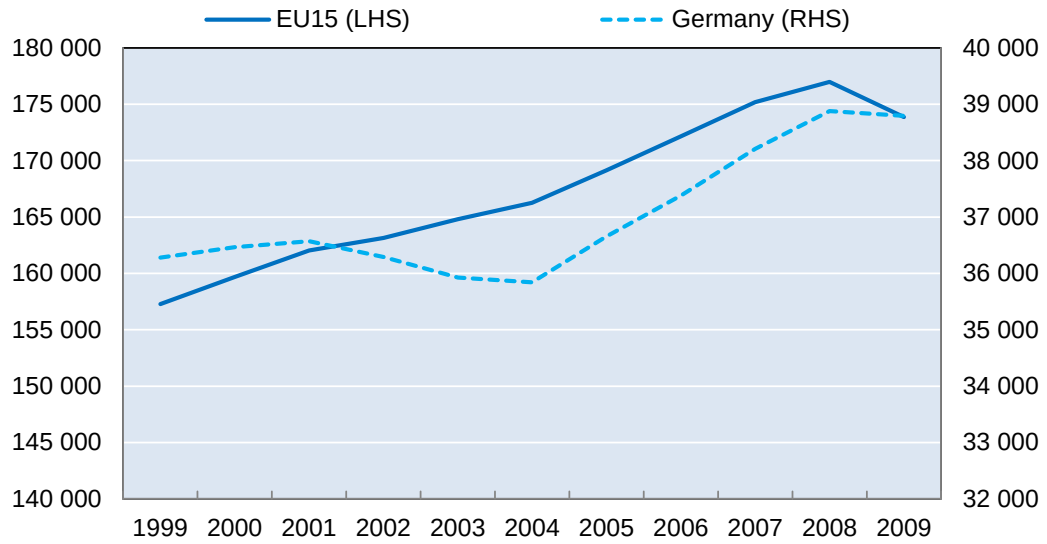
Total employment

Germany's performance in total employment throughout the decade of 1999 to 2009 was mixed (Figure 6.5). Total employment increased between 1999 and 2001 due to an economic upswing since 1999 (OECD, 2001). Compared to earlier periods of sluggish growth and weak

9. We use employment data provided by Eurostat, originating from the National Accounts (e.g. total employment, employment by industry) and the Labour Force Survey (e.g. employment by skill group). Wage data stems from the National Accounts, and the German Socio-Economic Panel (SOEP).

labour market performance, employment gains have been rather strong.[10] While total employment in the EU-15 further increased after 2001, in Germany it declined between 2001 and 2004. The bad performance relative to other countries has often been attributed to the continuing adjustment costs of the reunification (e.g. OECD, 2004). Moreover, Germany experienced a recession in 2003, so that reduced employment also reflects the stagnation in output and weak confidence. In 2004, the German economy recovered from the recession and started a period of impressive employment growth, strongly outperforming that of other EU-15 countries. For several years, real wage growth has been low compared to changes in labour productivity, allowing for the robust recovery of the labour market (OECD, 2008a).

Figure 6.5. Total employment (LFS)



Source: Eurostat, based on Labour Force Survey.

In contrast to other European Union countries, the financial crisis in early 2008 had rather muted effects on total employment in Germany. Also unemployment increased only slightly. It has been suggested that a major reason for the small effects was that previously introduced government policies allowed firms to flexibly decrease working hours of their employees. Short-time work schemes, additionally subsidised by the government, have also been a very popular instrument for firms to deal with the economic downturn, even though these schemes have not been the major source of employment stability (Boysen-Hogrefe and Groll, 2010, Gartner and Merkl, 2011). Also, firms hoarded qualified workers due to experienced, and expected, skill shortages (Möller, 2010).

10. However, these increases in total employment mask that hours worked have increased at a much slower rate, suggesting that the overall increase was mainly driven by the creation of part-time employment (OECD, 2001).

Employment by skill group

In Table 6.5, total employment is broken down by workers' educational attainment.[11] The last row shows the growth rates for each group during the decade: employment of workers with primary education has decreased by 12.8%, while employment of workers with secondary and tertiary education has increased by 13% and 21.5%, respectively. Note, however, that these numbers partly reflect composition effects, as can be seen from the evolution of employment *rates* by education group (Figure 6.6). While employment rates of workers with primary education experienced a sharp drop in 2001, they moved in tandem with those of medium- and high-skilled workers thereafter. Yet, the 2003 recession had a stronger impact on low-skilled workers. Similarly, the employment rate of low-skilled workers declined after the 2008 financial crisis, while it stagnated or even increased for medium- and high-skilled workers, respectively.

The roles of trade and offshoring in these aggregate labour market developments is not entirely clear (Lurweg and Uhde, 2010; Geishecker, 2008, Bachmann and Braun, 2011). The declines in employment have been mostly attributed to a weak overall economic performance, even though offshoring has certainly contributed to firms' shedding of labour. For example, it has been shown that offshoring mainly affects low-skilled labour (e.g. Geishecker, 2006; Geishecker and Görg, 2008; Winkler, 2009). However, trade, in particular exports, is a major driving force during economic upswings (OECD, 2008a). Below we look into employment by export-, import-, and offshoring-intensive industries.

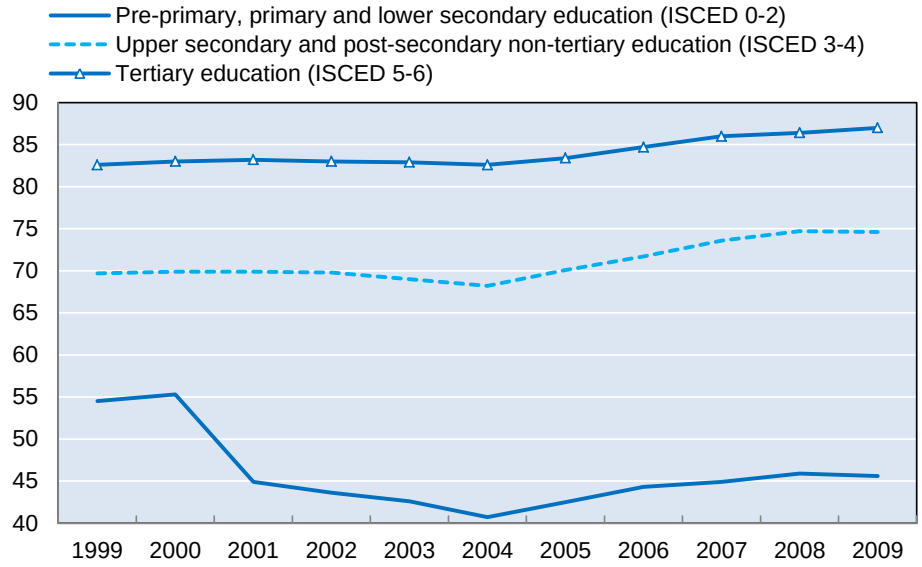
Table 6.5. Total employment by educational attainment (in thousands of workers)

	Educational attainment		
Levels	**Primary**	**Secondary**	**Tertiary**
1999	6 163	19 722	8 550
2000	5 856	19 685	8 775
2001	5 790	20 362	8 729
2002	5 550	20 954	8 293
2003	5 328	20 047	8 812
2004	4 994	19 604	9 049
2005	5 771	20 965	9 398
2006	5 927	21 629	9 273
2007	5 722	22 403	9 484
2008	5 511	22 672	9 957
2009	5 373	22 289	10 387
Growth rates			
1999-2009	-12.8%	13%	21.5%

Source: Eurostat, LFS, authors' calculations; 23 November 2010.

11. The time series on total employment described above is based on the German microcensus (labour force survey). Due to data availability, we employ a different time series from the national accounts (NA) for the breakdown of employment by industry at the 2-digit level. That series is partly based on the LFS, but also other data sources are taken into account. For completeness, the two series are compared in the annex in Figure 6.A1.1. Employment levels in the NA series are higher than in the LFS series, but the development of employment over time is mostly identical, even though the strong increase only starts in 2005 in the NA series.

Figure 6.6. Employment rates by educational attainment, 1999-2009



Source: Eurostat, LFS.

Real wages

This subsection describes the development of real wages in Germany. We employ two different sources of wage data for this purpose. First, we calculate annual earnings using data from the National Accounts (gross wages, salaries and total employment). Data is available for all industries, except for 2009. Second, we use survey data from the German Socio-Economic Panel (SOEP). All series are in nominal terms and are deflated using the CPI provided by the German Statistical Office.

Figure 6.7. Real annual earnings, 1999-2009
in Euros

Notes: From National Accounts (NA), and Socio-Economic Panel (SOEP); NA: Wages and salaries divided by total employment; SOEP: monthly earning multiplied by 12; all series deflated with CPI (German Statistical Office).

Real annual earnings are displayed in Figure 6.7. Even though the level of annual earnings calculated from the National Accounts is lower than in the SOEP, the development of real wages over time is similar.[12] The NA series indicates that real annual earnings stagnated between 1999 and 2003 and constantly declined thereafter. These observations are in line with other examinations of real wages in Germany (Brenke, 2009). While earnings in the SOEP increased relatively strongly between 2001 and 2003, real annual earnings also almost constantly declined thereafter. Interestingly, the SOEP data also indicate that annual earnings have risen in the aftermath of the financial crisis, whereas this does not show in the NA series.

Trends by industry 1999-2009

Employment

We now look at employment trends within detailed industries. First, we look at aggregate industry trends at a 1-digit NACE level. Second, we identify the five industries with highest and lowest change in employment levels between 1999 and 2008.[13] Third, we identify the five industries with strongest and weakest employment growth. Finally, we report employment changes within export-, import-, and offshoring-intensive industries using the classification described in Section 6.2.

Table 6.6. shows employment growth rates by 1-digit industry. Real estate, renting, and business activities (industry K) has had the strongest employment growth in percentage terms (about 40%). It has also been the strongest in terms of net job creation, with more than 1.6 million net jobs created between 1999 and 2008. Employment in hotels and restaurants (H), and health and social work (N) grew by about 18% between 1999 and 2008. The strongest decline in employment (in percentage terms) has been in mining and quarrying (industry C), but in absolute terms, the employment decrease has been rather small (53 000 jobs). More important in terms of jobs lost has been the decline in the construction industry (F) and in manufacturing (D).

Looking at more detailed industries, Table 6.7 reports the five best and worst performers in terms of absolute job growth. Employment in "Other business services", comprising professional business services (e.g. accounting, consultancies), technical business services (e.g. architectural), advertising, and personnel services, increased by about 1.3 million employees. Health and social work is the second most important industry, which shows about 600 000 jobs more in 2009 than in 1999. The strongest decreases in employment occurred in construction, with more than 660 000 jobs lost. Also public administration and defense shrank strongly by more than 260 000 jobs.

In Table 6.8, we show the five best and worst performers in terms of employment growth rates. The oil and gas extraction industry has grown strongly by 75%. Business services (computer and related activities and other business services) have also grown strongly by 70% and 42%, respectively. The largest decreases occurred in the mining industries, and in textile and related industries.

12. The difference is likely to originate from differences in measuring wages (i.e. bonus payments, 13th salaries, overtime pay, etc.), differences in the sample of employed (full-time, part-time, etc.), and possibly also differences in the population concept (residents, foreigners working in Germany, etc.).

13. Note that we compare to 2008 levels because the financial crisis of 2008 might have had unpredictable influences on employment trends at the industry level.

Linking employment trends to trade, we now compare the development of employment between export-, import, and offshoring-intensive industries.[14] As to offshoring intensities, we distinguish between narrow offshoring, materials and services offshoring. Figure 6.8 shows employment trends over time for these five industry aggregates (1999=100). Industries intensive in narrow offshoring have shown the strongest growth in employment; an increase of more than 20% between 1999 and 2008. While overall employment declined between 2001 and 2004 (recall Figure 6.5), employment levels in industries intensive in narrow offshoring increased throughout. All other industry aggregates follow the overall trend of an employment decline starting in 2001. Employment only started to pick up again around 2005 in these industries. In particular, industries intensive in materials offshoring show shrinking employment levels almost throughout the entire period and only return to 1999 employment levels by 2008.

Table 6.6. Employment growth by industry 1999-2008 (one-digit NACE)

NACE	Description	1999-2008	
		In '000	In %
A	Agriculture, hunting and forestry	-86.0	-9.14%
C	Mining and quarrying	-53	-39.55%
D	Manufacturing	-375	-4.66%
E	Electricity, gas and water supply	-37	-11.64%
F	Construction	-666	-23.29%
G	Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	26	0.44%
H	Hotels and restaurants	289	18.61%
I	Transport, storage and communication	141	6.77%
J	Financial intermediation	-80	-6.35%
K	Real estate, renting and business activities	1661	39.83%
L	Public administration and defence; compulsory social security	-265	-9.13%
M	Education	282	13.33%
N	Health and social work	646	18.06%
O	Other community, social and personal service activities	297	15.81%
P	Activities of households	72	11.34%

Source: Eurostat, National Accounts.

14. A description of how we classify trade intensities is given in section 6.2 above. We classified the industries on the basis of trade data for 2007.

Table 6.7. Industries with strongest and weakest absolute job growth between 1999 and 2008 (in thousands of workers, two-digit NACE)

Five industries with strongest job creation 1999-2008		
74	Other business activities	1349
85	Health and social work	646
55	Hotels and restaurants	289
80	Education	282
72	Computer and related activities	244
Five industries with weakest job creation 1999-2008		
65	Financial intermediation, except insurance and pension funding	-90
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles	-99
22	Publishing, printing and reproduction of recorded media	-130
75	Public administration and defence; compulsory social security	-265
45	Construction	-666

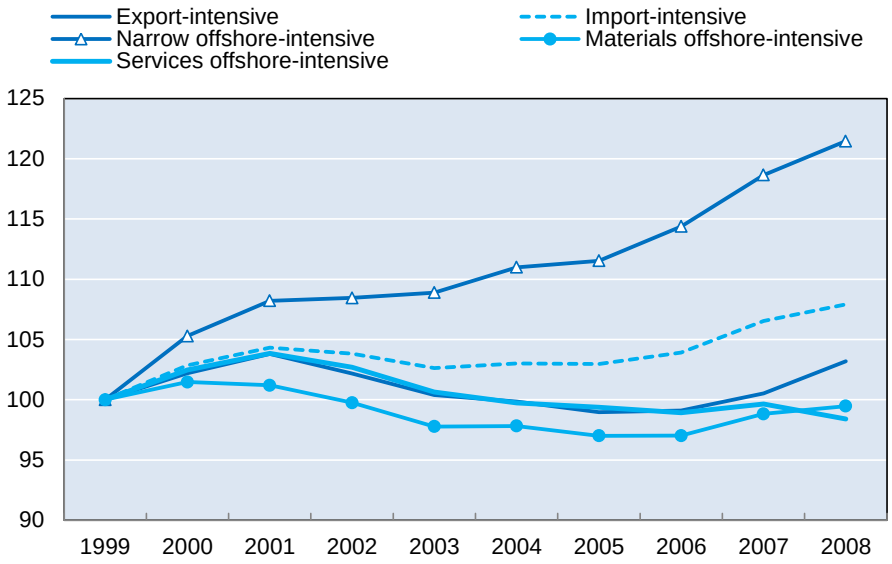
Source: Eurostat, National Accounts.

Table 6.8. Industries with highest and lowest employment growth rates between 1999 and 2008 (in %, two-digit NACE)

Five industries with highest employment growth 1999-2008		
11	Extraction of crude petroleum and natural gas; related service activities	75.00%
72	Computer and related activities	70.52%
37	Recycling	68.75%
74	Other business activities	42.54%
62	Air transport	36.73%
Five industries with lowest employment growth 1999-2008		
19	Manufacture of leather and leather products	-26.47%
17	Manufacture of textiles	-32.90%
5	Mining and quarrying	-39.55%
18	Manufacture of wearing apparel; dressing; dyeing of fur	-44.00%
10	Mining of coal and lignite; extraction of peat	-55.21%

Source: Eurostat, National Accounts.

Figure 6.8. Employment trends in trade intensive sectors



Source: Eurostat, National Accounts.

Employment by skill group

Table 6.9 displays the share of employed persons with a specific educational attainment in total employment (manufacturing and services) and separately by industry aggregates.[15] Looking at the overall figures, the table shows that the share of workers with no or only secondary education has declined from 16.2% to 11.3% between 1999 and 2009. The share of workers with vocational training has remained constant at around 62% throughout the period. The share of workers with tertiary education increased from 20.9% to 26.7%.

The rest of the table shows the shares of workers with different educational attainment in each of our five trade-intensity industry aggregates. The employment share of workers with no or just secondary education in all five industry aggregates is similar to their share in the overall economy. The share of workers with vocational training in trade-intensive industries is low compared to their share in overall employment (except in industries intensive in materials offshoring). In contrast, workers with tertiary education make up a relatively large share in trade-intensive industries. In export-intensive industries, and in industries intensive in narrow and services offshoring, their share is clearly above their average share in the overall economy. This is in line with the conventional wisdom that offshoring of materials and services increases demand for skilled labour (Geishecker, 2006; Winkler, 2009).[16]

15. Given limitations for data from official statistical sources, we rely on employment figures from the SOEP in this section.

16. Note, however, that in industries intensive in broadly defined materials offshoring, the share of skilled workers is below average.

Table 6.9. Share of workers by educational attainment and industry aggregates (in %)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
A. No or secondary education											
Overall	16.2	15.1	14.3	14.9	13.7	14.0	13.0	11.8	12.4	11.4	11.3
Export-int.	15.0	13.4	13.1	12.8	10.9	11.8	11.2	10.1	8.7	8.6	9.2
Import-int.	18.3	16.4	15.6	18.2	16.7	17.9	17.5	16.1	16.8	14.5	12.8
Narrow offsh.-int.	16.8	13.7	12.6	13.3	12.1	12.5	12.3	11.2	11.5	11.6	11.1
Material offsh.-int.	17.8	16.3	15.6	16.7	15.6	15.6	14.8	13.7	15.5	13.7	12.9
Service offsh-int.	16.1	13.5	13.4	14.0	12.0	11.7	11.4	10.7	11.2	11.2	10.6
B. Vocational education											
Overall	62.9	62.2	62.3	61.9	62.0	62.0	62.4	62.8	62.7	63.4	62.0
Export-int.	58.0	56.7	56.8	57.0	57.6	58.6	58.5	58.8	60.8	60.9	54.8
Import-int.	59.6	58.1	59.0	56.8	57.3	57.3	56.9	58.8	58.5	60.6	60.1
Narrow offsh.-int.	52.5	53.2	53.3	52.4	50.8	52.8	51.3	53.1	51.2	50.3	50.5
Material offsh.-int.	64.2	62.7	62.6	62.3	63.0	63.2	63.3	65.1	63.8	65.2	65.1
Service offsh-int.	60.2	57.1	56.9	57.2	56.6	59.1	57.3	58.3	57.9	58.0	56.8
C. Tertiary education											
Overall	20.9	22.8	23.5	23.1	24.3	24.0	24.7	25.3	24.9	25.2	26.7
Export-int.	27.0	29.9	30.0	30.2	31.5	29.5	30.3	31.1	30.4	30.5	36.0
Import-int.	22.1	25.5	25.4	25.0	26.0	24.8	25.6	25.0	24.8	25.0	27.1
Narrow offsh.-int.	30.7	33.1	34.1	34.3	37.1	34.7	36.4	35.7	37.3	38.1	38.4
Material offsh.-int.	18.0	21.0	21.8	21.0	21.5	21.2	21.9	21.2	20.7	21.1	22.1
Service offsh-int.	23.7	29.4	29.7	28.9	31.4	29.2	31.3	31.0	30.9	30.8	32.6

Note: Cells show percentage of workers with specific educational attainment in respective industry, e.g. percentage of workers with tertiary education in export-intensive industries.

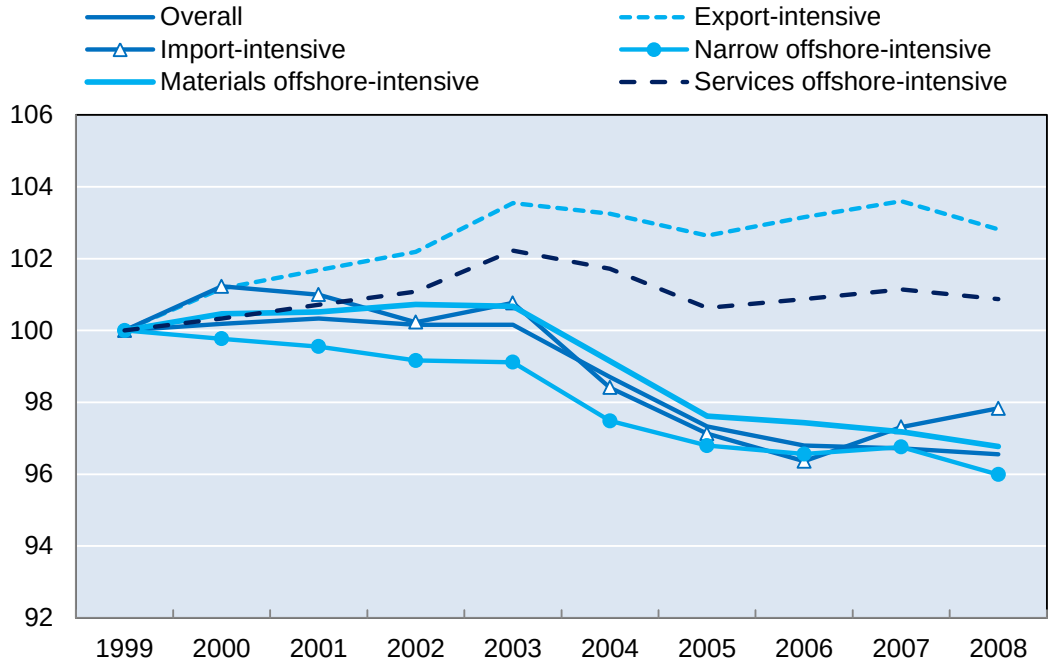
Source: SOEP.

Real wages

The evolution of real annual earnings between 1999 and 2008 for the overall economy (except agriculture and public services) and by trade-intensity industry aggregates is shown in Figure 6.9. In import-intensive industries and in industries intensive in narrow and materials offshoring, real wages have closely followed the overall trend of declining wages since 2003 (recall Figure 6.7). In contrast, wages in the export-intensive sectors increased more rapidly until 2003 and more or less stagnated thereafter. Similarly, real wages in industries intensive in services offshoring increased relatively strongly until 2003, and declined only slightly thereafter.

Table 6.10 shows the five best- and worst performing 2-digit industries in terms of growth in real earnings. Manufacture of communication equipment, transport equipment, coke, petroleum, nuclear fuels, and tobacco, and air transport industries had the strongest increase in real annual earnings. The strongest real earnings decline has occurred in education, recreational and sporting activities, mining, forestry, and extraction industries. Table 6.11 shows the best-and-worst performing industries in terms of earnings growth in percentages. The industry with the strongest increase was activities auxiliary to financial intermediation.

Figure 6.9. Evolution of real annual wages 1999-2008 overall and by industry aggregates (1999=100)



Note: Overall refers to manufacturing and private services (i.e. excluding agriculture and public services).
Source: Eurostat, LFS; own calculations.

Table 6.10. Industries with strongest and weakest real annual wage change between 1999 and 2008 (in levels, two-digit NACE)

A. Five industries with strongest real wage increase (levels) 1999-2008		
32	Manufacture of radio, television and communication equipment and apparatus	6544.1
35	Manufacture of other transport equipment	5103.6
23	Manufacture of coke, refined petroleum products and nuclear fuel	4849.0
62	Air transport	4808.1
16	Manufacture of tobacco products	4530.9
B. Five industries with weakest real wage increase (levels) 1999-2008		
92	Recreational, cultural and sporting activities	-4459.4
80	Education	-4502.3
10	Mining of coal and lignite; extraction of peat	-4914.3
2	Forestry, logging and related service activities	-5782.3
11	Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying	-10974.0

Source: Eurostat, National Accounts.

Table 6.11. Industries with strongest and weakest real annual wage change between 1999 and 2008 (in %, two-digit NACE)

A. Five industries with strongest real wage increase (%) 1999-2008		
67	Activities auxiliary to financial intermediation	26.34%
32	Manufacture of radio, television and communication equipment and apparatus	16.40%
18	Manufacture of wearing apparel; dressing; dyeing of fur	14.03%
35	Manufacture of other transport equipment	11.91%
16	Manufacture of tobacco products	9.94%
B. Five industries with weakest real wage increase (%) 1999-2008		
80	Education	-14.73%
4	Fishing	-14.86%
11	Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying	-18.18%
92	Recreational, cultural and sporting activities	-21.28%
2	Forestry, logging and related service activities	-27.72%

Source: Eurostat, National Accounts.

6.3. Linking trade and labour markets: econometric evidence

The analysis of aggregates in the preceding section allows us to say something about correlations between trade and labour market outcomes. Yet, labour market effects may strongly depend on individual level characteristics, such as education, age, tenure, *etc*. In order to be able to abstract from such confounding effects we now turn to an econometric analysis, where we use individual-level data combined with industry-level data on trade.[17] We look at two possible labour market outcomes, namely, individuals' wages and individuals' probability of moving into unemployment. The analysis is based on SOEP data for male and female full-time employees, aged 18 to 64, who are employed in manufacturing (NACE 15-36) or services industries (NACE 40-74), combined with industry-level data on trade variables (described in Section 6.2) for the period from 1999 to 2007.

Wage effects

To investigate the relationship between trade and individuals' wages we estimate variants of the following Mincerian wage regression:[18]

$$\ln WAGE_{ijt} = \alpha + \beta X_{it} + \gamma TRADE_{jt} + d_j + d_t + d_i + v_{it} \quad (1)$$

where *WAGE* is the real monthly gross wage for individual *i* in industry *j* in year *t*. As explanatory variables we include a vector of individual-specific characteristics (including marital status, tenure, work experience, education, size and ownership of the firm where the individual works, and a dummy for individuals living in East Germany).[19] Dummies for

17. This approach has recently been employed by other researchers, see Geishecker and Görg (2008) and Lurweg and Uhde (2010) for Germany or Liu and Trefler (2008) for the United States.

18. This approach is similar to Geishecker and Görg (2008) and Liu and Trefler (2008).

19. A definition of the explanatory variables and some summary statistics are in the Annex.

industry *j*, time *t* and individual *i* control for unobserved effects at these levels. We also include industry-specific time trends, in order to control for technical change that is specific to an industry. The main variable of interest is the vector TRADE, which includes various measures of trade exposure of the industry. Specifically, these are the export share (exports over total output) and import share (imports over total output) of the industry, as well as the offshoring measures (narrow, materials, services) as described in Section 6.2. We also alternatively use an openness measure defined as exports plus imports over industry output.

The baseline results using data for individuals employed in manufacturing or services industries are presented in Table 6.12. Given the potential endogeneity of the trade variables (Geishecker and Görg, 2008), we estimate all wage models using instrumental variables (IV) techniques.[20] Note, firstly, that the coefficients on our control variables are largely as expected: wages increase with firm size, work experience, tenure, education and status as married individuals.[21]

As regards the trade variables, a mixed picture emerges. Firstly, the export share of an industry is not statistically significantly correlated with individual-level wages.[22] This may, at first sight, be seen as out of line with evidence suggesting that exporting firms pay higher wages than non-exporters (e.g. Schank *et al*., 2007 for Germany). However, it has to be stressed that here we are concerned with individuals, not firms, and these individuals may work in firms that export or those that do not. We do not have information on exporting at the firm-level, only at the industry-level. In addition, German exports are strongly influenced by wage moderation during the period under investigation (Felbermayr *et al*., 2010), and even though we use an IV approach, perhaps we are not able to control for this endogeneity issue fully. Imports, materials offshoring and general openness are all negatively correlated with individual wage levels. The coefficient on services offshoring is positive, but not statistically significant.

Of course, the regression results hide substantial heterogeneity in our sample. Firstly, we pool manufacturing and services industries. Secondly, traditional trade theory would predict that trade effects should be different for workers with different skills. This is what we turn to investigating now. We run regressions of equation (1) for the subsamples of manufacturing and services industries, respectively. Within the broad sector, we also distinguish between export-intensive and non-export intensive industries. Furthermore, we allow for different effects of trade on individuals with different education levels, by including interactions of the trade variable with three education categories.

We report the regression results in Table 6.13. We estimate variants of equation (1), similar to Table 6.12. However, in order to save space we do not report all the regression results in a large number of tables. Rather, we collect the coefficients on the trade interactions from the various regression models and report these in the table.

20. Excluded instruments are the first and second difference in the respective trade variable. The diagnostic tests, which are not reported here to save space, suggest that the exogenous instruments are both relevant (based on first stage F test) and valid (based on Hansen J statistic for overidentification restrictions). Note that results do not change importantly if we include more than one trade variable jointly in the model. We, therefore, prefer the more parsimonious models reported here.

21. The coefficients on education and tenure are statistically insignificant. This may be due to our estimation procedure which controls for time invariant individual specific effects. Education and tenure vary only little over time, so they may not be able to be estimated with precision.

22. This is in line with Lurweg and Uhde (2009) who also use SOEP data and find that workers in "high volume trade" industries do not experience wage gains.

We find no statistical evidence that offshoring of materials is associated with individual level wages.[23]

Table 6.12. Baseline regression results (manufacturing and services industries)

	(1)	(2)	(3)	(4)	(5)	(6)
Export share	-0.0102					
	(-1.44)					
Import share		-0.0724				
		(-2.67)***				
Narrow offshoring			-0.0271			
			(-0.89)			
Material offshoring				-0.0997		
				(-2.62)***		
Services offshoring					0.0192	
					(1.15)	
Openness						-0.0199
						(-2.27)**
Married	0.0218	0.0180	0.0217	0.0211	0.0228	0.0201
	(2.15)**	(1.73)*	(2.14)**	(2.07)**	(2.24)**	(1.96)**
Tenure	0.0000357	0.000142	0.0000699	-0.0000509	0.0000521	0.0000429
	(0.04)	(0.15)	(0.08)	(-0.06)	(0.06)	(0.05)
Public ownership	-0.00335	-0.00320	-0.00376	-0.00472	-0.00443	-0.00273
	(-0.30)	(-0.28)	(-0.34)	(-0.42)	(-0.40)	(-0.24)
Firm size 2	0.0309	0.0326	0.0313	0.0323	0.0312	0.0309
	(3.05)***	(3.19)***	(3.09)***	(3.17)***	(3.08)***	(3.04)***
Firm size 3	0.0260	0.0302	0.0266	0.0272	0.0262	0.0267
	(2.07)**	(2.37)**	(2.13)**	(2.16)**	(2.09)**	(2.12)**
Firm size 4	0.0231	0.0261	0.0229	0.0238	0.0225	0.0245
	(1.62)	(1.80)*	(1.61)	(1.67)*	(1.58)	(1.70)*
Education medium	0.0336	0.0345	0.0309	0.0256	0.0307	0.0368
	(0.30)	(0.31)	(0.27)	(0.23)	(0.27)	(0.33)
Education high	0.117	0.121	0.117	0.114	0.116	0.119
	(1.08)	(1.12)	(1.08)	(1.05)	(1.07)	(1.10)
Experience	0.0827	0.0832	0.0829	0.0833	0.0835	0.0823
	(5.56)***	(5.59)***	(5.59)***	(5.60)***	(5.63)***	(5.51)***
Experience squared	-0.000544	-0.000546	-0.000546	-0.000549	-0.000547	-0.000543
	(-12.81)***	(-12.69)***	(-12.89)***	(-12.87)***	(-12.90)***	(-12.71)***
East Germany	0.0100	0.0214	0.0108	0.00989	0.0102	0.0131
	(0.27)	(0.57)	(0.29)	(0.27)	(0.28)	(0.35)
N individuals	6059	6059	6059	6059	6059	6059
N	27466	27466	27466	27466	27466	27466

Notes: IV estimations, Endogenous: trade shares, Instruments: First and second difference of trade shares, t-statistics of robust standard errors in parentheses; all models include year dummies, industry dummies, and industry-specific time trends; *** significance at 1%, ** significance at 5%, * significance at 10%.

23. This is different to Geishecker and Görg (2008) who find positive effects for high skilled workers and negative for low skilled workers. However, even though there effects are statistically significant, they are also small. While Geishecker and Görg also combine SOEP data with industry level trade data, they investigate a different time period (1991 to 2000) and a different measure of offshoring which can only indirectly capture trade in intermediates, while we can observe it directly from the input-output tables. This may explain some of the differences in results. See also Winkler and Milberg (2009).

Table 6.13. Estimates by sector and education

	(1) All manufacturing	(2) Export intensive manf.	(3) Non-export intensive manf.	(4) All services	(5) Export intensive services	(6) Non-export intensive services
Model 1						
edu1Xexpsh	-0.0246	0.0359	-0.0312	0.0103	0.0537	0.0186
	(-1.63)	(0.71)	(-1.05)	(1.60)	(0.39)	(1.05)
edu2Xexpsh	-0.0298	-0.0593	-0.0238	0.00377	0.119	0.00628
	(-1.86)*	(-1.17)	(-0.81)	(0.68)	(1.63)	(0.78)
edu3Xexpsh	-0.0293	-0.0418	-0.0373	0.000878	0.0536	-0.00153
	(-1.78)*	(-1.13)	(-1.32)	(0.14)	(0.56)	(-0.14)
Model 2						
edu1Ximpsh	-0.0390	-0.00373	-0.0542	-0.0241	0.0506	-0.0229
	(-1.83)*	(-0.15)	(-1.30)	(-0.72)	(1.13)	(-0.54)
edu2Ximpsh	-0.0463	-0.0438	-0.0593	-0.0376	-0.0173	-0.0319
	(-2.06)**	(-1.88)*	(-1.39)	(-1.10)	(-0.35)	(-0.74)
edu3Ximpsh	-0.0431	-0.0372	-0.0633	-0.0581	-0.0105	-0.0646
	(-1.97)**	(-1.65)*	(-1.57)	(-1.58)	(-0.32)	(-1.25)
Model 3						
edu1Xnarrowsh	0.00128	0.0912	0.0172	0.0633	0.0346	0.0519
	(0.04)	(1.25)	(0.34)	(1.16)	(0.10)	(0.94)
edu2Xnarrowsh	-0.00396	-0.00520	0.00959	-0.0126	-0.142	-0.00595
	(-0.12)	(-0.08)	(0.19)	(-0.26)	(-0.54)	(-0.12)
edu3Xnarrowsh	-0.00161	0.00937	-0.00269	-0.0593	-0.196	-0.0681
	(-0.05)	(0.14)	(-0.05)	(-1.16)	(-1.14)	(-1.25)
Model 4						
edu1Xmatsh	-0.0247	0.158	-0.00788	-0.0378	2.211	-0.0546
	(-0.98)	(1.09)	(-0.22)	(-0.38)	(0.84)	(-0.30)
edu2Xmatsh	-0.0439	-0.129	-0.0118	-0.113	-0.0791	-0.141
	(-1.52)	(-1.06)	(-0.32)	(-1.14)	(-0.87)	(-0.75)
edu3Xmatsh	-0.0243	0.00108	-0.0120	-0.133	-0.302	-0.161
	(-0.86)	(0.01)	(-0.32)	(-1.26)	(-0.93)	(-0.82)
Model 5						
edu1Xsersh	0.335	2.561	-0.700	0.0447	0.228	0.0301
	(1.09)	(2.32)**	(-1.38)	(1.88)*	(0.97)	(1.24)
edu2Xsersh	0.169	1.315	-1.003	-0.00286	0.0175	-0.00896
	(0.53)	(1.69)*	(-1.76)*	(-0.18)	(0.29)	(-0.53)
edu3Xsersh	0.147	1.302	-0.878	-0.0164	0.0101	-0.0296
	(0.45)	(1.44)	(-1.58)	(-1.00)	(0.08)	(-1.79)*
Model 6						
edu1Xopen	-0.0219	0.0124	-0.0231	0.00522	0.0411	0.00686
	(-1.96)**	(0.54)	(-1.24)	(0.63)	(0.50)	(0.58)
edu2Xopen	-0.0263	-0.0401	-0.0241	-0.00113	0.0791	0.00122
	(-2.18)**	(-1.65)*	(-1.25)	(-0.15)	(1.72)*	(0.13)
edu3Xopen	-0.0252	-0.0318	-0.0291	-0.00625	-0.0108	-0.0111
	(-2.09)**	(-1.55)	(-1.54)	(-0.74)	(-0.10)	(-0.89)

Notes: IV estimations, robust standard errors in parentheses. Models include all covariates as in Table 6.12.; these are not reported here to save space.

To summarise the results, we can, firstly, see that there is little evidence that export activity in an industry is statistically significantly associated with individual-level wages. Secondly, total imports have a negative effect on individual-level wages only in export intensive manufacturing industries. These industries are in many cases also those that have high import penetration, as seen in Section 6.2. Hence, export intensive industries may see a large degree of international competition, which may lead to higher pressure on wages than in other industries.

By contrast, services offshoring is positively associated with wages for low- and medium-skilled workers in export-intensive manufacturing industries, while there is a negative correlation for medium-skilled workers in non-export intensive industries. This suggests that in export-intensive manufacturing industries, the offshoring of services is complementary to low-and medium-skilled activities in the industry. By contrast, in other manufacturing industries, services offshoring may substitute for medium-skilled work, such as, for example, back-office activities, such as accounting.

Overall, however, our estimates give the impression that trade in its various facets is only to a low degree responsible for wage developments at the individual level.[24] Or, to cite Liu and Trefler (2008), there may be "much ado about nothing". This may perhaps not come at a surprise as Germany is generally regarded as being fairly inflexible in terms of wage setting, which is done by large unions at the sectoral level. In countries with rigid wage setting institutions, trade may perhaps have larger effects on employment than wages, as argued by Krugman (1995). We turn to investigating this in the next section.

Employment effects

In this section, we look at the link between an individual's probability of losing her job and trade. To do so, we estimate the probability of job loss conditional on individual and industry characteristics:

$$\Pr(\text{job loss})_{ijt} = \alpha\, X_{it} + \lambda\, \text{TRADE}_{jt} + d_j + d_t + d_i + e_{it} \qquad (2)$$

where job loss is defined as a dummy variable equal to one if an individual i moves from full-time employment in period t-1 into unemployment in period t, and zero otherwise. The explanatory variables are identical to those in equation (1). Given the binary nature of the dependent variable the model is estimated using fixed effects logit techniques.[25]

The baseline results for the full sample are presented in Table 6.14.[26] The estimates suggest that the probability of switching into unemployment is positively correlated with the export share – in other words, individuals in industries with high export shares are more likely to lose their jobs. This may be against the common expectation.

24. A similar conclusion is drawn by Lurweg and Uhde (2009) and Geishecker and Görg (2008).

25. This approach is similar to Geishecker (2008) and Bachmann and Braun (2011) who, however, focus only on the link between offshoring and labour market transitions at the individual level. Lurweg and Uhde (2009) also have a similar analysis but use very different definitions of the trade variables. They do not distinguish between exports and imports, and also do not consider offshoring. Also, they do not control for individual fixed effects.

26. Since we include individual-level fixed effects, the estimation only utilises observations for individuals that switch from employment to unemployment. This allows us to examine the specific question of what determines switches into unemployment, rather than a comparison of individuals who lose their job with those that do not.

However, splitting the sample into export-intensive and not export-intensive sectors sheds further light on this (Table 6.15.). It is only in the latter sectors that we find a positive relationship. Workers in industries that are not very export-oriented become more likely to lose their jobs with increasing export exposure of the industry. This may be because these are industries that do not belong to the most internationally competitive and, therefore, are likely to lose out to foreign competition as they increase their exposure to the export market. Note that we do not find any statistically significant coefficients for any of the other trade-related variables.

Table 6.14. Job loss estimations: baseline regression results (manufacturing and services industries)

	(1)	(2)	(3)	(4)	(5)	(6)
Export share	1.099					
	(2.44)**					
Import share		1.059				
		(0.82)				
Narrow offshoring			1.101			
			(0.55)			
Material offshoring				0.948		
				(-0.48)		
Services offshoring					1.387	
					(1.55)	
Openness						1.071
						(2.26)**
Married	0.854	0.850	0.847	0.847	0.854	0.855
	(-0.66)	(-0.68)	(-0.69)	(-0.69)	(-0.65)	(-0.65)
Tenure	1.166	1.164	1.164	1.164	1.166	1.166
	(8.90)***	(8.88)***	(8.88)***	(8.88)***	(8.89)***	(8.90)***
Public ownership	1.691	1.668	1.672	1.676	1.688	1.677
	(1.02)	(0.99)	(1.00)	(1.00)	(1.01)	(1.00)
Firm size 2	1.011	1.009	1.007	1.003	0.996	1.013
	(0.06)	(0.05)	(0.04)	(0.02)	(-0.02)	(0.07)
Firm size 3	0.991	1.004	1.008	0.991	1.007	0.999
	(-0.04)	(0.02)	(0.03)	(-0.03)	(0.03)	(-0.00)
Firm size 4	0.932	0.948	0.949	0.941	0.934	0.942
	(-0.21)	(-0.16)	(-0.16)	(-0.18)	(-0.21)	(-0.18)
Education medium	1.719	1.751	1.735	1.703	1.776	1.754
	(0.61)	(0.64)	(0.63)	(0.61)	(0.66)	(0.64)
Education high	1.494	1.526	1.497	1.471	1.528	1.537
	(0.30)	(0.31)	(0.30)	(0.29)	(0.31)	(0.32)
Experience	1.511	1.512	1.507	1.503	1.502	1.516
	(3.41)***	(3.43)***	(3.40)***	(3.37)***	(3.37)***	(3.44)***
Experience squared	1.008	1.008	1.008	1.008	1.008	1.008
	(5.04)***	(4.98)***	(5.01)***	(5.00)***	(5.02)***	(5.00)***
East Germany	1.000	1.000	1.000	1.000	1.000	1.000
	(0.07)	(0.32)	(0.38)	(0.61)	(0.60)	(-0.02)
N	5524	5524	5524	5524	5524	5524

Notes: Fixed effects logit estimation, displayed coefficients are odds ratios, t-statistics in parentheses; all models include year dummies, and industry dummies; *** significance at 1%, ** significance at 5%, * significance at 10%.

Table 6.15 allows for further heterogeneity in the effects by industry and educational attainment of the individual. Here, a number of other noteworthy results emerge. Firstly, the positive relationship between exports and job loss in non-export intensive sectors affects both low- and high-skilled workers. There is no evidence, however, that this also affects workers with medium-skill levels.

We can now also document some important differences between manufacturing and services sectors.[27] In the services sector, we find strong evidence of positive correlations between export exposure and becoming unemployed. All three different skill groups are equally affected. We also find that the offshoring of material inputs in the services industry is strongly negatively correlated with moving into unemployment, again affecting all skill groups equally. Here, the results suggest that a one percentage point increase in material offshoring reduces the risk of becoming unemployed by about 60%.[28] By contrast, the offshoring of services in the services industry is associated with increases in the risk of becoming unemployed, and this effect is stronger for high-skilled than for low- or medium-skilled workers. These two results taken together are consistent with the idea that the offshoring of non-core activities, such as materials, allows services firms to focus on their core activity and increase productivity (as in Amiti and Wei, 2009 and Görg *et al*., 2008), thereby improving employment prospects. By contrast, offshoring of services activities substitutes for domestic labour, in particular of high-skilled workers.

For manufacturing industries, the story is different. There is only weak evidence that exporting and importing are positively related with the probability of becoming unemployed, although these estimates are barely or never statistically significant. The only stronger effect is observed for materials offshoring, where we find that offshoring of this type reduces the risk of becoming unemployed, but only for medium-skilled workers.

Overall, the results suggest for manufacturing industries that trade does not seem to have any strong effects on unemployment probabilities (similar to the wage effects). However, for services industries we do find some stronger effects. Here, in particular, offshoring has two types of effects: the offshoring of non-core material inputs reduces the risk of unemployment, while offshoring of core services activities increases this risk. Also, exporting of final goods is positively associated with the probability of becoming unemployed. This may suggest that German services firms are finding it difficult to compete internationally with other services exporters that may be better placed in world markets, such as the world's top services exporters United States or United Kingdom.

27. Due to data limitations we do not split the sample between export-intensive and other industries in the logit estimations.

28. This result is in line with Bachmann and Braun (2011) who also find that outsourcing of materials increases employment stability in services industries.

Table 6.15. Job loss estimates by sector and education

	(1) All	(2) All export intensive	(3) All non-export intensive	(4) Manufacturing	(5) Services
Model 1					
edu1Xexpsh	1.075	0.845	1.103	1.162	1.195
	(2.09)**	(-1.06)	(2.17)**	(1.68)*	(2.19)**
edu2Xexpsh	1.046	1.197	1.067	1.094	1.170
	(1.41)	(1.45)	(1.57)	(1.11)	(2.17)**
edu3Xexpsh	1.098	0.987	1.124	1.089	1.245
	(2.64)***	(-0.09)	(2.44)**	(0.96)	(2.57)**
Model 2					
edu1Ximpsh	1.045	0.827	1.052	1.192	1.194
	(0.85)	(-0.85)	(0.84)	(1.33)	(1.15)
edu2Ximpsh	1.010	0.848	1.030	1.217	0.939
	(0.19)	(-0.91)	(0.53)	(1.56)	(-0.49)
edu3Ximpsh	1.067	0.913	1.071	1.270	0.983
	(1.25)	(-0.45)	(1.13)	(1.76)*	(-0.13)
Model 3					
edu1Xnarrowsh	1.079	0.614	1.060	0.732	0.840
	(0.47)	(-0.71)	(0.30)	(-0.96)	(-0.22)
edu2Xnarrowsh	1.056	0.956	1.127	0.938	1.557
	(0.38)	(-0.08)	(0.75)	(-0.22)	(1.59)
edu3Xnarrowsh	1.234	0.686	1.208	0.998	1.573
	(1.29)	(-0.57)	(0.90)	(-0.00)	(1.30)
Model 4					
edu1Xmatsh	0.984	0.916	0.951	1.032	0.431
	(-0.15)	(-0.19)	(-0.39)	(0.14)	(-2.10)**
edu2Xmatsh	0.923	0.986	0.873	0.687	0.442
	(-0.78)	(-0.03)	(-1.16)	(-2.07)**	(-2.24)**
edu3Xmatsh	1.044	1.006	0.966	0.701	0.406
	(0.38)	(0.01)	(-0.25)	(-1.32)	(-2.30)**
Model 5					
edu1Xsersh	1.332	2.484	1.348	0.101	1.523
	(1.13)	(1.05)	(1.00)	(-1.07)	(0.97)
edu2Xsersh	1.487	3.697	1.480	0.160	1.970
	(1.99)**	(1.20)	(1.70)*	(-0.92)	(2.65)***
edu3Xsersh	1.223	2.143	1.316	0.527	2.143
	(0.84)	(1.02)	(0.89)	(-0.29)	(2.37)**
Model 6					
edu1Xopen	1.042	0.890	1.048	1.124	1.173
	(1.78)*	(-0.81)	(1.70)*	(1.75)*	(2.33)**
edu2Xopen	1.024	1.069	1.032	1.119	1.099
	(1.08)	(0.58)	(1.24)	(1.77)*	(1.63)
edu3Xopen	1.054	0.960	1.057	1.125	1.137
	(2.22)**	(-0.29)	(1.97)**	(1.68)*	(2.00)**

Notes: Fixed effects logit estimation, displayed coefficients are odds ratios, t-statistics in parentheses.
*** significance at 1%
** significance at 5%,
* significance at 10%
Models include all covariates as in Table 6.14. These are not reported here to save space.

6.4. The impact of labour market policies

Overview

One important macroeconomic explanation for Germany's export success is without doubt the labour market reforms implemented in the early 2000s, and here in particular the policy of wage moderation. While wage restraint was not one of the aims of the labour market reforms per se, it appeared as an important and very welcome side-effect (Meier, 2009). As we show in Figure 6.9, reported earlier, real wages fell since 2003. This came after periods of much higher wage growth in the 1980s and 1990s (Boysen-Hogrefe and Groll, 2010). Wage restraint, implying relative low growth of real wages, made German exports more competitive as it effectively lead to a real depreciation vis-à-vis other Euro member countries (e.g. Felbermayr *et al.*, 2010).

More recently, the limiting factors to German export growth have been the topic of debate. Here, in particular, much of the focus is on skill shortages. The *Institut der deutschen Wirtschaft* (Institute of the German Economy, IW, 2008) calculates that in 2008 there was a gap of about 140 000 skilled positions in engineering and technical jobs. In other words, these were jobs that could not be filled with suitably qualified candidates. This, of course, implies substantial losses to the German economy, which are calculated by IW (2008) to be around EUR 28.5 billion during the period mid-2007 to mid-2008.

The notion of skill shortages is not uniformly accepted however. Brenke (2010), for example, argues that there is no convincing evidence of skill shortages in the German economy since there is no accepted method of determining such shortages. If there were shortages in some aspects of labour supply, then wages should rise considerably, which is not what one sees in the data. Still, the question of skill shortages and whether or not a potential shortage should be alleviated by immigration are important topics on the current public policy agenda.

Another important development in labour market policy in Germany is the recent strong increase in temporary work arrangements. This was one aspect of labour market reforms implemented in the early 2000s with the aim of making employment contracts more flexible. As this is an aspect of labour market changes that, to the best of our knowledge, has not received much attention, we focus on this aspect in this section.

Labour markets are considered dual when workers are segregated into two groups: one group with permanent contracts, high protection through Employment Protection Legislation (EPL), and hence sheltered from many risks; and another group with temporary contracts, low protection through EPL, and hence exposed to all the risks of the market. Several OECD countries, including Germany, Spain and Italy reformed their EPL between the late 1980s and the early 2000s, easing legislation for workers with temporary contracts, but leaving legislation for workers with permanent contracts mostly unchanged (Boeri and Garibaldi, 2007). As a consequence, dual labour markets were created in these economies.

In Table 6.16, we compare the prevalence of temporary contracts in Germany and several other European countries. Looking at total German employment, the share of temporary contracts increased slightly from 13% in 1999 to 14.5% in 2009. This share is comparable to those in other countries, e.g. France, Italy and Netherlands. Spain exhibits an exceptionally high share of temporary contracts with figures ranging from 25% to 34%. However, looking at younger workers (up to 24 years old), the table shows that Spain is no longer particularly exceptional: in fact, among the young, the share of workers with temporary contracts in 2009 is higher in Germany than in all other countries (57%; up from 53% in 1999). Among workers

between 15 and 19 years old, the share is even higher: 79% hold temporary contracts in Germany in 2009.[29]

While easing EPL on temporary contracts has led to increased job creation and employment growth when the economy is in good shape, several authors have discussed the problems created by dual labour markets when a recession hits the economy (e.g. Dolado *et al*., 2002). Due to a large wedge between firing costs for permanent and temporary workers, firms are hesitant to transform temporary contracts into permanent ones. In a recession with many jobs being shed, this can result in high levels of unemployment among groups with a high prevalence of temporary contracts (Blanchard and Landier, 2002; Cahuc and Postel-Vinay, 2002; Boeri and Garibaldi, 2007).

Table 6.16. Temporary workers as a percentage of the total number of employees (by age and countries)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
A. 15-64 years old											
Germany	13.1	12.8	12.4	12.0	12.2	12.5	14.2	14.5	14.6	14.7	14.5
EU	13.3	13.6	13.5	13.2	13.1	13.5	14.5	15.0	14.5	14.0	13.4
Denmark	10.1	10.2	9.4	8.9	9.5	9.8	9.8	8.9	8.6	8.3	8.9
Spain	32.8	32.4	32.1	32.1	31.8	32.1	33.4	34.1	31.7	29.3	25.5
France	13.9	15.4	14.9	14.1	13.4	13.0	14.1	14.1	14.4	14.1	13.5
Italy	9.8	10.1	9.6	9.9	9.5	11.9	12.3	13.1	13.2	13.3	12.5
Netherlands	11.9	13.8	14.3	14.2	14.4	14.4	15.4	16.4	17.9	17.9	18.0
B. 15-24 years old											
Germany	53.1	52.4	52.1	51.4	53.0	55.5	58.0	57.6	57.5	56.6	57.2
EU	39.2	39.4	39.0	38.2	38.1	39.1	41.2	41.9	41.1	40.0	40.2
Denmark	29.7	29.8	26.9	25.0	27.3	26.9	26.9	22.4	22.2	23.2	23.6
Spain	70.3	68.9	66.6	65.1	63.9	64.8	66.5	66.1	62.8	59.4	55.9
France	54.4	55.0	52.2	48.5	47.4	47.8	50.7	50.8	52.5	51.5	51.2
Italy	26.2	26.2	23.3	27.3	25.5	34.4	37.0	40.9	42.3	43.3	44.4
Netherlands	33.3	35.3	36.5	36.4	37.2	37.9	41.7	43.5	45.1	45.2	46.5
C. 15-19 years old											
Germany	82.9	81.3	79.9	80.2	82.0	84.0	83.3	80.6	79.8	77.5	78.8
EU	52.1	52.4	51.5	50.9	50.9	50.9	53.8	54.5	55.3	54.0	55.5
Denmark	27.2	26.4	25.4	23.0	27.8	23.4	26.4	21.0	20.2	23.4	22.6
Spain	86.7	85.4	83.4	80.7	80.6	82.2	80.0	82.1	79.8	77.2	73.6
France	81.7	82.8	79.6	78.0	73.7	78.0	81.5	82.4	82.4	80.9	82.5
Italy	32.9	35.2	28.3	37.1	36.1	43.2	43.4	49.8	50.9	55.5	58.8
Netherlands	43.4	45.3	43.7	44.9	46.3	44.5	49.6	51.3	53.1	53.8	54.9

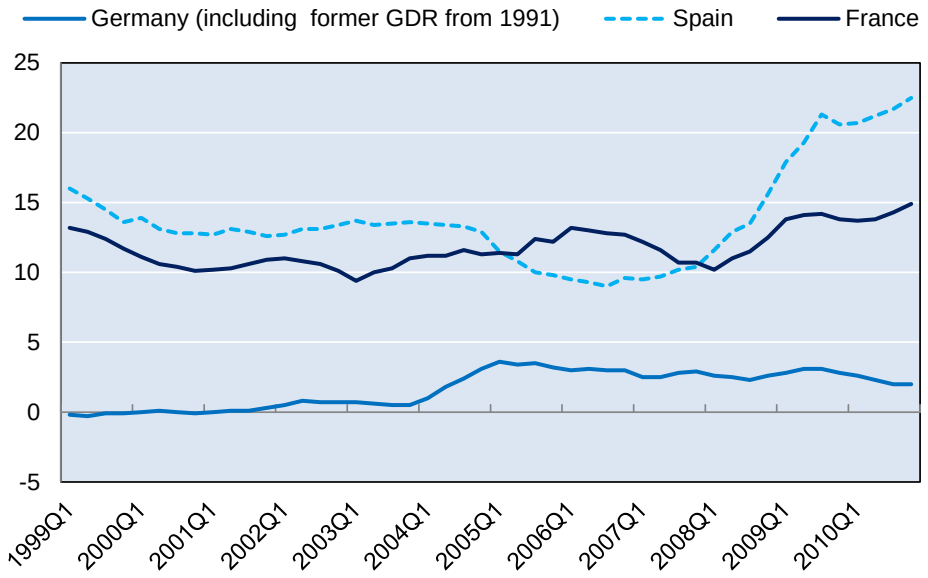
Source: Eurostat, LFS.

In Figure 6.10, we plot the difference between the *youth* unemployment rate and the total unemployment rate for Germany, Spain, and the European Union average. It shows that, in a country such as Spain, with many young workers holding temporary contracts, youth unemployment was indeed shooting up during the economic crisis in 2008. Interestingly, such developments did not occur in Germany, even though the prevalence of temporary contracts

29. Note, however, that this number might be strongly influenced by the particularities of the German apprenticeship system, where young workers are already employed in firms, but only on a temporary basis for the duration of their training.

among young workers was comparable to that of Spain. Note however, that Germany's labour market performed exceptionally well during the crisis (see Boysen-Hogrefe and Groll, 2010), so that a comparison of Germany and Spain is difficult. Nevertheless, it seems that labour market dualism is not creating the same problems in Germany as in other economies, even though the extent of segmentation is extremely high.

Figure 6.10. Differences between youth unemployment rate and total unemployment (quarterly, seasonally adjusted, in %)



Source: Eurostat, LFS.

As a first attempt to link the dualism to international trade, we summarise the prevalence of temporary contracts by our trade intensity industry aggregates (Table 6.17). The analysis is based on survey data from the SOEP. Looking first at the entire workforce (16-64 years old; panel A), the data confirm the positive trend in the share of temporary contracts in all industries, as reported above. The same holds for the sample of younger workers (panel B). Looking inside the industry aggregates does not confirm the impression of a steady increase in the prevalence of temporary contracts. Rather, the increase seems to be concentrated in the years since 2007 (with the industries intensive in offshoring materials being an exception). Again, this holds for both the entire workforce and younger workers.

In general, the table shows that trade-intensive industries have a lower share of temporary workers than the economy average. Yet, individual characteristics also play a role in explaining whether or not an individual has a temporary contract. A way of controlling for individual characteristics is to run individual-level probit regressions of holding a temporary contract on each indicator for trade intensity.[30] Using the entire age distribution, this exercise conveys that working in an export-intensive industry, or in an industry intensive in materials offshoring is associated with a higher probability of holding a temporary contract. Working in an industry intensive in narrow offshoring is associated with a lower probability, while there is no statistically significant relationship between being on a temporary contract and working in an import-intensive or service offshoring industry.[31]

30. These results are not reported here to save space.

31. For the sample of young workers, all trade-related variables are statistically insignificant.

Table 6.17. Temporary workers as a percentage of the total number of employees (by age groups and industry aggregate)

		Export-intensive	Import-intensive	Narrow-intensive	Materials-intensive	Service-intensive
			B. 16-64 years old			
1999	13.7%	10.2%	10.9%	9.9%	11.8%	9.5%
2000	13.8%	11.5%	12.6%	11.0%	14.4%	9.6%
2001	13.7%	10.2%	10.6%	9.8%	12.5%	7.7%
2002	13.8%	10.1%	10.0%	9.9%	13.6%	9.2%
2003	14.0%	9.0%	10.1%	8.7%	11.4%	7.7%
2004	14.8%	9.4%	11.5%	10.8%	14.3%	8.4%
2005	14.2%	8.2%	9.3%	9.1%	13.7%	7.7%
2006	15.1%	9.6%	9.9%	11.4%	13.5%	9.5%
2007	15.6%	12.4%	16.6%	13.5%	15.7%	11.0%
2008	15.9%	12.7%	15.4%	14.5%	14.8%	11.5%
2009	15.6%	14.0%	14.8%	13.1%	13.6%	12.4%
Average	14.6%	10.7%	12.0%	11.1%	13.6%	9.5%
			B. 16-25 years old			
1999	51.0%	53.0%	52.7%	50.0%	49.1%	41.4%
2000	52.7%	52.1%	44.2%	46.0%	51.7%	46.1%
2001	55.8%	53.4%	42.6%	48.0%	50.3%	48.2%
2002	58.2%	58.8%	47.0%	48.8%	56.3%	54.7%
2003	57.9%	59.9%	48.3%	44.4%	54.8%	51.7%
2004	59.1%	49.0%	48.5%	48.6%	59.5%	49.8%
2005	61.1%	45.8%	48.9%	48.6%	57.8%	44.9%
2006	62.5%	65.1%	58.0%	67.4%	54.7%	64.4%
2007	59.6%	61.8%	72.1%	62.6%	59.9%	60.5%
2008	58.3%	54.9%	62.6%	63.1%	54.7%	54.1%
2009	61.6%	70.4%	69.8%	58.7%	57.7%	66.5%
Average	58.0%	56.7%	54.1%	53.3%	55.1%	52.9%

Source: SOEP, weighted using cross-section weights.

We now look into the implications of such temporary work arrangements on labour market outcomes. In particular, we will investigate whether the impact of trade differs between workers on temporary and permanent contracts. To answer these questions, we again need to turn to econometric estimation, which allows us to control for other important individual characteristics that also affect labour market outcomes.

Econometric estimation

As in the previous section, we estimate the effects of trade and temporary contracts on wages in an instrumental variables framework. The estimated model is identical to the previous one, except that we add a dummy for holding a temporary contract and the interaction of this dummy with the trade intensities. The base line regression for the full sample is displayed in Table 6.18. For the separate manufacturing and services regressions, we only present a summary of the results in order to save space (Table 6.19).

Table 6.18. Temporary contracts and wages: baseline regression results (manufacturing and services industries)

	(1)	(2)	(3)	(4)	(5)	(6)
Export share	-0.00203					
	(-0.35)					
Temp. contract*export share	0.00134					
	(1.28)					
Import share		-0.0253				
		(-1.26)				
Temp. contract*import share		0.00141				
		(0.95)				
Narrow offshoring			0.0174			
			(0.68)			
Temp. contract*narrow offsh.			-0.0000565			
			(-0.01)			
Material offshoring				-0.0267		
				(-0.91)		
Temp. contract*material offsh.				0.00522		
				(1.45)		
Services offshoring					0.00652	
					(0.37)	
Temp. contract*services offsh.					0.0377	
					(3.08)***	
Openness						-0.00613
						(-0.89)
Temp. contract*openness						0.000770
						(1.18)
Temp. contract	-0.0816	-0.0770	-0.0568	-0.0873	-0.116	-0.0817
	(-3.74)***	(-3.42)***	(-3.02)***	(-3.68)***	(-5.05)***	(-3.53)***
Married	0.0258	0.0246	0.0266	0.0255	0.0271	0.0252
	(3.20)***	(3.01)***	(3.30)***	(3.16)***	(3.36)***	(3.11)***
Tenure	0.000127	0.000125	0.000114	0.000114	0.0000737	0.000117
	(0.16)	(0.15)	(0.14)	(0.14)	(0.09)	(0.14)
Public ownership	-0.0116	-0.0112	-0.0114	-0.0122	-0.0110	-0.0113
	(-1.17)	(-1.12)	(-1.15)	(-1.23)	(-1.09)	(-1.14)
Firm size 2	0.0367	0.0374	0.0366	0.0372	0.0367	0.0367
	(4.06)***	(4.12)***	(4.05)***	(4.11)***	(4.06)***	(4.06)***
Firm size 3	0.0376	0.0392	0.0372	0.0382	0.0368	0.0379
	(3.42)***	(3.53)***	(3.38)***	(3.46)***	(3.34)***	(3.44)***
Firm size 4	0.0415	0.0427	0.0413	0.0420	0.0403	0.0419
	(3.38)***	(3.46)***	(3.37)***	(3.42)***	(3.28)***	(3.41)***
Education medium	0.176	0.178	0.173	0.173	0.168	0.178
	(1.85)*	(1.86)*	(1.80)*	(1.80)*	(1.75)*	(1.88)*
Education high	0.277	0.279	0.274	0.276	0.271	0.279
	(2.97)***	(2.98)***	(2.90)***	(2.92)***	(2.87)***	(2.99)***
Experience	0.0317	0.0315	0.0325	0.0318	0.0314	0.0311
	(2.21)**	(2.21)**	(2.27)**	(2.23)**	(2.18)**	(2.16)**
Experience squared	-0.000460	-0.000460	-0.000459	-0.000462	-0.000458	-0.000459
	(-11.90)***	(-11.89)***	(-11.89)***	(-11.96)***	(-11.87)***	(-11.86)***
N individuals	4970	4970	4970	4970	4970	4970
N	22119	22119	22119	22119	22119	22119
Cragg-Donald F stat. (first stage)	239.7	54.95	198.7	123.4	646.7	105.9
Hansen J stat. (p-value)	0.691	0.0997	0.0999	0.463	0.0590	0.344

Notes: IV estimations, Endogenous: trade shares, interaction trade shares/temp. contract, Instruments: First and second difference of trade shares and interactions, t-statistics of robust standard errors in parentheses; all models include year dummies, industry dummies, and industry-specific time trends; *** significance at 1%, ** significance at 5%, * significance at 10%.

Table 6.19. Wage regression by sector

	Manufacturing			Services		
	All	Export intensive	Non-export intensive	All	Export intensive	Non-export intensive
Model 1						
Export share	0.00284	-0.00273	0.00947	0.00182	0.0259	0.00859
	(0.18)	(-0.09)	(0.37)	(0.4)	(0.35)	(1.44)
Temp. contract*export share	0.000724	0.0785	-0.00144	0.00808	0.0355	0.0464
	(0.18)	(0.55)	(-0.18)	(2.01)**	(0.25)	(3.25)***
Model 2						
Import share	-0.00467	-0.0370	0.0291	-0.00377	-0.00191	0.0435
	(-0.20)	(-1.35)	(0.82)	(-0.13)	(-0.05)	(1.07)
Temp. contract*import share	0.00142	0.00308	0.00126	0.00929	0.0156	0.0160
	(0.48)	(0.49)	(0.35)	(0.9)	(1.84)*	(1.04)
Model 3						
Narrow offshoring	0.0395	0.0569	0.0620	0.0189	-0.165	0.0432
	(1.26)	(1.01)	(1.24)	(0.49)	(-0.92)	(1.19)
Temp. contract*narrow offsh.	-0.00408	-0.00424	0.00177	0.00979	0.0374	0.0151
	(-0.35)	(-0.09)	(0.14)	(0.58)	(0.46)	(0.88)
Model 4						
Material offshoring	0.00618	0.0173	0.0163	-0.00344	-0.117	0.347
	(0.23)	(0.31)	(0.47)	(-0.03)	(-1.42)	(1.18)
Temp. contract*material offsh.	-0.00143	0.0824	-0.0130	0.0398	0.190	0.0424
	(-0.08)	(0.58)	(-0.56)	(3.06)***	(1.28)	(2.37)**
Model 5						
Services offshoring	0.0476	0.514	-1.025	-0.00858	-0.0306	-0.0145
	(0.15)	(0.64)	(-1.91)*	(-0.49)	(-0.63)	(-0.76)
Temp. contract*services offsh.	0.0196	0.386	-0.0324	0.0425	0.137	0.0579
	(0.35)	(1.95)*	(-0.51)	(2.75)***	(1.33)	(2.55)**
Model 6						
Openness	-0.00097	-0.0177	0.0109	0.00117	-0.000862	0.0125
	(-0.08)	(-0.87)	(0.64)	(0.18)	(-0.02)	(1.58)
Temp. contract*openness	0.000800	0.0103	0.000318	0.00544	0.0329	0.0171
	(0.33)	(0.68)	(0.10)	(1.60)	(1.59)	(2.23)**

Notes: IV estimations, Endogenous: trade shares, interaction trade shares/temp. contract, Instruments: First and second difference of trade shares and interactions, t-statistics of robust standard errors in parentheses; *** significance at 1%, ** significance at 5%, * significance at 10%. Models include all covariates as in Table 6.18, these are not reported here to save space.

Generally, workers holding a temporary contract receive a lower real monthly wage than workers holding permanent contracts. This is in line with the empirical literature (e.g. Booth *et al*., 2002, Hagen, 2002). In this article, however, we are mostly interested in whether trade affects the labour market outcomes of temporary and permanent workers differently.

Trade-intensive industries are facing global competition and are, consequently, under constant pressure to adjust unit labour costs and employment levels such that they can compete on global market. While, in principle, all workers in an industry are equally likely to be affected from these constraints, there are several reasons to believe that workers on temporary contracts are affected differently than workers on permanent contract. Workers on temporary contracts are the least protected workers on the labour markets. Accordingly, they might have a stronger propensity to lose their job due to international competition. Due to their weaker bargaining

position they might also suffer from stronger wage reductions, in case employers adjust to globalisation pressure at the intensive margin.

The wage analysis shows that there is hardly any differential impact of trade between workers on temporary or permanent contracts at all. Looking at the full sample of manufacturing and services industries, only the interaction term of services outsourcing and temporary contracts is significant. While services offshoring and wages are unrelated for workers on permanent contracts, a 1% increase in the share of services outsourcing is associated with a wage increase of almost 4% for workers on temporary contracts.

Why is higher services offshoring associated with a higher wages for temporary workers? At least one explanation might be applicable, even though we cannot test it here. It could be that industries with strong services offshoring are characterised by labour churning among workers with temporary contracts. Newly hired workers may be able to negotiate a higher wage than permanent staff, particularly if they are also more skilled.

Looking at manufacturing industries only, the results show that the positive wage effect of services outsourcing on temporary workers only holds within export-intensive manufacturing industries. In manufacturing industries, which are not intensive in exports, service outsourcing has a small, negative impact on temporary workers (even though the coefficient is statistically insignificant).

Looking at services industries shows that rising exports, materials outsourcing, and services outsourcing are associated with higher wages for temporary workers (1%, 4%, and 4.3%, respectively), but not for permanent employees. Distinguishing between export-intensive and other industries does not provide new insights here.

In principle, it is not surprising that, except in services offshoring industries, the wage effects of trade do not differ between permanent and temporary workers. Limited contract duration may not necessarily be related to pay and the rigid German wage setting institutions may not allow strong differences. Rather, we would expect to see differences at the extensive margin, i.e. in employment stability. Accordingly, we now investigate whether trade affects the probability of job loss differently for temporary and permanent workers. As above, we define job loss as the transition from full-time employment in period *t-1* into unemployment in period *t*.

Looking first at the full sample, comprising workers in both manufacturing and service industries, our regressions do not detect a significant difference in job loss probability between temporary and permanent workers (see Table 6.20; Table 6.21 provides a summary of the relevant coefficients).

Yet, splitting up the sample between workers in export-intensive industries (as defined previously) and workers in other industries reveals large differences between these industries. As argued above, export-intensive industries are of particular importance for economic activity in Germany. Moreover, since they are also characterised by strong import shares, they are subject to a large degree of international competition and are, hence, likely to display stronger trade-related labour market effects. While there continue to be no significant differences between temporary and permanent workers in industries *not* intensive in exports, the results convey that in export-intensive industries the probability of job loss and the consequent transition into unemployment of temporary workers is positively associated with all trade measures, except services offshoring. Or, to put it differently, it appears that workers on permanent contracts are much better shielded from the forces of globalisation than their colleagues holding temporary contracts; at least in export-intensive industries. In fact, temporary workers are up to twice more likely to become unemployed than permanent workers when trade intensity rises by one percentage point.

Table 6.20. Temporary contracts and job loss: baseline regression results (manufacturing and services industries)

	(1)	(2)	(3)	(4)	(5)	(6)
Export share	1.074					
	(1.73)*					
Temporary contract*export share	1.002					
	(0.15)					
Import share		0.995				
		(-0.07)				
Temporary contract*import share		1.013				
		(0.82)				
Narrow offshoring			1.095			
			(0.48)			
Temporary contract* narrow offshoring			1.045			
			(0.65)			
Material offshoring				0.910		
				(-0.79)		
Temporary contract*material offshoring				1.016		
				(0.40)		
Services offshoring					1.394	
					(1.38)	
Temporary contract*services offshoring					0.979	
					(-0.16)	
Openness						1.046
						(1.36)
Temporary contract*openness						1.003
						(0.46)
Temporary contract	1.025	0.902	0.948	0.937	1.082	0.963
	(0.09)	(-0.38)	(-0.21)	(-0.21)	(0.27)	(-0.14)
Married	0.992	0.991	0.984	0.986	0.993	0.995
	(-0.03)	(-0.03)	(-0.06)	(-0.05)	(-0.03)	(-0.02)
Tenure	1.175	1.175	1.174	1.174	1.175	1.175
	(8.13)***	(8.17)***	(8.17)***	(8.14)***	(8.11)***	(8.14)***
Public ownership	1.426	1.367	1.404	1.373	1.412	1.397
	(0.65)	(0.57)	(0.62)	(0.58)	(0.63)	(0.61)
Firm size 2	1.022	1.020	1.017	1.013	1.000	1.025
	(0.11)	(0.10)	(0.09)	(0.07)	(-0.00)	(0.13)
Firm size 3	1.028	1.028	1.036	1.023	1.041	1.034
	(0.10)	(0.09)	(0.12)	(0.08)	(0.14)	(0.11)
Firm size 4	1.009	1.004	1.006	1.010	1.004	1.017
	(0.02)	(0.01)	(0.02)	(0.03)	(0.01)	(0.04)
Education medium	1.615	1.578	1.623	1.567	1.657	1.624
	(0.55)	(0.52)	(0.56)	(0.52)	(0.58)	(0.55)
Education high	9.803	9.468	9.759	9.417	10.05	9.981
	(1.27)	(1.28)	(1.29)	(1.28)	(1.31)	(1.29)
Experience	1.553	1.551	1.551	1.543	1.544	1.558
	(3.27)***	(3.26)***	(3.27)***	(3.22)***	(3.23)***	(3.30)***
Experience squared	1.008	1.008	1.008	1.008	1.008	1.008
	(4.25)***	(4.25)***	(4.26)***	(4.25)***	(4.27)***	(4.23)***
Industry production	1.000	1.000	1.000	1.000	1.000	1.000
	(-0.09)	(0.21)	(0.12)	(0.44)	(0.39)	(-0.10)
N	4840	4840	4840	4840	4840	4840

Notes: Logit estimation, displayed coefficients are odds ratios, t-statistics in parentheses; all models include year dummies, and industry dummies; *** significance at 1%, ** significance at 5%, * significance at 10%.

Table 6.21. Job loss regression by sector

	Manufacturing and services			Manu-facturing	Services
	All	Export intensive	Non-export intensive	All	All
Model 1					
Export share	1.074	1.056	1.109	1.104	1.230
	(1.73)*	(0.43)	(1.67)*	(1.27)	(2.71)***
Temp. contract*export share	1.002	1.326	1.012	1.027	1.009
	(0.15)	(3.91)***	(0.65)	(0.85)	(0.17)
Model 2					
Import share	0.995	0.779	1.035	1.235	0.961
	(-0.07)	(-1.31)	(0.34)	(1.65)*	(-0.27)
Temp. contract*import share	1.013	1.272	1.025	1.043	0.994
	(0.82)	(3.53)***	(1.19)	(1.12)	(-0.08)
Model 3					
Narrow offshoring	1.095	0.896	1.120	0.988	1.841
	(0.48)	(-0.20)	(0.50)	(-0.04)	(1.45)
Temp. contract*narrow offshoring	1.045	2.177	1.173	1.204	1.037
	(0.65)	(2.52)**	(1.56)	(1.69)*	(0.18)
Model 4					
Material offshoring	0.910	0.996	0.801	0.747	0.501
	(-0.79)	(-0.01)	(-1.60)	(-1.64)	(-1.65)*
Temp. contract*material offshoring	1.016	1.349	1.052	1.158	1.030
	(0.40)	(2.19)**	(0.95)	(1.31)	(0.25)
Model 5					
Services offshoring	1.394	4.147	1.370	0.497	2.145
	(1.38)	(1.77)*	(1.03)	(-0.35)	(2.35)**
Temp. contract*services offshoring	0.979	0.138	0.959	0.493	1.103
	(-0.16)	(-2.87)***	(-0.28)	(-0.55)	(0.47)
Model 6					
Openness	1.046	0.971	1.062	1.126	1.149
	(1.36)	(-0.27)	(1.35)	(1.87)*	(2.14)**
Temp. contract*openness	1.003	1.149	1.009	1.020	0.998
	(0.46)	(3.56)***	(0.92)	(1.09)	(-0.05)

Notes: Logit estimation, displayed coefficients are odds ratios, t-statistics in parentheses.
*** significance at 1%
** significance at 5%
* significance at 10%
Models include all covariates as in Table 6.20, these are not reported here to save space.

Looking at workers in manufacturing industries shows that temporary workers are 1.2 times as likely as permanent workers to become unemployed when the share of narrow outsourcing in their industry rises by 1%. In service industries we do not find any significant differences between temporary and permanent workers.[32]

Wrapping up, our results suggest that, in terms of job loss probability, workers on temporary contracts are more exposed to international competition than their colleagues holding permanent contracts, given that trade integration of the industry they are working in is sufficiently strong.

32. Note that, due to data limitations, we do not split the sample between export-intensive and other industries.

For temporary workers, the chance of losing their jobs as trade intensity increases is significantly higher than for permanent workers.

On the one hand, temporary contracts allow employers to flexibly react to changing market conditions. On the other hand, temporary contracts imply a significant insecurity for workers, which is strengthened by increasing globalisation. Hence, the two trends of increasing labour market dualism and rising trade integration seem to be forming a dangerous mix, which is worth keeping in mind when policy makers attempt to further soften employment protection legislation.

6.5. Conclusions and policy implications

The German economy is characterised by a high degree of foreign exposure through exports and imports. This chapter considers the link between trade and labour market outcomes in Germany. To that end we combine individual-level data from the German Socio Economic Panel for the period 1999 to 2007 with industry-level data on various aspects of trade – exports, imports and offshoring. We consider their effects on wages and the probability of moving into unemployment.

Our econometric analysis suggests that there is little impact of trade-related variables on individual-level wages, neither positive nor negative. Hence, once controlling for characteristics of the individual (such as education, tenure, work experience, etc.) the extent of exposure of an industry to international competition does not seem to matter much for wages. This is in line with literature for Germany and other countries. Lurweg and Uhde (2009) look at the openness of an industry (not distinguishing exporting, importing or offshoring as we do) and its relationship with wages, and find only small, if any, effects. More recently, a growing literature looks at wage effects of offshoring of material and services inputs, largely concluding that any effects, if they are present, are low (e.g. Geishecker and Görg, 2008 for Germany, Geishecker and Görg, 2009 for the United Kingdom, Liu and Trefler, 2008 for the United States). For an economy like Germany this may not be too surprising, as the wage setting is rather rigid and one may, therefore, expect adjustments to be through the extensive margin, i.e. employment levels.

We have, therefore, analysed this aspect in our paper. We find some important differences between manufacturing and services sectors, in particular with regard to exporting and offshoring. As regards exports, we find that exporting of final goods in the services industry is positively associated with the probability of becoming unemployed, and this effect is similar for all skill groups. By contrast, we do not find any strong evidence for such an effect for exporting in manufacturing industries. One possible explanation is that German services firms are finding it difficult to compete internationally with other services exporters that may be better placed in world markets, such as the world's top services exporters United States or United Kingdom. If this was the case, policy makers should be aware of this and think about ways of making German services more competitive on world markets. This seems an important issue for further research.

In the services sector, we find that offshoring of material inputs reduces an individual's probability of moving into unemployment. This seems to affect all skill groups equally. More specifically, the results of our estimation suggest that a percentage point increase in material offshoring reduces the risk of becoming unemployed by about 60%.[33] Material offshoring in

33. This result is in line with Bachmann and Braun (2011) who also find that outsourcing of materials increases employment stability in services industries.

manufacturing industries also reduces the risk of unemployment, but the effect is much lower. It is statistically significant only for medium skilled workers, where we find that a one percentage point increase in material offshoring implies a reduction in the probability of moving into unemployment by about 30%. These findings are in line with Bachmann and Braun (2011) for Germany, who also find that outsourcing of materials increases job stability in particular in services industries. They suggest that firms are able to benefit from productivity increases due to offshoring, which then translate into better employment opportunities for workers in the offshoring firms (cf. Görg *et al*., 2008; Amiti and Wei, 2009).

However, in the services industry, the probability of becoming unemployed increases with the extent of services offshoring, and this effect is stronger for high-skilled workers. We do not find this effect for manufacturing industries. This suggests that in services industries, offshoring of services activities substitutes for domestic labour, in particular of high skilled workers.[34] In terms of policy implications, this suggests that there may be substantial heterogeneity depending on the type of activity that is offshored abroad. This needs to be considered when judging the potential benefits or otherwise of offshoring for the German economy.

We also consider some of the labour market policies implemented in Germany in the last decade. We focus our analysis on the increasing use of temporary contracts, as this has not attracted as much attention as some of the other policies (e.g. wage restraint, short time work). While our analysis shows that temporary workers earn on average less than permanent workers (controlling for individual-level characteristics), we also investigate whether trade has any differential impact on temporary and permanent workers.

As regards the latter question, we find little evidence for this in the wage regressions. One striking finding is, though, that services offshoring is associated with higher wages only for temporary but not for permanent workers. One explanation may be that industries with high services offshoring are also those with high staff turnover, where temporary workers may be able to negotiate higher wages because of their flexibility. However, this clearly needs further research to understand the mechanism that is at work.

Looking at unemployment probabilities, we find that an increase in trade intensities is associated with a higher unemployment risk for workers on temporary contracts, in industries that are highly integrated internationally. Given the strong trend in Germany towards dual labour markets with permanent and temporary employees, and increasing levels of globalisation through trade and offshoring, this latter result may suggest a trend towards decreasing employment security for temporary workers. This is an important finding from a policy perspective, given the debate as to whether globalisation and employment insecurity are linked (Rodrik, 1997, Scheve and Slaughter, 2004). While a full answer to this issue would clearly need further research, these findings should be taken into account when policy-makers plan to further soften Employment Protection Legislation.

34. This is in line with recent examples cited by Grossman and Rossi-Hansberg (2008). They describe the offshoring from the United States of reading x-rays, software development and even heart surgery to India. These are all high skilled intensive services activities.

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Annex 6.A1

Calculation of outsourcing measures (imported intermediate inputs)

This definition of outsourcing measures follows the initial work by Feenstra and Hanson (1999) and work for Germany by Geishecker (2006). International Outsourcing is measured as the value of an industry's imported intermediate inputs from industries abroad as a share of the domestic industry's output. We can observe the amount of inputs that are imported for each industry from input-output tables for Germany. This enables us to observe the share of imports from an industry abroad that is used by the domestic industry in a given period (denoted *k* in the equation below).

Formally, outsourcing in domestic industry *j* in year *t* is defined as

$$OUT_{jt} = \sum IMP_{kt} / Y_{jt}$$

where *IMP* are imported intermediates in domestic industry j from foreign industry *k*, and *Y* is industry output.

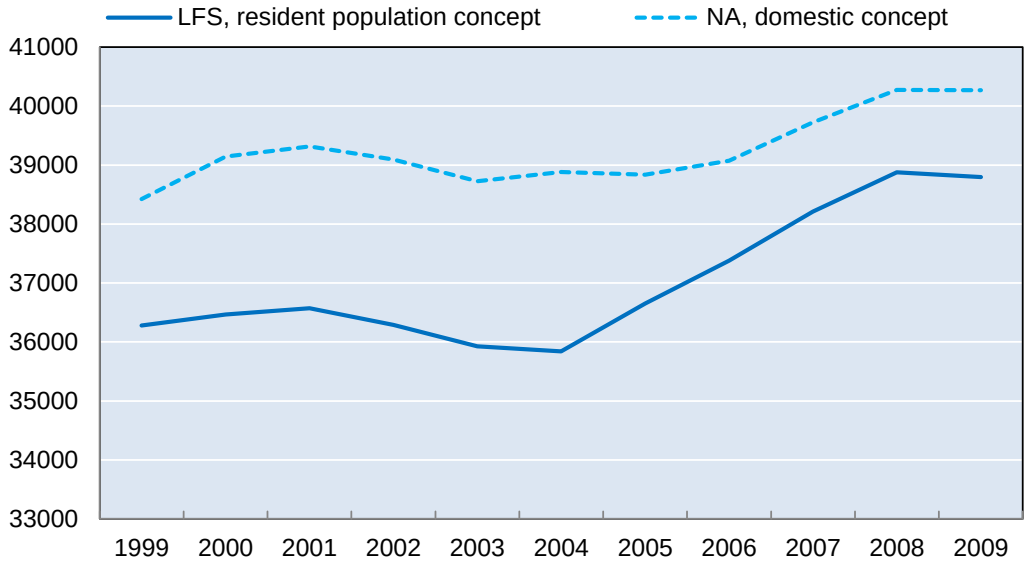
Based on this formula we calculate three different measures:

- Narrow offshoring: domestic industry j = foreign industry k.
- Other materials offshoring:
  a) For manufacturing industries: k is defined as all manufacturing industries excluding j.
  b) For services industries: k is defined as all manufacturing industries.
- Other services offshoring:
  c) For manufacturing industries: k is defined as all services industries.
  d) For services industries: k is defined as all services industries excluding j.

Data come from annual German input output tables from 1999 to 2007.[1]

1. *www-ec.destatis.de/csp/shop/sfg/bpm.html.cms.cBroker.cls?cmspath=struktur,sfgsuchergebnis.csp&pagenr=2*

Figure 6.A1.1. Total employment – comparison LFS and National Accounts



Source: Eurostat, based on LFS and National Accounts.

Data, variable definitions and summary statistics for econometric analysis

The econometric analysis is based on the German Socio-Economic Panel (SOEP), waves 1999 to 2009. We use all samples for the analysis. Yearly industry-level information about trade and offshoring is merged with the SOEP on basis of industry classification provided in the SOEP (NACE 1.1). Variables are defined as follows.

Variable	SOEP variable and modifications
Log real monthly gross wage	Gross monthly income (LABGRO$) deflated by CPI (German Statistical Office). Imputed incomes are *not* used.
Job loss	Dummy for job loss is set to 1 in period *t* if person is unemployed in *t* (LFS$) and was working full time in *t-1* (EMPLST$). For unemployed persons, no industry information is provided in period *t*. We replace the missing value in *t* by the values in *t-1*.
Married	Dummy = 1 if person is married ($FAMSTD)
Tenure	Number of years with employer ($ERWZEIT)
Public ownership	Dummy = 1 if employer is public service (OEFFD$)
Firm size	Firm size categories (ALLBET$): 1. less than 20 employees (omitted category) 2. greater/equal 20 and less than 200 employees 3. greater/equal 200 and less than 2000 employees 4. greater/equal 2000 employees
Education	Highest educational level obtained (ISCED$): 5. unqualified labour, up to secondary education (ISCED 1 & 2) 6. skilled labour, apprenticeship, vocational education (ISCED 3 & 4) 7. high-skilled labour, tertiary education (ISCED 5 & 6)
Experience	Years of work experience; one year of full-time work (EXPFT$) counts as one year, one year of part-time work (EXPPT$) counts as 0.5 year.
East Germany	Dummy for Eastern federal state (BULA$)
Industry production	Taken from input-output table provided by German Statistical Office (destatis)

Table 6.A1.1. Summary statistics

Variable	Observations	Mean	Standard deviation
Real gross monthly wage	132 150	2415.80	2155.947
Dummy: job loss	192 477	0.011	
Dummy: married	192 477	0.638	
Tenure	133 421	10.119	9.795
Dummy: public ownership	128 639	1.748	
Firm size (category 1 to 4)	127 899	2.425	1.194
Dummy: primary/secondary education	192 477	0.156	
Dummy: vocational education	192 477	0.524	
Dummy: tertiary education	192 477	0.265	
Work experience	186 431	15.623	12.171
Dummy: temporary contract	113 774	0.144	
Dummy: Eastern federal state	192 477	0.240	
Industry production	102 502	150445	78664.1