Düsseldorf Institute for Competition Economics

DISCUSSION PAPER

No 127

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December 2013

HEINRICH HEINE UNIVERSITÄT DÜSSELDORF

d|u|p düsseldorf university press

IMPRINT

DICE DISCUSSION PAPER

Published by

düsseldorf university press (dup) on behalf of
Heinrich-Heine-Universität Düsseldorf, Faculty of Economics,
Düsseldorf Institute for Competition Economics (DICE), Universitätsstraße 1,
40225 Düsseldorf, Germany
www.dice.hhu.de

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ISSN 2190-9938 (online) – ISBN 978-3-86304-126-7

The Rise of the East and the Far East: German Labor Markets and Trade Integration *

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Abstract

We analyze the effects of the unprecedented rise in trade between Germany and "the East" – China and Eastern Europe – in the period 1988–2008 on German local labor markets. Using detailed administrative data, we exploit the cross-regional variation in initial industry structures and use trade flows of other high-income countries as instruments for regional import and export exposure. We find that the rise of "the East" in the world economy caused substantial job losses in German regions specialized in import-competing industries, both in manufacturing and beyond. Regions specialized in export-oriented industries, however, experienced even stronger employment gains and lower unemployment. In the aggregate, we estimate that this trade integration has caused some 442,000 additional jobs in the economy and contributed to retaining the manufacturing sector in Germany. This is almost exclusively driven by the rise of Eastern Europe, not by China. We also conduct an analysis at the individual worker level, and find that trade had a stabilizing overall effect on employment relationships.

JEL-Classification: F16, J31, R11
Keywords: International Trade, Import Competition, Export Opportunities, Local Labor Markets, Employment, China, Eastern Europe, Germany

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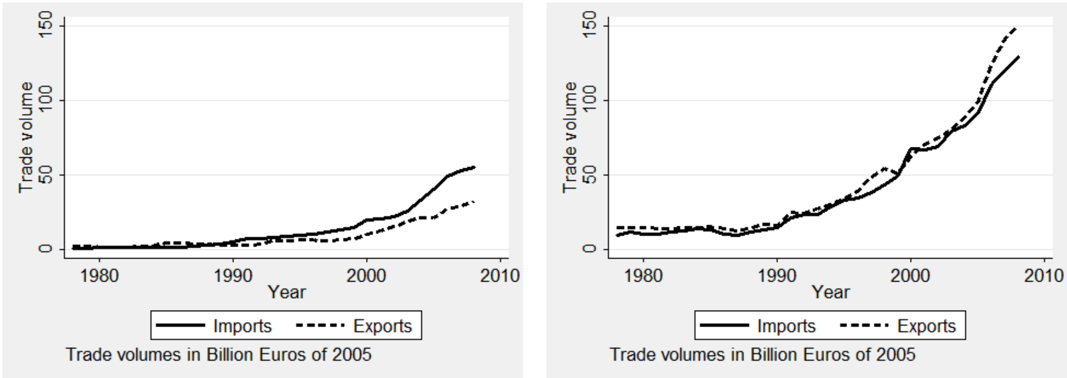
We thank Stefano DellaVigna, David Autor, Marius Brülhart, Bernd Fitzenberger, William Kerr, Daniel Sturm, Fabrizio Zilibotti, and participants of various seminars for very helpful comments. The usual disclaimer applies.

1 Introduction

One of the central forces of globalization in the last decades has been the rise of Eastern Asian countries, especially China, in the world economy. The substantial rise of trade with China, and its perceived competitiveness, have led to major concerns in Western market economies about possible adverse effects for domestic labor markets. This "fear" is particularly strong in the United States, and numerous studies have addressed the impacts of this trade integration on the US economy.[1]



(a) China

(b) Eastern Europe

Figure 1: German trade volumes with China and Eastern Europe, 1978-2008.

From the perspective of Germany, which consistently ranks among the most open economies in the world and for a long time held the unofficial title of the "export world champion", China's rise was also striking. Starting from almost zero trade until the late 1980s, the German annual import volume from China has risen to more than 50 billion Euros in 2008 (see Figure 1). This corresponds to a growth rate of 1608 percent, which is far higher than for any other trading partner. However, although Germany runs a trade deficit vis-a-vis China despite an overall trade surplus, the magnitude of this deficit is much smaller than in the US case. This is because German exports to China have also risen by about 900 percent, from almost zero in 1988 to some 30 billion Euros in 2008. The "rise of China" has therefore led to two major changes for the German economy: Increased import competition, particularly in such sectors as textiles, toys, or office and computer equipment, but at the same time a substantial rise in market opportunities for German exporters, most notably in sectors such as automobiles, specialized machineries, and electronic and medical equipment.

In addition to the "rise of China", Germany was affected by another major facet of globalization that – at least economically – had a much milder impact in North America, namely the sudden and unexpected fall of the iron curtain with the subsequent transformation of the former socialist countries into market economies. Overall, the rise of German exports to Eastern Europe even outpaced export growth to China. Im-

[1]See, among others, Feenstra and Hanson (1999); Harrigan (2000); Feenstra and Wei (2010); Harrison et al. (2010); Ebenstein et al. (2013).

port growth also has been substantial, exceeding 800 percent during the period 1988-2008.[2] For the German economy, trade exposure therefore increased not only from the Far East, but also from the East closer by.

In this paper, we analyze the impacts of these major trade shocks from the perspective of small-scale German regions. There is substantial variation in sectoral employment patterns at the regional level, also within the manufacturing sector where commodity trade occurs. Given these initial specializations, regions are differently exposed to import competition and export opportunities arising from Eastern European and Asian countries. Regions that are strongly specialized in export-oriented industries, say "automobile regions", may benefit from the rise of new markets, while regions specialized in import industries, say "textile regions", may see their labor markets put under strain by the rising exposure to foreign competition. In our aggregate analysis, we relate changes in key local labor market variables to measures of import and export exposure that reflect the local industry mix. Afterwards, we adopt a disaggregate approach and analyze how trade exposure affects individual employment biographies across heterogeneous worker-establishment pairs in different industries.

This study is most closely related to a recent string of literature that identifies the impact of trade shocks at the *regional level*, see Chiquiar (2008), Kovak (2011), Topalova (2010) and in particular, Autor, Dorn and Hanson (2013) (henceforth labeled as *ADH*). They separate the US into local labor market areas and analyze the differential performance of these regions depending on their initial industry employment patterns, which determine their exposure to import competition from China. To account for unobserved shocks that simultaneously affect imports and regional performance, they use trade flows of other high-income countries as an instrument for US local trade exposure. Their main finding is that regions strongly prone to Chinese import competition have experienced severe negative impacts on their labor markets, such as lower manufacturing employment, rising unemployment, or lower labor force participation.[3]

Our empirical approach is similar to *ADH*, but we obtain results for Germany that differ substantially from their findings. Consistent with the US experience, we also find a negative *causal* effect of import exposure from the East. That is, German regions specialized in import competing sectors saw a decline in manufacturing employment attributable to the impact of trade. Yet, this negative impact is, on average, more than offset by a positive *causal* effect of export exposure, as the respective export oriented regions built up manufacturing employment as a result of the new market opportuni-

[2] We consider Eastern Europe to comprise the countries Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovakia, Slovenia, and the former USSR or its succession states Russian Federation, Belarus, Estonia, Latvia, Lithuania, Moldova, Ukraine, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. The increase in trade volumes between the US and these countries is negligible, at least in comparison to the German numbers.

[3] *ADH* also find that Chinese trade shocks induced only small cross-regional population shifts. This low labor mobility, in turn, supports the view that regions can be treated as "sub-economies" across which adjustment to shocks works far from instantaneously. Since regional labor mobility in Germany is traditionally much lower than in the US (Molloy et al.; 2011), (Bertola; 2000), their empirical approach indeed seems especially well applicable in the German context.

ties. In the aggregate, we estimate that the rise of the East has retained some 442,000 full-time equivalent jobs in Germany over the period 1988–2008 that would not exist without this trade integration. This aggregate implication is very different from *ADH*'s conclusions for the US, and leads to a starkly opposite picture how globalization has affected the labor markets in Western market economies.

We also pay close attention to the question which part of "the East" – China or Eastern Europe – had stronger impacts in German local labor markets. The rise of China, facilitated by several market openings and reforms, productivity gains of Chinese producers, and market access gains after its WTO accession in 2001, occurred quickly and exogenously from the point of view of "the West". Yet, the rise of Eastern Europe shared many of those characteristics. The fall of the iron curtain in the late 1980s was arguably at least as sudden as the Chinese market openings, and the transformation of the former socialist block triggered substantial productivity gains in those economies (Burda and Severgnini (2009)). Moreover, many Eastern European countries adopted concrete steps of trade integration early on, for example in 1995, where several of them (including Poland, Czech Republic and Hungary) joined the WTO.[4] The increasing German export and import volumes documented in Figure 1 are, thus, likely to stem – at least to a large extent – from the strongly rising productivity and accessibility of Eastern Europe, particularly during the first decade after the iron curtain fell, and less so by developments that have their origin in Germany. And indeed, several studies have exploited this unique historical setting as a quasi-natural experiment, including Redding and Sturm (2008), Brülhart et al. (2012), or Glitz (2012), who investigate how locations in "the West" were affected along different margins by this major exogenous shock.

Our empirical findings suggest that the rise of Eastern Europe affected local labor markets in Germany more strongly than the rise of China. This differential impact seems to be mainly driven by the structure of imports from the two areas. More specifically, we find that changes in trade exposure in such industries where imports from China grew the most (textiles, for example) had negligible labor market effects. The reason seems to be that Germany already tended to import those labor-intensive goods in the 1980s, in which China subsequently became the world's dominant supplier. When the Chinese rise gained momentum, this has then mainly led to a diversion of German import flows from other countries (such as Italy or Greece), but it has not caused major job displacements in Germany. For the case of Eastern Europe, we find a rather different pattern: Germany initially tended to export goods where the subsequent Eastern European rise was particularly strong. Hence, we find substantial displacement effects from rising Eastern European import penetration across German regions. Yet, in the aggregate, those employment losses were more than offset by the creation of new manufacturing jobs stemming from rising German exports to that area. This is quite in contrast to the US experience, where rising import penetration from China fuelled a large overall trade deficit and hurt domestic workers on balance.

[4] In the online appendix we provide additional historical background on the trade integration of Eastern European countries since the 1990s, and the rise of productivity there.

Moving beyond the manufacturing sector, we then investigate how local labor markets responded more broadly to the rise of the East. We find that export-oriented regions saw significant total employment gains and reductions in unemployment. The positive trade effects also spill over to non-manufacturing sectors, such as business services, and cause mildly positive wage gains. Import-competing regions, on the other hand, not only lost manufacturing jobs but were adversely affected more generally.

Finally, our worker-level analysis allows for an even more detailed look at the causal effects of trade. Here, we use cumulative employment spell information and find that a higher import exposure lowers expected overall employment durations, and also the workers' expected job tenure with the original employer or within the initial local industry. Overall, however, we find that rising trade exposure has *stabilized* individual employment biographies, since rising export exposure tends to raise expected employment durations. This pattern is quite stable across different types of workers (by age, gender and qualification), and we find that trade shocks seem to affect employees of small establishments more strongly. We then discuss those findings in the light of recent theories of international trade with heterogeneous firms.

The rest of this paper is organized as follows. Section 2 describes the empirical approach and the data. Sections 3 and 4 are devoted to the analysis of manufacturing employment at the regional level, while Section 5 looks at other local labor market outcomes. Section 6 presents the worker-level analysis, and Section 7 concludes.

2 Empirical approach

2.1 Trade exposure across local labor markets

Our empirical strategy exploits the variation in initial industry specialization across local labor markets at the onset of the economic rise of "the East", i.e., China and Eastern Europe. We first consider the import exposure of a German region i. Using *ADH*'s approach, which is based on a monopolistic competition model of international trade with cross-country productivity differences, this import exposure can be written as:

$$\Delta(\textit{Import exp.})_{it}^{EAST} = \sum_{j} \frac{E_{ijt}}{E_{jt}} \frac{\Delta Im_{jt}^{D\leftarrow EAST}}{E_{it}}, \tag{1}$$

where $\Delta Im_{jt}^{D\leftarrow EAST}$ is the total change in imports from "the East" to Germany that was observed in industry j between time periods t and $t+1$.[5] E_{ijt}/E_{jt} represents region i's share of national industry employment in j at time t, and E_{it} is total manufacturing employment in region i. This measure in (1) thus captures the *potential* increase in import exposure of a German region i, given its initial sectoral employment structure, as it apportions the *national* change in sectoral imports to the single regions according to their shares in national industry employment.

[5]For now, $\Delta Im_{jt}^{D\leftarrow EAST}$ refers to the joint increase of German imports from both China and Eastern Europe. In Section 4 we also consider import exposure from the two areas separately.

To capture regional export exposure, we derive an analogous measure:

$$\Delta(\textit{Export exp.})_{it}^{EAST} = \sum_j \frac{E_{ijt}}{E_{jt}} \frac{\Delta Ex_{jt}^{D \rightarrow EAST}}{E_{it}}, \tag{2}$$

which captures the potential of a region, given its initial sectoral employment patterns, to benefit from rising demand from the East for German manufacturing products. In the empirical analysis we aim to identify the causal effect of the rise of the East on the economic performance of German regions. More specifically, we regress the change of a regional outcome variable (such as overall manufacturing employment) between t and $t+1$, denoted as ΔY_{it}, on the change of regional import and export exposure over the same time period, see eqs. (1) and (2), while controlling for start-of-period regional control variables X_{it}' as discussed below:

$$\Delta Y_{it} = \beta_0 + \beta_1 \cdot \Delta(\textit{Import exp.})_{it}^{D \leftarrow EAST} + \beta_2 \cdot \Delta(\textit{Export exp.})_{it}^{D \rightarrow EAST} + X_{it}' \cdot \beta_3 + \varepsilon_{it}. \tag{3}$$

The main challenge for this exercise is the endogeneity of trade exposure, in particular the presence of unobserved supply and demand shocks that simultaneously affect import/export exposure and regional economic performance.

2.2 Identification strategy

To address this concern, we use an instrumental variable (IV) strategy that is close in spirit to the approach by *ADH*. To instrument German regional import exposure from the East, we construct the following variable for every German region i:

$$\Delta(\textit{Import exp.}_{Inst})_{it}^{EAST} = \sum_j \frac{E_{ijt-1}}{E_{jt-1}} \frac{\Delta Im_{jt}^{Other \leftarrow EAST}}{E_{it-1}}. \tag{4}$$

Here, $\Delta Im_{jt}^{Other \leftarrow EAST}$ are changes in import flows of industry j-goods from the East to other countries. Similarly, for regional export exposure we construct the following instrumental variable that uses changes in exports of other countries to the East:

$$\Delta(\textit{Export exp.}_{Inst})_{it}^{EAST} = \sum_j \frac{E_{ijt-1}}{E_{jt-1}} \frac{\Delta Ex_{jt}^{Other \rightarrow EAST}}{E_{it-1}}. \tag{5}$$

The idea behind the instrument (4) is that the rise of China and Eastern Europe in the world economy induces a supply shock and rising import penetration for *all* trading partners, not just for Germany. Using the import flows of other countries as an instrument for local import exposure in Germany therefore identifies the exogenous component of rising competitiveness in the East, and purges the effects of possible shocks that simultaneously affect German imports and regional performance variables.[6]

[6] Note that the import values are distributed across German regions according to *lagged* sectoral employment shares. This is done to tackle issues of measurement error or reverse causality, if employment reacted in anticipation of future trade exposure.

The logic of the instrumental variable (5) is similar. As the East rises in the world economy, this induces a demand shock for *all* countries since the East becomes a more attractive export destination not just for Germany. Using (5) as an instrument for (2) purges the impacts of unobservable shocks, and thus identifies the causal impact of the rise of export opportunities in the East on German local labor markets.

The quality of the instruments hinges, in particular, on three important conditions. First, they should have explanatory power in order to avoid a weak instrument problem. Second, the unobservable supply and demand shocks in those other countries should not be strongly correlated with those of Germany, since otherwise the instruments do not purge those shocks and the estimated coefficients would still be biased. Third, in order for the exclusion restriction not to be violated, there should not be independent effects of the trade flows of those other countries with China/Eastern Europe on the German regions, other than through the exogenous rise of the East.

To take these conditions into account, it is important to consider which countries are included in the "instrument group" whose trade flows are used to construct (4) and (5). We adopt the following approach: We focus on developed countries with a similar income level as Germany, but we exclude all direct neighbors as well as all members of the European Monetary Union. This is for two reasons. First, supply and demand shocks in such countries (e.g., France or Austria) are likely to be too similar to those in Germany, hampering the identification. Second, since those countries are highly integrated with Germany in an economic union where exchange rate alignments are impossible, it is likely that shocks which change trade flows between those countries and the East also directly affect regional performance in Germany, thus violating the exclusion restriction. For this reason we also do not consider the United States in the benchmark group, because of its high significance in the world economy.

Our final instrument group consists of Australia, Canada, Japan, Norway, New Zealand, Sweden, Singapore, and the United Kingdom. The trade flows of those countries with the East are, indeed, relevant instruments for German trade exposure according to our first-stage results reported below. Moreover, we expect correlations in demand and supply shocks between Germany and those countries, and possible independent effects of shocks in those countries on German local labor markets, to be relatively modest. Still, we conduct several robustness checks where we change the instrument group. Furthermore, we also consider an alternative identification strategy (described in the online appendix) based on a gravity approach to international trade. More specifically, instead of using *actual* increases in German imports and exports as in (1) and (2), which may also be driven by shocks, we use gravity residuals that capture the *implied* differential rise of competitiveness and market access of the East, and respectively, the *implied* differential rise of attractiveness of the East as a market for German exports, relative to other possible origins/destinations.[7]

[7] This approach thus extends the gravity-based method by *ADH* by constructing a regional exposure measure not only for imports but also for (gross and net) exports.

2.3 Data

For the analysis at the regional level, we combine two main data sources. The German labor market data at the regional and local industry level come from the IAB-Establishment History Panel (BHP, see Spengler; 2008) which includes the universe of all German establishments with at least one employee subject to social security. This data set consists of an annual panel with approximately 2.7 million yearly observations on establishments aggregated from mandatory notifications to social security in the years from 1975 to 2008. Due to the administrative origin, the data are restricted to information relevant for social security (structure of workforce with regard to age, sex, nationality, qualification, occupation, wage) but at the same time are highly reliable and available on a highly disaggregated level.

Detailed data for regional sectoral employment is available from 1978 onwards. Since much of the rise of China and Eastern Europe occurred after 1990, we use 1988 as our starting point and thus observe data for two time periods (1988 to 1998 and 1998 to 2008) for each region. This timing also allows us to use employment lagged by ten years in the construction of our instruments as discussed above. Eastern German regions are only included for the second decade 1998 to 2008, because sectoral employment data for these regions only became available in the mid-1990s.

Information on international trade is taken from the United Nations Commodity Trade Statistics Database (Comtrade). This data contains annual international trade statistics of over 170 reporter countries detailed by commodities and partner countries. Trade flows are converted into Euros of 2005 using exchange rates supplied by the German *Bundesbank*. We merge these two data sources by harmonizing industry and product classifications. The correspondence between 1031 SITC rev. 2/3 product codes and the employment data (equivalent to NACE 3-digit industry codes) is provided by the UN Statistics Division and allows unambiguously matching 92 percent of all commodities to industries. Trade values of ambiguous cases are partitioned into industries according to national employment shares in 1978. Finally, we drop all industries related to agriculture, mining and fuel products, so that our empirical analysis focuses on 101 different manufacturing industries.

2.4 Descriptive overview

In Appendix Tables (A.1) and (A.2) we report the sectors with the highest import and export volumes vis-a-vis Eastern Europe and China, respectively. As can be seen, Germany tends to export similar goods to the two areas, most notably cars, car parts, and special purpose machinery. Yet, the imports are rather different: From China, Germany mainly imports textiles, toys, and lower-tier electronic products. In the case of Eastern Europe, on the other hand, the top import sectors are also motor vehicles and car parts, that is, there is substantially more intra-industry trade with this area.

The changes of sectoral trade volumes over time are used to construct the regional exposure measures according to (1) and (2), and Appendix Table (A.3) reports the mean values (and standard deviations) across all German regions separately for the two time periods and the two areas. For China, we see that German regions were exposed to trade mainly during the second period (1998-2008). On average, the exposure to Chinese imports rose by € 1,900 during those ten years, as compared to only € 590 between 1988 and 1998. Export exposure also increased much faster in the second time period.

For Eastern Europe, the average import and export exposure of German regions increased even stronger and also substantially earlier. Specifically, the import exposure rose by € 1,800 and the export exposure by € 2,170 between 1988 and 1998. Then, during the second period, trade volumes continued to grow and average export exposure (€ 3,710) outpaced import exposure (€ 1,850) even more clearly. Notice an interesting parallel in the rise of the two areas. As is apparent from these numbers as well as from Figure 1 above, trade flows with Eastern Europe particularly accelerated since the mid-1990s. Around that time, many important Eastern European countries joined the WTO (also see the online appendix), and this picture is thus consistent with the substantial expediting of trade with China in the aftermath of its WTO accession in 2001.

Behind these average exposures, there is substantial variation across local labor markets in Germany as illustrated in Figures A.1 and A.2 in the online appendix.[8] It stands out that former Eastern Germany faced little import competition or export opportunities. The reason is the massive de-industrialization that occurred quickly after reunification, due to the strong real appreciation that came with the introduction of the *Deutschmark*. Western Germany was exposed much more strongly to trade, as the manufacturing sector is concentrated there, and within the West, exposure varies considerably across regions depending on the detailed local employment patterns.

Finally, Appendix Table (A.4) reports the cross-regional correlations of local import and export exposure vis-a-vis China and Eastern Europe, respectively. Bearing in mind that aggregate German exports to the two areas consist of similar goods, it is not surprising to see a high correlation (0.835) between the two regional measures of export exposure. For import exposure, this correlation is much weaker (0.328), indicating that some German regions have industrial structures that make them vulnerable to import competition from one area, but not the other. Moreover, bearing in mind the strong prevalence of intra-industry trade with Eastern Europe helps to understand the high correlation (0.745) between local import and export exposure with respect to this area. For China, this correlation is much lower (0.394) since German exports to, and imports from China consist of very different types of goods.

3 Trade exposure and manufacturing employment

We now turn to our econometric analysis, where we estimate eq. (3) and use (4) and (5) as instruments for our main variables (1) and (2). Because of the partly substantial correlations just described it would not be sensible, however, to control at the same

[8] The maps focus on the period 1998-2008, so that former Eastern Germany is also included.

time for import and export exposure with respect to both China and Eastern Europe. We rather adopt a complimentary approach. Specifically, we first add up China and Eastern Europe and analyze how German local labor markets were affected by the joint rise of "the East", distinguishing the impacts from import and export exposure. Afterwards, we consider the effects of *net* export exposure and distinguish the effects from the two areas, China and Eastern Europe.[9]

Our benchmark dependent variable is the decennial change in manufacturing employment as a share of the working age population in region i, $Y_{it} = E_{it}^{M/WP}$. In Section 5, we then consider other local labor market indicators as outcome variables.

3.1 Baseline Specification: Manufacturing Employment Growth

The first column of Table (1) shows the most parsimonious specification, where the only additional control is the overall regional employment share in tradeable goods industries.[10] This variable is important, since our approach seeks to exploit the detailed variations of employment structures *within* the manufacturing sector. The first-stage results reported in the bottom panel indicate that our instruments are strong, with F-test statistics well above conventional threshold levels. Turning to the second-stage results, export exposure has a positive and significant impact on manufacturing employment growth, while the impact of import exposure is not statistically different from zero. We also find a trend of mean reversion of manufacturing employment, since growth is negatively related to the initial share of tradeable goods industries.

In column 2 we add control variables for the composition of the local workforces: A higher initial share of high-skilled, foreign and female workers is negatively related to manufacturing employment growth, since those groups are more prevalent in service industries. Furthermore, motivated by the literature on job off-shoring (e.g. Grossman and Rossi-Hansberg; 2008), we include the percentage of routine-intensive occupations (represented by basic activities in the taxonomy of Blossfeld (1987)), but find no significant impact. Most importantly, the inclusion of these controls leaves the results for our central variables unaffected.

In column 3 we add dummy variables for the time periods and for four higher-order German regions (North, South, West, East) comparable to Census divisions in the US. The coefficients for export exposure as well as for the other control variables remain stable. Moreover, the negative impact of import exposure on manufacturing employment gets larger in absolute terms and is now also statistically significant.

Next, to address the special role of cars for the German economy, we split up the initial share of tradable goods industries into two parts: the initial local employment share in the automotive industry, and the initial share of all other tradable goods sectors. In column 4, we find that there is mean reversion in both manufacturing branches.

[9]The correlation between net export exposure to China and Eastern Europe across all German regions is virtually zero (-0.067), thus allowing for a separate identification of the effects.

[10]To account for spatial and serial correlation, we cluster the standard errors at the level of 50 greater labor market areas as defined in Kropp and Schwengler (2011) in all specifications.

Table 1: Trade Exposure and Manufacturing Employment

	Dependent variable: 10-year change manufacturing employment / working age pop. in %-points					
	(1)	(2)	(3)	(4)	(5)	(6)
	(2SLS)	(2SLS)	(2SLS)	(2SLS)	(2SLS)	(OLS)
Δ import exposure	0.035	-0.028	-0.149**	-0.158**	-0.190***	-0.075
	(0.09)	(0.08)	(0.07)	(0.07)	(0.07)	(0.05)
Δ export exposure	0.332***	0.444***	0.409**	0.425**	0.399*	0.442***
	(0.12)	(0.12)	(0.18)	(0.21)	(0.21)	(0.12)
% manuf. of tradable goods	-0.108***	-0.083***	-0.073***			
	(0.01)	(0.02)	(0.02)			
% high skilled		0.011	-0.046	-0.042	-0.039	-0.047
		(0.05)	(0.04)	(0.04)	(0.04)	(0.04)
% foreigners		-0.197***	-0.159***	-0.159***	-0.162***	-0.161***
		(0.04)	(0.04)	(0.04)	(0.04)	(0.03)
% women		-0.057***	-0.062***	-0.061***	-0.060***	-0.060***
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
% routine occupations		-0.039	-0.025	-0.021	-0.014	-0.023
		(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
% manuf. of other tradable goods				-0.073***	-0.068***	-0.083***
				(0.02)	(0.02)	(0.02)
% manuf. of cars				-0.081**	-0.074**	-0.092***
				(0.03)	(0.03)	(0.03)
Time dummy	–	–	Yes	Yes	–	–
Region dummies	–	–	Yes	Yes	–	–
Region × time interaction	–	–	–	–	Yes	Yes
First stage results, dependent variable: Δ import exposure						
Δ import exposure	0.255***	0.257***	0.248***	0.253***	0.252***	
(other countries)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)	
Δ export exposure	0.146***	0.144***	0.117***	0.107***	0.105***	
(other countries)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	
R-squared	0.751	0.756	0.761	0.762	0.763	
F-test of excluded instruments	105.809	74.453	17.984	18.127	16.361	
First stage results, dependent variable: Δ export exposure						
Δ import exposure	0.038*	0.035*	-0.006	0.006	0.002	
(other countries)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	
Δ export exposure	0.567***	0.555***	0.423***	0.398***	0.393***	
(other countries)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)	
R-squared	0.766	0.772	0.818	0.824	0.826	
F-test of excluded instruments	96.909	81.708	26.050	25.116	22.280	

Notes: N=739 (326 regions in first and 413 regions in second period). All regressions include a constant. Both first stage regressions include the same set of control variables as the corresponding second stage in the upper panel. All control variables are constructed as the number of workers in a particular group relative to total employment. % manuf. of tradable goods is the percentage of workers in manufacturing of consumption, production, or capital goods. % high skilled is the percentage of workers with a university degree. % routine occupations is the percentage of workers in basic unskilled manual, service, and administrative occupations according to the taxonomy of Blossfeld (1987). Standard errors clustered at the level of 50 aggregate labor market regions in parentheses. Levels of significance: *** 1 %, ** 5 %, * 10 %.

Moreover, our key results for export and import exposure remain robust.

Finally, in column 5 we use interacted region × time period fixed effects instead of separate dummies. This specification is the most demanding one, as it is only identified by within region-time variation. Again, we find that our results remain stable. Moreover, the first-stage results remain highly significant throughout.

For this benchmark specification, we also reports the results of a simple ordinary least squares (OLS) regression (see column 6). The comparison with the two-stage least squares (2SLS) coefficient from column 5 shows that the OLS estimate for import exposure is biased towards zero due to measurement error and unobserved demand shocks.[11] For export exposure there are two countervailing effects: a downward bias due to measurement error, and an upward bias due to the impact of unobserved supply shocks. The second source of bias seems to be somewhat more important, but the OLS estimate is roughly in the same ballpark as the baseline 2SLS coefficient.

Robustness checks: Regional classification. We have conducted a battery of sensitivity tests that deal with the regional units used in our analysis. First, we drop all regions located in former Eastern Germany and repeat our analysis only for the local labor markets in the Western part. This is an important robustness check, since the two parts of Germany have been very different in terms of industry structure and economic performance, and our time period coincides with many other important changes. The results are reported in columns 1 and 2 of the upper panel in Appendix Table A.5. Reassuringly, both for import and export exposure, the effects become even stronger when focussing only on Western German regions.

Another concern might be that the 413 counties (Landkreise and kreisfreie Städte) may be too small to constitute independent local labor markets. In columns 3 and 4 of the upper panel in Appendix Table A.5, we thus carry out our analysis at the level of 147 functional labor markets (delineated according to commuting distances, see Eckey et al. (2006)). Re-estimating our benchmark specification, we obtain qualitatively unchanged results although the coefficient for export exposure is reduced. Finally, we use dummies for the 16 German Federal States instead of the higher-order regions, and respectively, State × time interactions. The results are reported in Appendix Table A.6, and turn out to be very similar to our baseline findings.

Robustness checks: Instrument group. In the lower panel of Appendix Table A.5, we check the sensitivity with respect to the construction of our instruments. First, we specify an over-identified model instead of the just identified 2SLS model used as the benchmark. This approach does not add up the import/export flows of all instrument countries with the East, but exploits the detailed variation across countries. The results remain qualitatively unchanged, and the Hansen J test statistic of 20.276 (p=0.12) does not reject the hypothesis of validity of the excluded instruments.

[11] For the US case, *ADH* also find that the OLS coefficient is smaller in absolute terms than the 2SLS coefficient, so our results are consistent with this. In the next subsection we provide a detailed comparison of our results and theirs.

Next, we change the countries that are included in the instrument group, in order to address the concern that there could be independent direct effects of shocks in those countries on German regions. This may be particularly relevant for the United Kingdom, which is the most important trading partner of Germany among the benchmark instrument countries. We therefore drop the UK from the group and re-estimate the (just identified) baseline specification. The estimation results are almost the same as before. We next add the USA to the instrument group, but again this hardly affects the results. Finally, we add several neighboring countries (such as France). The explanatory power of the instrument gets even stronger in that case, particularly for export exposure, and second-stage results remain robust. But for this specification one surely has to worry about the exclusion restriction.

Overall, the lower panel of Appendix Table A.5 suggests that our results are robust with respect to specification issues of the instrumental variable approach.

3.2 Quantitative comparison to the US and further robustness checks

What do the benchmark results imply quantitatively? Our preferred estimates from column 5 in Table (1) imply that a 10-year change of €1,000 per worker in import exposure reduces manufacturing employment relative to working age population by 0.19 percentage points, whereas export exposure increases this share by 0.4 percentage points. Taking into account that average export exposure per worker increased by €7,060 from 1988-2008, and import exposure by €6,147, we can calculate that the new export opportunities in the East increased the aggregate manufacturing share by 2.82 percentage points. Import competition reduced it by only 1.17 percentage points, thus leading to a net increase by 1.65 percentage points as a result of trade integration.

To set this number into perspective, note that the overall manufacturing employment share in the working-age population has been declining in Germany over the period 1988-2008 by about 4 percentage points, from roughly 16 % to 12 %, reflecting a general trend of structural change observed in most developed countries. Our results therefore indicate that trade integration with Eastern Europe and China has slowed down this trend, and has retained manufacturing in the German economy.

Comparison to the US. The results by *ADH* lead to a rather different picture. They estimate a coefficient of -0.596 for the causal effect of Chinese import penetration on manufacturing employment/working-age population in the US (see their Table 3, column 6). Taking into account that their analysis is conducted in 2007-$ instead of 2005-€, this coefficient can be converted to around -0.786 and then compared to our -0.19 reported in column (5) of Table (1).[12] The marginal impact of import exposure thus seems to be significantly larger in the US than in Germany. Benchmarking the impact of import exposure, *ADH* report that the rise of China has led to a decrease in the

[12]For the conversion we have taken into account an average rise in German prices by +3.9% between 2005 and 2007, and an average exchange rate of 1.3705 $ per € in 2007.

manufacturing employment share by 0.68 percentage points in the period 1990-2000, and by 1.10 percentage points in the period 2000-2007. In other words, import exposure from China seems to have caused much larger aggregate job losses in the US than in Germany, where the impact of imports (even with respect to China *and* Eastern Europe together) reduced the manufacturing share by only 1.17 percentage points over 20 years. Moreover, in the German case, those job losses were more than compensated by aggregate job gains stemming from rising export opportunities in the East, something that apparently did not happen in the US.

As noted by *ADH*, those quantitative predictions likely overstate the impact of trade on manufacturing employment. Even though the 2SLS coefficients identify the causal effects of the rise of the East, the measured changes in trade flows may also partly stem from other sources such as unobserved shocks.[13] However, even if we correct for this and provide a more conservative benchmarking, the principal conclusions are the same: trade with the East has raised the manufacturing share in Germany by $1.222 - 0.627 = 0.595$ percentage points, which corresponds to roughly 305,000 manufacturing jobs that were retained. In the US, by contrast, *ADH* estimate that trade exposure with China has destroyed more than 1.5 million manufacturing jobs.

Table 2: Benchmarking, robustness and comparison to *ADH*

	Dependent variable: 10-year change manufacturing employment / working age pop. in %-points							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(2SLS) Benchmark	(OLS) Benchmark	(2SLS) + third markets	(OLS) gravity	(2SLS) Falsification	(OLS) Falsification	(2SLS) Falsification	(OLS) Falsification
Δ Net exposure	0.237**	0.224***	0.205***	0.067***	0.093	0.078	0.043	0.045
	(0.09)	(0.07)	(0.08)	(0.02)	(0.06)	(0.05)	(0.05)	(0.04)
First stage results, dependent variable: Δ Net exposure								
Δ Net exposure	0.255***		0.294***		0.185***		0.188***	
(other countries)	(0.05)		(0.05)		(0.03)		(0.04)	
R-squared (first-stage)	0.542		0.499		0.569		0.559	
F-test of excl. inst.	25.886		29.216		29.269		26.759	

Notes: N=739 (columns 1–4), N=326 (columns 5+6) and N=323 (columns 7+8). Δ *net exposure* is constructed by subtracting (1) from (2). In column 3, Δ *net exposure* includes import competition from the East in other Eurozone countries weighted by the respective country's share in Germany's total exports (see the online appendix). In column 4, Δ *net exposure* is constructed according to the gravity approach explained in the online appendix. In columns 5–8 the dependent variable is the growth rate of manufacturing employment over working age population in the period 1978-1988, and Δ *net exposure* refers to 1988–2008, with control variables from 1978. Columns 5 and 6 include all Western German regions. In columns 7 and 8 we drop Groß-Gerau, Fürth and Ulm. All regressions include the full set of control variables from table 1, column 5. Standard errors clustered at the level of 50 aggregate labor market regions in parentheses. Levels of significance: *** 1 %, ** 5 %, * 10 %.

[13] *ADH* develop a method to decompose the total change in trade over time into two parts: i) the part caused by the exogenous rise of the East, and ii) a residual part that may be explained by other causes. This decomposition essentially relies on the comparison of the 2SLS and the OLS coefficients in the baseline specification (see the theory appendix of *ADH* for details). Using our results from columns 5 and 6 of Table (1), this method implies that 43.3 % of the increase in exports is due to the rise of the East, and 53.8 % of the rise in imports. This compares to the US figure of 48% for Chinese import exposure reported by *ADH*. The share of trade that can be attributed to the exogenous rise of the East thus appears to be roughly in the same range in both cases.

Net exports, exposure on third markets, and gravity. To facilitate a further comparison, we now consider *net* exports. In column 1 of Table 2 we report the 2SLS coefficient for German net export exposure vis-a-vis the East, instrumented accordingly with the combined net exports of the other countries to China and Eastern Europe. First-stage results again suggest that we are working with a strong instrument, and the main coefficient of 0.237 is precisely estimated. This should be compared to the coefficient of 0.594 for the net impact of China on the US (see Table 10, panel D in *ADH*).[14] The marginal effect of trade exposure thus again seems to be stronger in the US. Moreover, net exports to the East have increased in Germany, while US net exports to China have decreased over time, thus leading to opposite quantitative predictions how trade has affected manufacturing employment in the two economies.[15]

We then take into account that Germany is exposed to rising import penetration from the East not only in its domestic market, but also in other markets in foreign countries. In the online appendix we derive a more encompassing measure of local net export exposure across German regions that includes such displacement effects in third markets. Column 3 shows that the marginal effect of net export exposure on manufacturing employment becomes a bit smaller, which is mainly due to the scaling of the alternative exposure measure, but remains highly significant.

Next, in column 4 we show the results of the alternative identification strategy where we use gravity residuals instead of raw import/export flows to construct the measures of local net export exposure (see the online appendix for details). Notice that we use OLS for this estimation, as the gravity approach per construction sterilizes the confounding effects of possible unobservable shocks. We find that the marginal effect remains highly significant, but its size decreases even further. This is because the rise in gravity residuals captures only the exogenous differential rise in market size and accessibility of the East, which is smaller than the raw increase of German-East trade flows. But once we convert this marginal effect into economic magnitudes, we find that the gravity exercise – which lends further credence to the causal interpretation of our results – leads to virtually identical quantitative predictions as the instrumental variable approach (using the conservative benchmarking explained before).

Falsification test. Finally, as a further important robustness check, we conduct a falsification exercise. Following *ADH*, we regress past employment changes (1978-1988) on future changes in trade exposure (1988-2008), using both OLS and the 2SLS strategy, and including all control variables from our benchmark model (now measured in 1978). The main concern here is that changes in manufacturing employment and trade exposure may be simultaneously driven by a common long-run trend. For example, employment in some manufacturing industries may have been on a secular decline

[14]Note that *ADH* consider US net imports instead of net exports to China, hence the change in sign. We then convert their raw coefficient (0.45) into 2005-€ .

[15]In column 2 of Table (2) we also report the OLS coefficient for the impact of net export exposure. Doing a similar decomposition exercise as above, we find that 41.4 % of net exports arose because of the causal effect of the rise of the East, which is in line with our previous findings.

even before the rise of the East kicked in, and the decreasing domestic production may then have been substituted by imports from the East. Similarly, industries may have boomed even before the mid-1980s, so that export exposure with the East was rather a symptom than a cause of domestic employment gains in manufacturing.

However, this is actually not the case, as columns 5 and 6 of Table 2 show that lagged employment changes do not predict future regional trade exposure. Moreover, upon graphical inspection, we find that these coefficients appear to be strongly driven by three outlier regions with very idiosyncratic experiences.[16] When dropping those three cases from the analysis, the coefficients for the falsification exercise are cut by about half, see columns 7 and 8. By contrast, dropping the three observations from our benchmark specification, the estimates are basically unchanged. Either way, the falsification test suggests that our results are not driven by pre-trends.

4 Eastern Europe versus China

Until now, we have considered the joint impact of "the East" (China and Eastern Europe) on German local labor markets. Yet, as we have outlined above in Section 2.4, the structure of German trade with these two trading partners has been quite different, in particular on the import side. Hence, we now investigate in this section if the "rise of China" and the "rise of Eastern Europe" had different impacts in Germany.

4.1 Differential effects on German manufacturing employment

In panel A of Table 3, we estimate the effects of import and export exposure separately for the two areas.[17] For Eastern Europe, the estimated marginal effects increase substantially compared to the baseline estimates from Table 1. Moreover, the two coefficients for import and export exposure are of similar magnitude and statistically not distinguishable – a finding that is well in line with our previous observation that trade between Germany and Eastern Europe is mostly intra-industry. In stark contrast, for China the coefficient for import exposure is small and only marginally significant, and the coefficient for export exposure is very imprecisely estimated.

A problem with these specifications is omitted variable bias since we consider trade exposure just with respect to one area while leaving out the (potentially relevant) exposure to the other. We tackle this issue in column 1 of panel B in Table 3, where we control for the *net* export exposure of Germany with respect to China and Eastern Europe in the same regression.[18] For Eastern Europe, we find a coefficient for net exports

[16] Each of the three regions (Groß-Gerau, Fürth and Ulm) witnessed a strong decline in manufacturing in the 1980s, in each case driven by the decline of one major employer. Groß-Gerau, for example, was the founding place of *Adam Opel AG*, a formerly large German automobile firm that has been taken over by General Motors in 1920. This large plant had to reduce employment sharply during the 1980s, when General Motors imposed its subsidiary not to sell cars outside of Europe any more.

[17] The full results including first-stages and controls are reported in Appendix Tables (A.7) and (A.8).

[18] Recall that the two net exposure measures are virtually uncorrelated. For consistency, we use the net exports of the other countries vis-a-vis Eastern Europe and, respectively, China as instruments.

Table 3: Eastern Europe versus China: Baseline Results

	Dependent variable: 10-year change manufacturing employment / working age pop. in %-points	
	A: Import and export exposure separately	
	(1)	(2)
	Eastern Europe	China
Δ import exposure	-0.973**	-0.149*
	(0.34)	(0.08)
Δ export exposure	0.900***	0.536
	(0.32)	(0.93)

	B: Net exposure, Eastern Europe and China separately			
	(1) Benchmark	(2) 1988-1998	(3) 1998-2008	(4) Final goods only
Δ net exposure Eastern Europe	0.874***	1.005*	1.131*	1.377**
	(0.34)	(0.59)	(0.65)	(0.59)
Δ net exposure China	0.080	-0.268	0.098	0.237
	(0.14)	(0.75)	(0.14)	(0.15)

Notes: N=739 (panel A and panel B column 1), N=326 (panel B column 2), N=413 (panel B column 3). Δ *import exposure* and Δ *export exposure* in panel A comprise only trade with Eastern Europe (column 1) and China (column 2), respectively. Δ *net exposure* in panel B is constructed by subtracting (1) from (2). See online appendix for the categorization of final goods. All regressions include the full set of control variables from the benchmark model of table 1, column 5. Standard errors clustered at the level of 50 aggregate labor market regions in parentheses. Levels of significance: *** 1 %, ** 5 %, * 10 %.

equal to 0.874, which is highly significant and substantially larger than the 0.237 estimated above for the joint "East". For China, on the other hand, the impact of net export exposure is estimated to be basically zero. The message is thus consistent with panel A of Table 3: the global effects of trade exposure with "the East" seem to be mostly driven by Eastern Europe.

One possible concern with this conclusion is that our estimation approach may not be equally well suited to capture the nature of German trade exposure towards the two different areas. Specifically, rising German trade with Eastern Europe could originate in genuinely German developments, rather than by an exogenous rise in productivity and market access of the Eastern European countries. In particular, trade could be mainly driven by a deeper fragmentation of German value chains, which in turn fosters offshoring to Eastern Europe, or by other sources of internal productivity growth in Germany. We proceed in three different ways to address this concern.

Separate time periods. First, in columns 2 and 3 of Table 3-B, we estimate the same model as in column 1 but now separately for the two time periods. We consider this to be an important exercise, because the period 1988–1998 captures the quasi-natural experiment of the sudden fall of the iron curtain, and the subsequent rise of the new market economies in Eastern Europe, much better than the period 1998–2008 does. Vice versa, if rising German trade with Eastern Europe were actually driven by German productivity growth or developments such as offshoring, we would expect this to be mainly relevant during the second time window, but not the first.

As can be seen in columns 2 and 3, our results for the two separate periods are similar as in the pooled model. For Eastern Europe, we estimate a positive and significant impact of net export exposure. Standard errors are a bit larger than in the pooled model, since we now have fewer observations, but the qualitative conclusions are the same. For China, we consistently find no effects in either time period.

Final versus intermediate goods. Second, the alternative story outlined above suggests that German trade with Eastern Europe could be mainly characterized by an export of intermediate goods that are processed abroad, and then returned to Germany for final assembly. To address this concern we use input-output tables to distinguish final from intermediate goods (see the online appendix for details). We then repeat our specification from column 1 of Table 3-B only for net export exposure in final goods, with the instrument adjusted accordingly. Results are shown in column 4.

We find that the results for Eastern Europe continue to hold, and that the marginal effect even gets a bit larger when we only consider final goods exposure. This is consistent with our estimation approach and interpretation of the baseline results, and less consistent with the alternative story about offshoring. Moreover, we still find no significant effects from net exposure with respect to China.

Cars. Third and finally, we address the special role of the automotive sector. As shown in Section 2.4, cars and car parts account for the biggest chunk of German trade with Eastern Europe. Even more importantly, in that sector we would especially expect that rising trade volumes could be driven by value chain fragmentation or productivity gains in Germany, rather than by the rise of Eastern Europe.

To investigate these issues, we re-estimate column 1 of Table 3-B but exclude cars and car parts. Results are reported in column 1 of Appendix Table (A.9). We find that the coefficient for net export exposure of Eastern Europe drops by about 10 %. Not surprisingly the standard error also increases, but the coefficient still remains significant. For China, the coefficient is virtually unchanged. In the further columns of Appendix Table (A.9), we respectively drop other sectors from the analysis. For those cases, results are very similar to the baseline findings. Hence, although cars are undoubtedly very important for Germany, they do not seem to drive all results.

Summing up, the results from this Section suggest that Eastern Europe has affected German labor markets more strongly than China. Moreover, and very importantly, we have provided several pieces of evidence which suggest that our instrumental variable approach seems well applicable to uncover causal effects in this context. Of course, we cannot rule out that some part of the rising trade with Eastern Europe may be due to genuinely German developments, such as productivity growth or unobservable shocks. However, our results suggest that at least a major chunk of the observed trade increase actually stems from the exogenous "rise" of productivity and accessibility of Eastern Europe, as posited by our empirical approach.

4.2 Why Eastern Europe? Why not China?

The question remains *why* the German labor market responds so strongly to the rise of Eastern Europe, and in the same vein, *why* there seem to be almost no displacement effects stemming from the rise of China. The latter conclusion is in stark contrast to *ADH*s findings for the US, and it would be hard to explain this difference solely by the fact that Germany runs a persistent overall trade surplus while the US runs a trade deficit. The German trade balance vis-a-vis China is also negative (see Figure 1), albeit to a smaller extent than the American one, but still the Chinese import exposure did not seem to cause major job losses. In this subsection we aim to provide a possible explanation for the differential impact of Eastern Europe and China in Germany.

Heterogeneous effects across industries. Recall that German local export exposures to Eastern Europe and China are highly correlated (0.835). Consequently, what should be driving the different overall impact of the two areas is the differential composition of the *import* exposures, where the correlation is only 0.328 (see Appendix Table A.4).

As in Section 3, we again aggregate the trade flows of Eastern Europe and China and consider the German net exports to the joint "East". However, we now split up sectors into two groups: the first group consists of those $X = \{10, 20, 30\}$ industries where imports from China, or respectively from Eastern Europe, increased the most between 1988 and 2008. The second group consists of all the other industries. We then repeat the specification from column 1 of Table 2, but now allow the two different groups of industries to have a different impact on manufacturing employment. Column 1 of Table 4 shows the estimation results.[19]

Table 4: Eastern Europe versus China: Heterogeneous effects across industries

	Dependent variable: 10-year change manufacturing employment / working age pop. in %-points		
	(1) Top 10	(2) Top 20	(3) Top 30
	A: Eastern Europe importing industries		
Δ net exposure top Eastern Europe	0.298	0.211*	0.275**
	(0.19)	(0.11)	(0.12)
Δ net exposure all other industries	0.197*	0.295	0.162
	(0.11)	(0.19)	(0.13)
	B: China importing industries		
Δ net exposure top China	0.119	0.147	0.161
	(0.13)	(0.12)	(0.11)
Δ net exposure all other industries	0.422**	0.503**	0.507**
	(0.19)	(0.21)	(0.22)

Notes: N=739. Δ net exposure top Eastern Europe (China), is constructed using only the 10/20/30 industries where imports from Eastern Europe (China) grew the fastest between 1988 and 2008. All regressions include the full set of control variables from the benchmark model of table 1, column 5. Standard errors clustered at the level of 50 aggregate labor market regions in parentheses. Levels of significance: *** 1 %, ** 5 %, * 10 %.

[19] The instruments are constructed accordingly using the different net exports of the other countries.

Comparing these estimates to the "homogenous" industry coefficient of 0.237 from Table 2, we consistently find that the marginal effect of trade exposure is smaller for the top import industries from China than for the average industry. In other words, rising German trade in those labor-intensive sectors does not seem to have displaced many domestic jobs. For the top import industries from Eastern Europe, on the other hand, Table 4 shows that the marginal effect of trade exposure is above the average. That is, there are notable labor market effects from trade exposure in those industries where imports from Eastern Europe grew most rapidly (e.g., iron, steel, or car parts).

Initial trade balance and heterogeneous effects. To understand why this might be the case, it is instructive to consider Germany's initial trade balance in 1988. We consider the $X = 30$ sectors where imports from China grew the most between 1988 and 2008. We then correlate the sectoral changes in Chinese import values with the initial trade balance of Germany (with respect to the entire world) in 1988. This correlation is negative (-0.48) and statistically highly significant ($p < 0.01$). In other words, Germany tended to import goods from such sectors already in 1988 in which China *subsequently* became the world's most dominant supplier; the rise of China then tended to displace the imports from other countries.

Figure 2: German Imports of Textiles, 1998-2008

Consider the textile and apparel industry as an example. Figure 2 shows the evolution of German textile imports from China (1998-2008) and the joint volumes of textile imports from Greece, Italy and Turkey, which were previously the countries with the highest textile sales in the German market. The figure shows the rapid increase in textile imports from China, particularly since 2001, but at the same time an almost parallel reduction of the import volume from the other three countries.

The graph may thus provide at least a partial explanation for the weak labor market effects of Chinese import exposure: Germany imported textiles (and other goods where China developed a strong comparative advantage) already initially, so that domestic production and employment were already small to begin with. The "rise of China" then led to a re-direction of import flows, which supposedly caused job losses in the other countries, but not in Germany.[20]

Importantly, for imports from Eastern Europe we obtain a very different picture. Considering the $X = 30$ sectors in which imports from Eastern Europe grew the most since 1988, we obtain a positive and highly significant correlation of $+0.48$ ($p < 0.01$) with Germany's initial trade balance. In other words, Germany tended to *export* goods in 1988 where the subsequent rise of Eastern Europe was particularly strong. This is then consistent with the pronounced job displacement effects of rising import penetration that we find in panel A of Table 3. Yet, bearing again in mind that most trade with Eastern Europe is intra-industry, those job losses were more than offset by the rising export opportunities in the same sectors for Germany.

We like to stress that we see the evidence presented in this sub-section as mostly suggestive, shedding some light on the differential impact of Eastern Europe and China in the German labor markets. Yet, this tentative evidence may also be helpful to develop an intuition for the stark differences between our results and the findings by *ADH* for the US. In particular, they provide evidence for substantial direct displacement of domestic American workers by Chinese imports. This corresponds well with the observation that rising Chinese imports did not lead to a comparably strong diversion of import flows away from other countries, but fuelled a large aggregate US trade deficit.

5 Other local labor market outcomes

In this section we consider the impact of the rise of the East on other outcome variables across German local labor markets. Specifically, we analyze regional population sizes, median wages, unemployment rates and non-manufacturing employment.

Population shifts. In their analysis, *ADH* emphasize sluggish adjustment of population across local labor markets. In other words, they find no evidence for population shifts in response to rising Chinese import competition in the US.

Returning to our benchmark specification from column 5 of Table 1, we address the impact of rising trade exposure on the change in (log) population sizes across German regions in column 1 of Table 5. Both for export and for import exposure, we obtain only very small effects, and moreover, these coefficients are very imprecisely estimated and statistically not distinguishable from zero.[21] Hence, in line with *ADH*'s results, we also find that the local adjustments to trade shocks do not seem to involve major population shifts across regions. This is also consistent with the consensus view in the literature (see Molloy et al.; 2011) that regional labor mobility is even lower in Germany than

[20] Large imports do not necessarily imply small domestic production of the respective sector, for example if trade is mostly intra-industrial in nature. However, with inter-industry trade such a negative relationship between imports and domestic production is indeed implied by standard trade theory.

[21] Notice that the dependent variable in column 1 is now a log change. The coefficients, thus, indicate that an increase in export (import) exposure by 1000 € would increase (decrease) the regional population size by as little as 0.168 (0.165) per cent. The effects are, thus, very small and noisy.

in the US. The possibility that the rise of the East has caused at least small migratory responses is, however, not decisively rejected by the data since the estimated effects are very noisy. We will revisit this issue in our worker-level analysis in Section 6.

Table 5: Other labor market indicators

	Dependent variables: 10-year change				
	(1) working-age population	(2) median wage	(3) unemployment	(4) non-manufacturing employment	(5) total employment
Δ import exposure	-0.165	-0.016	0.009	-0.131*	-0.320**
	(0.14)	(0.02)	(0.02)	(0.08)	(0.13)
Δ export exposure	0.168	0.108***	-0.096*	0.227*	0.626***
	(0.17)	(0.04)	(0.05)	(0.13)	(0.24)

Notes: N=739. The dependent variables in column 1 is log change in working age population × 100, and in column 2 the log change in the regional median wage × 100. The dependent variables in columns 3–5 are, respectively, the percentage point change in the number unemployed persons/non-manufacturing workers/all workers in the local working age population. All regressions include the full set of control variables from the benchmark model of table 1, column 5. Standard errors clustered at the level of 50 aggregate labor market regions in parentheses. Levels of significance: *** 1 %, ** 5 %, * 10 %.

Wages and unemployment. A detailed analysis how trade integration has affected wages and income inequality in Germany is beyond the scope of this paper. However, column 2 provides a brief look at such price responses. There we address the impact of export and import exposure on the change in (log) median wages across local labor markets. We find that an increase in local export exposure by 1,000€ leads to a small increase of the regional wage level by about 0.1 per cent. Rising import exposure, on the other hand, does not seem to cause regional wage declines.

This corroborates our earlier finding that German labor markets have responded to rising trade exposure mainly at the employment margin, since induced wage responses are small at best. Moreover, there is some evidence for asymmetric effects, which could stem from downward nominal wage rigidity that is often found to be a feature of the German labor market (Dustmann et al. (2009)).

In column 3 we analyze the effects on the number of registered unemployed persons in the regional working-age populations. We obtain two main findings. First, more export-exposed regions experience decreasing unemployment rates, which is consistent with our previous results on net employment gains in those locations. Second, there is again an asymmetry since higher import exposure apparently does not cause higher unemployment rates, despite the wage rigidities discussed before. A possible explanation, apart from labor force exit, is that there are numerous active labor market policies in Germany which target workers who have been laid off or face a substantial risk thereof. These programs may cushion possible adverse import shocks, as workers prone to becoming unemployed are either retained in their original job with reduced hours (*Kurzarbeit*), or they may be quickly transferred into an active labor market measure in which case they are not counted as unemployed.

Non-manufacturing and total employment. In column 4 of Table 5 we show that higher export exposure causes employment gains not only within the manufacturing sector, but also beyond. Specifically, we find a significantly positive effect on regional non-manufacturing employment relative to working age population. Analogously, higher import exposure causes job losses also in non-manufacturing sectors. Such "spillovers" may exist as demand from the manufacturing sector for local services is likely to increase (decrease) in regions with an export-oriented (import-competing) initial industry structure, thus causing employment adjustments also in those industries that are not (or, at least, not so much) directly affected by the rise of the East.

We further disentangle the employment reactions in different non-manufacturing industries in Appendix Table A.10. There we find that these spillover effects are almost exclusively concentrated on business services.[22] For the other service branches, namely the construction sector and personal services, we find no such evidence.

Finally, column 5 reports the impact on total regional employment relative to population. Converting these marginal effects, and using a similar conservative benchmarking as in Section 3.2, the results imply that import penetration from the East has reduced the aggregate German employment rate by about 1.05 percentage points over the period 1988-2008. The rise in export exposure, by contrast, has led to an increase by about 1.91 percentage points. This corresponds to a *net* creation of around 442,000 full-time equivalent jobs that would not be there without the rise of the East, out of which around 69 % are within and 31 % are outside the manufacturing sector.

6 Worker-level evidence

In this final section, we complement our aggregate analysis with an investigation how trade liberalization has affected individual worker biographies. Specifically, we address the impact of rising import and export exposure from "the East" on expected job durations and, thus, on the stability of individual employment relationships.

6.1 Data and estimation approach

We use the Sample of Integrated Labour Market Biographies (SIAB). This data stems from all German social security notifications in the years 1975 to 2008. A two percent random sample has been drawn from all persons who have either been employed or officially registered as job-seekers, resulting in an individual-level spell data set with information on age, sex, nationality, qualification, occupation, spell durations, etc. This data is highly accurate even on a daily base due to its original purpose of calculating retirement pensions, and the previously used establishment-level data (the BHP) can

[22]Upon closer inspection, we find evidence that within the business services, temporary work agencies (*"Zeitarbeit"*) are responsible for a notable part of the overall effect. In this sector, agencies "rent" workers who perform production or management tasks to manufacturing establishments, which can flexibly adjust labor inputs without having to hire workers permanently. Our results suggest that export exposure has complementary effects on regular manufacturing jobs, and on these temporary jobs.

be merged to it. From the data, we identify all working-age individuals (age 22-64) who have been employed in manufacturing at the beginning of 1988 (respectively, 1998), and we then construct our dependent variable as the cumulative days in employment over the subsequent ten-year period.

To quantify how an individual worker is (potentially) affected by the rise of the East over the same period, we now construct the measures of trade exposure at the *industry* level. Specifically, the changes in import and export exposure per worker in a German industry j for $t = \{1988-1998, 1998-2008\}$ are defined as

$$\Delta(\textit{Import exp.})^{EAST}_{jt} = \frac{\Delta Im^{D\leftarrow EAST}_{jt}}{E_{jt}} \quad \text{and} \quad \Delta(\textit{Export exp.})^{EAST}_{jt} = \frac{\Delta Ex^{D\rightarrow EAST}_{jt}}{E_{jt}}$$

where $\Delta Im^{D\leftarrow EAST}_{jt}$ and $\Delta Ex^{D\rightarrow EAST}_{jt}$ are, respectively, the change in the German total import (export) volume from (to) China and Eastern Europe in industry j during the period t (in 1000 € of 2005), and E_{jt} is total national industry employment at the beginning of the period. An overview of the data is provided in Appendix Table A.11.

For identification, we rely on a similar instrumental variable approach as in Autor, Dorn, Hanson and Song (2013). Specifically, for each person, we consider the sector of employment three years prior to the start of the observation period (denoted $j-3$). We then measure the change in trade flows of the "instrument countries" vis-a-vis the East in the respective industry, divided by lagged national industry employment. This tackles possible issues of measurement error and sorting due to anticipation effects:

$$\Delta(\textit{Import exp.}_{Instr.})^{EAST}_{jt} = \frac{\Delta Im^{Other\leftarrow EAST}_{j-3t}}{E_{j-3t-3}} \; , \; \Delta(\textit{Export exp.}_{Instr.})^{EAST}_{jt} = \frac{\Delta Ex^{Other\rightarrow EAST}_{j-3t}}{E_{j-3t-3}}$$

In the regression, we furthermore use region $\times$ time interaction terms, and we include dummies to control whether a worker was employed in the automotive sector or another tradable goods industry. Additionally, we use dummies for standard individual-level control variables, as well as year of birth dummies.

Since import and export exposure only vary across industries, one might worry that they capture industry-level effects that correlate with the change in trade exposure. To mitigate this problem, we also include further industry-level control variables in the regression, more specifically the Herfindahl-Index of establishment sizes, the Ellison and Glaeser (1997) agglomeration-index, the share of plants younger than two years, the average establishment size, the share of highly qualified employees, and the share of employees older than 50. Throughout, we allow our standard errors to be correlated between workers within the same industry and Federal State.

6.2 Results and discussion

The estimation results are reported in Table 6. Column 1 shows that a € 1,000 increase in import exposure per worker reduces the expected employment duration over 10 years by $0.313 \times \frac{365}{100} = 1.14$ days, ceteris paribus. Given that the average worker in manufacturing has faced an increase of import exposure by about €19,280 over the period 1988-2008, this implies an overall decrease by about 28 days. By contrast, the average worker experienced a rise in export exposure by €23,298, which in turn is estimated to raise the expected employment duration by 105 days over 20 years.

In other words, rising import exposure from the East has increased the individual risk of job displacement for incumbent manufacturing workers in Germany. Yet, this is more than offset by a stabilizing effect stemming from the rising export opportunities. This finding complements our previous result that the rise of the East has, in the aggregate, created more manufacturing jobs than it has destroyed.

Table 6: Trade exposure and individual employment biographies

	Dependent variable: 100 x cumulative years of employment over 10 year period			
	2SLS (1) total	2SLS (2) plant	2SLS (3) 3-digit ind.	2SLS (4) region
Δ Imports	-0.313***	-1.105***	-1.032***	-0.658***
per worker$_{t=0}$	(0.10)	(0.22)	(0.22)	(0.17)
Δ Exports	1.236***	2.367***	2.265***	2.188***
per worker$_{t=0}$	(0.25)	(0.78)	(0.67)	(0.41)
Female	-167.714***	-127.654***	-142.822***	-142.767***
	(2.58)	(3.39)	(3.49)	(2.98)
Foreign citizen	-47.396***	-21.437***	-29.092***	-31.238***
	(2.68)	(3.60)	(3.55)	(3.10)
Low Skilled	-28.107***	-13.625***	-19.485***	-9.535***
	(2.05)	(2.94)	(2.85)	(2.52)
High Skilled	35.945***	-35.780***	-14.306**	-36.432***
	(3.25)	(6.37)	(6.07)	(5.37)
Employment in	-13.632	81.063	-44.130	-31.172
automotive sector in $t = 0$	(20.28)	(50.21)	(43.28)	(30.89)
Employment in other tradable	3.072	9.825	-19.337**	4.905
goods industries in $t = 0$	(4.24)	(9.02)	(8.15)	(6.07)
Industry level controls	Yes	Yes	Yes	Yes
1st Stage F-statistic IP	220.177	220.177	220.177	220.177
1st Stage F-statistic EP	38.202	38.202	38.202	38.202

N=177,653. Standard errors clustered by 1,279 industry × Federal State cells, reported in parentheses. Control variables include dummy variables for start of period tenure, plant size, year of birth and Federal State × time period fixed effects. Models (2) – (4) consider cumulative employment only within the original establishment, 3-digit industry, and region, respectively. * p ≤ 0.10, ** p ≤ 0.05, *** p ≤ 0.01.

Our data allow us to dig deeper into these effects. In particular, the rising trade exposure from the East may have led individuals to change jobs across plants, industries, or regions without a notable unemployment spell, and these types of induced job churning remain invisible when we only consider overall employment durations.

Columns 2–4 in Table 6 show the impact of import and export exposure on expected tenure within the original plant, industry and region where the respective worker was initially employed. The results imply that the rising import exposure has causally increased job churning at all levels. In particular, the job duration in the original plant/industry/region was reduced by 78/73/46 days over 20 years for a worker who faced the average increase in import competition. Yet, at the same time, rising export exposure has increased those durations by 201/193/186 days, respectively. The rise of the East has, therefore, stabilized individual work biographies on balance, as it has led to longer expected employment durations at the plant, industry and regional level for the average incumbent manufacturing worker.

In the remainder of this paper, we shed light on three specific questions that arise from these results: 1) how are work biographies of different types of individuals affected by the rise of the East, 2) how to relate our key finding that trade integration has stabilized jobs to recent theories of international trade with heterogeneous firms, and 3) how to square our worker-level findings with our earlier aggregate results, in particular with respect to trade-induced population shifts across regions.

Heterogeneous workers. In Appendix Table A.12 we split our sample of manufacturing workers, and consider how the effects of trade exposure on expected employment durations differ by the workers' education level, age, and gender.

The results suggest that young and old workers (age below/above the median) are affected similarly by the rise of the East. For male and female workers we also find, by and large, homogeneous effects. We do, however, observe notable differences how workers from different skill groups respond to trade shocks. In particular, while the rise of the East has led to an overall employment stabilization for all types of workers, we find that the low- and especially the medium-skilled are more responsive to trade exposure when it comes to job churning across plants and industries.

Medium-skilled workers have completed dual apprenticeship training, and their human capital is therefore relatively sector- and firm-specific. They are, thus, most vulnerable to rising import competition and face a higher individual displacement risk, but we still find that trade exposure has raised job stability also for this group.

Heterogeneous Establishments. In Appendix Table A.13 we investigate how trade exposure has affected workers differently, depending on the characteristics of the plant in which they were initially employed. Panels A and B distinguish individuals who originally worked for small/large plants (with size below/above the industry median within the same Federal State). Analogously, panels C and D distinguish whether the worker's original plant paid a median wage below/above the State-industry median.

We find that import exposure from the East has affected expected employment durations roughly similarly in all sub-samples. This true both for the overall employment duration, as well as for the plant-, industry- and region-specific tenures. In all cases, we find no significant differences in the estimated marginal effects between the different sub-samples of workers originally employed in small or large, or in "productive" (high-wage) or "less productive" (low-wage) establishments.

These empirical findings appear to be somewhat at odds with recent trade theories along the lines of Melitz (2003). From those models, one would expect that workers in small, less productive establishments should be hit harder by import shocks, but this prediction is not supported by our data. This is, however, consistent with recent results by Autor, Dorn, Hanson and Song (2013) who even find that import shocks in the US have affected employment durations in large establishments more severely than in small ones. More generally, a large literature in labor economics (von Wachter and Bender; 2006; Sullivan and von Wachter; 2009) documents that supply shocks seem to cause stronger displacement effects in large establishments.[23]

With respect to export exposure, notice that we do not observe employment expansions or contractions at the establishment level on which the Melitz-model makes sharp predictions, but job durations of incumbent workers. Still, one would expect that the job stabilization effect should be stronger in expanding, exporting plants. Unfortunately, our data do not allow us to observe the plants' productivity or export status. Yet, our results from panel A and B of Appendix Table A.13 suggest that rising export exposure at the industry-level has prolonged job durations mostly in small establishments. For workers of large plants, we find much weaker (sometimes insignificant) effects, particularly when focussing on expected tenure with the original employer (see panels A and B). Although this also goes a bit against the intuition derived from the Melitz-model, it should be noted that the initial size of a plant is only a rough proxy for its productivity. This is especially true in the German context, where many small and medium-sized firms (*"Mittelstand"*) are actually highly active as exporters.[24]

Distinguishing plants according to their initial median wage, as in panels C and D, is arguably a better proxy for their productivity and export status, even though Schank et al. (2007) find only a small wage premium for German exporters and Schmillen (2011) even points out that German exporters to new EU member states often pay no wage premium at all. Still, along those lines, we find that export exposure had a similar job stabilization effect in both sub-samples, and for plant- and industry-specific tenure this job stabilization was even slightly stronger for workers of "productive" establishments. This is better in line with standard theoretical reasoning.

Summing up, our empirical findings are by no means a refutation of recent trade models, but suggest that more work is needed to understand how rising trade exposure affects employment in heterogeneous worker-establishment matches as modeled, for example, in recent work by Helpman et al. (2012).

Trade-induced regional mobility. Finally, our results from column 5 of Table 6 indicate that rising trade exposure also affects the expected employment durations within the original region. In particular, rising export exposure raises region-specific tenure for a worker, while rising import exposure lowers it, and this pattern appears to be quite stable across different types of individuals (see Appendix Tables A.12 and A.13).

[23]Our results, which suggest that large and small plants were affected similarly by import exposure, are thus even closer in spirit to the Melitz-model than those other studies.

[24]In the recent framework by Holmes and Stevens (2012) there is also no monotonous relationship between firm size and export status. In their model, some firms produce standardized products while other firms (within the same industry) produce customized specialty goods, and the former firm type may be larger and more vulnerable to trade shocks than the latter.

How can we convert these coefficients into meaningful economic magnitudes? Consider the second time window (1998–2008). During this ten-year period, the average German manufacturing worker was employed for 7.9 years, and thereof 7.18 years in the original region where he or she was initially employed. This corresponds to an unconditional probability to leave the own region of about 9 per cent. Now, the average import shock from the East during this period was 13,188 €, which in turn implies a reduction of region-specific tenure by 0.087 years, or an increase in the probability to move to another region by 1.1 percentage points. Correspondingly, the average export shock was 17,021 €, which corresponds to a tenure prolongation of 0.372 years and a reduction of the migration probability by 4.7 percentage points. On average, we therefore find that rising trade exposure has *reduced* labor mobility in Germany.[25] This finding is thus consistent with our aggregate-level results from Table 5, which show that the rise of the East has not induced major population shifts across regions.

Still, considering only import exposure, we find negative effects on region-specific tenure for manufacturing workers. Generally speaking, even if there are such adjustments to trade shocks via individual mobility responses, this does in principle not jeopardize the applicability of our empirical approach which treats "regions" as small sub-units of the aggregate economy.[26] Quantitatively, however, we find that the implied magnitudes for such migratory responses are quite small, and moreover, we find little evidence that individual workers move systematically from import-exposed to more export-oriented regions.[27] Overall, we therefore conclude that our worker-level results are well in line with the insights from the aggregate-level analysis which suggested that the rise of the East has led to small population shifts at most.

7 Conclusions

The past decades have seen a strong increase in the volume of international trade. Deregulation and the abolishment of trade barriers as well as drastic reductions in transport costs have led to a steadily increasing integration of national economies. In this paper, we focus on two major facets of globalization: China's explosive ascent and the rise of Eastern Europe after the fall of the iron curtain. Understanding the consequences of those developments for the labor markets in the Western European

[25]Descriptively, we observe a trend of increasing labor mobility in Germany over time. Appendix Table A.11 reports, for example, that overall employment durations have increased from the first to the second time period, while own-region tenure has decreased. Yet, our empirical findings suggest that the rise of the East was not the driving force behind this mobility increase.

[26]The underlying theoretical framework of our empirical approach assumes immobile labor. However, that framework could potentially be generalized to allow for endogenous individual location decisions along the lines of the economic geography literature. Rising international trade exposure would then likely spur reallocations of workers across regions that are differently exposed to an aggregate trade shock, and this would "capitalize" in local wages and land prices in spatial equilibrium. Developing such a theoretical framework is left for future research, however.

[27]To investigate this issue, we have constructed another tenure variable for each worker, namely the employment duration in regions with a greater export exposure than the original region. Using this as the dependent variable, we obtain only small and insignificant coefficients.

market economies is crucial, both from an economic and a political point of view.

We analyze the *causal* impact of the rise of China and Eastern Europe on the performance of local labor markets in Germany during the period 1988 to 2008, using an instrumental variable approach pioneered by Autor, Dorn and Hanson (2013). At the regional level, Germany is characterized by a substantial variation in local industry structures. These initial structures determine how the regions were affected by the rising trade exposure that kicked in since the mid 1990s.

The key message that can be derived from our analysis is that, overall, the rise in trade exposure has led to substantial employment gains in the German economy. But these gains are highly unevenly distributed across space. In fact, some regions have lost jobs as a result of the deeper trade integration, both in the manufacturing sector and beyond. But those losses were, in the aggregate, more than offset by additional jobs created in regions with industrial structures that allowed them to take advantage of the new export opportunities in the East. In our analysis at the individual level we complement this picture and show that trade exposure has, overall, led to more stable employment relationships by reducing the risk of job termination. However, trade again produces winners and losers, since workers in import competing industries indeed faced an increased risk of job churning and lower overall employment spells.

Our results for the German economy differ quite substantially from the findings for the United States. The US economy faced severe adverse effects on local labor markets due to the rapidly increasing Chinese import penetration, but the situation in Germany seems to be quite different. There we observe only negligible job displacement effects, and we provide a possible explanation why this was the case: Because the "rise of China" mainly diverted imports from other countries. Furthermore, our analysis suggests that focusing only on China provides an incomplete picture, at least in the German context. The rise of Eastern Europe had much stronger effects on German local labor markets. It caused substantial job losses, but even stronger job gains in regions that were specialized in the "right" types of industries. Furthermore, we show that the identification approach that was tailored to analyze the causal effects of the "rise of China" also seems applicable in the context of Eastern Europe.

An advantage of our approach is that it allows to analyze the local adjustments to trade exposure along many different margins. Our main focus on manufacturing employment is interesting, because in most industrialized countries there has been a long-run trend of structural change where employment secularly shifted away from the manufacturing sector and towards modern service industries. Our results suggest that trade with the East has per se decelerated this trend, and contributed to retaining the manufacturing sector in the German economy. Our conclusions for Germany may be representative for other developed economies to the extent that they also exhibit a notable specialization in modern, export-oriented manufacturing goods. An important avenue for future research would be to investigate if other countries are more similar to Germany or to the US in the way they adjust to rising trade exposure.

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Supplementary online appendix – not for publication

The Rise of the East and the Far East: German Labor Markets and Trade Integration

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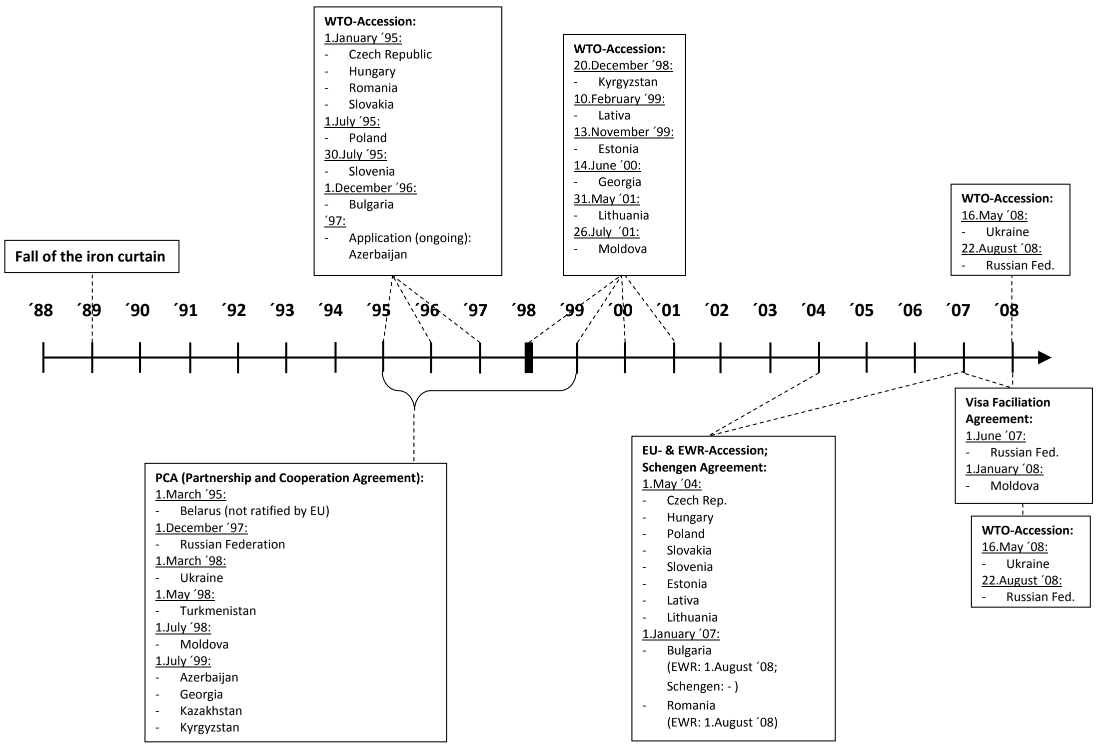
December 2013

A) Some background about trade integration and productivity growth in Eastern Europe

While the different aspects of the "rise of China" are well documented in *ADH*'s work and elsewhere, comparatively less is known about the trade integration and productivity trends in Eastern Europe after the fall of the iron curtain. In this appendix we provide a very brief overview.

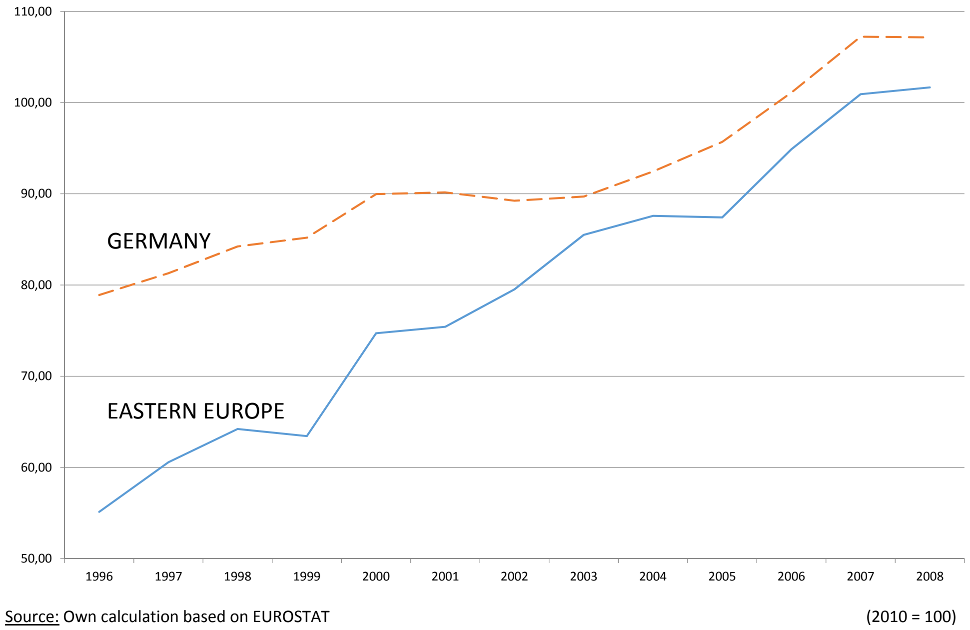
Trade integration. The following time line summarizes the major policy steps towards trade integration of the 21 Eastern European countries considered in our study.



As can be seen, Eastern European trade integration is a continuous and still ongoing process. Still, for many countries relatively close to, and important for Germany, notable events occurred early during the years 1995 and 1996, i.e., in the first ten-year period considered in our empirical analysis. During those years, several countries joined the WTO or signed partnership arrangements. Further countries followed shortly afterwards. The next major step then occurred in 2004, during our second ten-year time period, when several Eastern European countries joined the European Union (Bulgaria and Romania followed in 2007).

A quantitative measure for the magnitude of trade barriers between Germany and Eastern Europe is difficult to obtain, but the time line strongly suggests that such barriers have been falling significantly during the observation period of our study, form almost infinitely high levels prior to 1989.

Productivity growth. We also briefly document the trend of Eastern European productivity growth during the observation period. The following figure depicts average labor productivity (total output over hours worked in manufacturing) across the 21 Eastern European countries (2010=100). Data stem from national accounts data as compiled by EUROSTAT and refer to the time period 1995–2008, as data coverage is insufficient for the earlier years. For comparison, the figure also includes the German productivity trend (2010=100) over the same period.



The figure clearly shows a differential trend of stronger productivity growth in Eastern Europe relative to Germany, and thus a catching-up of "the East" relative to "the West" over these years. This conclusion is also supported in the study by Burda and Severgnini (2009), who consider various methods to deal with severe measurement error present in the output and productivity data of the transition economies in Central and Eastern Europe. They find high and increasing rates of TFP growth in those economies over the period 1994-2009, outpacing the corresponding trends in "old Europe" (including Germany).

Summing up, the "rise of Eastern Europe" seems to have many similar features as the "rise of China", especially during the first decade after the fall of the iron curtain: Relatively strong productivity growth and gains in accessibility stemming from a massive reduction in trade barriers vis-a-vis Western Europe and Germany, in particular.

B) Trade exposure on third markets

In columns 1 and 2 of Table 2 we first consider the standard local measure of net export exposure that is obtained by subtracting eq. (1) from eq.(2):

$$\begin{aligned} \Delta(\textit{Net export exp.})_{it}^{EAST} &= \Delta(\textit{Export exp.})_{it}^{EAST} - \Delta(\textit{Import exp.})_{it}^{EAST} \\ &= \sum_j \frac{E_{ijt}}{E_{jt}} \frac{\Delta Ex_{jt}^{D\rightarrow EAST} - \Delta Im_{jt}^{D\leftarrow EAST}}{E_{it}}, \end{aligned} \tag{A.1}$$

where $\Delta Ex_{jt}^{D\rightarrow EAST}$ and $\Delta Im_{jt}^{D\leftarrow EAST}$ are the changes in aggregate German exports/ imports to/from "the East" in industry j between t and $t+1$. In column 1 of Table 2 we correspondingly use the net exports of Australia, Canada, Japan, Norway, New Zealand, Sweden, Singapore, and the United Kingdom vis-a-vis "the East" (China and Eastern Europe) as an instrument for (A.1).

The import exposure part of this measure is "domestic" in the sense that it measures how German producers from region i are displaced by the rise of the East across their domestic (German) markets. As an alternative to eq.(1), we now consider an extended measure of import exposure along the lines of what *ADH* do in their Table 10, Panel B. Specifically, we take into account that German producers are also displaced in other markets, namely in foreign third-countries, and compute

$$\Delta(\textit{Import exp.})_{it}^{EAST,O} = \sum_j \frac{E_{ijt}}{E_{jt}} \frac{\Delta Im_{jt}^{D\leftarrow EAST} + \sum_O \frac{X_{jt}^{D\rightarrow O}}{X_{jt}^{D\rightarrow world}} \Delta Im_{jt}^{O\leftarrow EAST}}{E_{it}} \tag{A.2}$$

In contrast to (1), this measure includes the change in imports of other countries, denoted as O, from the East and weights the importance of the different other countries by their share in total German exports in the respective industry. As "other countries" we use all Western European EU members.

We then compute *net export exposure* analogously as in (A.1) by subtracting (A.2) from (2): $\Delta(\textit{Net export exp.})_{it}^{EAST,O} = \Delta(\textit{Export exp.})_{it}^{EAST} - \Delta(\textit{Import exp.})_{it}^{EAST,O}$. That is, we use the same measure for local export exposure as before but exchange the measure for import exposure. The instrument for this new measure $\Delta(\textit{Net export exp.})_{it}^{EAST,O}$ is constructed analogously, by using the trade flows of the "instrument countries" to/from the East and the other Western European EU members. Column 3 of Table 2 then reports the 2SLS coefficient for the impact of this novel measure on manufacturing employment relative to working-age population across German regions.

As a further robustness check, we have also considered an extended measure for local *export* exposure. Specifically, analogously to (A.2), we compute:

$$\Delta(\textit{Export exp.})_{it}^{EAST,O} = \sum_j \frac{E_{ijt}}{E_{jt}} \frac{\Delta Ex_{jt}^{D\rightarrow EAST} + \sum_O \frac{M_{jt}^{D\leftarrow O}}{M_{jt}^{D\leftarrow world}} \Delta Ex_{jt}^{O\rightarrow EAST}}{E_{it}} \tag{A.3}$$

This measure captures the idea that the rise of the Eastern markets also diverts export flows of the other Western EU countries towards "the East", which in turn leads to tougher competition for German exporters there. The local measure for *net export exposure* is then calculated by now subtracting (A.2) from (A.3), with the instrument adjusted accordingly.

Using that measure it turns out, however, that the estimation results are virtually identical to those in column 3 of Table 2. In particular, we estimate a marginal effect on manufacturing employment that is still equal to 0.205, and remains highly significant. In other words, third-market effects seem to play a more important role for local import exposure than for local export exposure.

C) The identification approach based on gravity residuals

In this appendix, we describe the alternative identification approach that is based on a gravity approach to international trade. Consider a standard gravity equation as in the seminal paper by Anderson and van Wincoop (2003):

$$X_{ik}^{j} = \frac{y_i^j y_k^j}{Y_W^j} \cdot \left(\frac{\tau_{ik}}{P_i^j P_k^j} \right)^{1-\sigma} \tag{A.4}$$

Here, X_{ik}^{j} is the total export flow from country i to country k in industry j (time subscripts are omitted for now). World expenditure on the goods from that industry is denoted as Y_W^j, and country i's expenditure level is y_i^j. The variable P_i^j denotes the standard CES price index in i for j, σ is the elasticity of substitution, and τ_{ik}^{j} are iceberg trade costs between countries i and k.

We use this gravity equation to express total (log) exports from "the East" ($i = E$) to some destination country k, and analogously, from Germany ($i = D$) to k as follows:

$$\log X_{Ek}^{j} = \log \left[\frac{1}{Y_W^j} \cdot \frac{y_k^j}{(P_k^j)^{1-\sigma}} \right] + \log \left[\frac{y_E^j}{(P_E^j)^{1-\sigma}} \right] - (\sigma - 1) \log \tau_{Ek}^{j}$$
$$\log X_{Dk}^{j} = \log \left[\frac{1}{Y_W^j} \cdot \frac{y_k^j}{(P_k^j)^{1-\sigma}} \right] + \log \left[\frac{y_D^j}{(P_D^j)^{1-\sigma}} \right] - (\sigma - 1) \log \tau_{Dk}^{j}$$

Hence, East relative to German exports to country k can be written as

$$\log X_{Ek}^{j} - \log X_{Dk}^{j} = \left(\log z_E^j - \log z_D^j \right) - (\sigma - 1) \left[\log \tau_{Ek}^{j} - \log \tau_{Dk}^{j} \right], \tag{A.5}$$

where $z_i^j = y_i^j / (P_i^j)^{1-\sigma}$. The term $(\log z_E^j - \log z_D^j)$ thus captures the East's comparative advantage in industry j (relative to Germany), which includes relative productivity, domestic expenditure, toughness of competition (measured by P_i^j), and so on. The term $(\log \tau_{Ek}^{j} - \log \tau_{Dk}^{j})$ captures relative accessibility of market k from the East and Germany, respectively.

To implement the gravity approach, we estimate the following specification:

$$\log X^j_{Ekt} - \log X^j_{Dkt} = \alpha_j + \alpha_k + \epsilon_{jkt} \tag{A.6}$$

That is, we regress East relative to German sectoral exports to various high-income countries k, pooled over the period 1988-2008, on industry and destination market fixed effects. We recover the residual from this regression. Using (A.5), this residual has the following interpretation:

$$\epsilon_{jkt} = \left[\log\left(\frac{z^j_{Et}}{z^j_{Dt}}\right) - \alpha_j\right] + \left[-(\sigma-1)\log\left(\frac{\tau^j_{Ekt}}{\tau^j_{Dkt}}\right) - \alpha_k\right]. \tag{A.7}$$

It thus captures East's productivity and trade cost advantage vis-a-vis Germany in industry j and destination market k in year t. Taking the difference between time period t and $t-1$ then gives the East's increase in relative competitiveness vis-a-vis Germany in market k as follows:

$$\Delta\epsilon_{jkt} = \epsilon_{jkt} - \epsilon_{jk(t-1)} = \log\left(\frac{z^j_{Et}/z^j_{Dt}}{z^j_{E(t-1)}/z^j_{D(t-1)}}\right) - (\sigma-1)\log\left(\frac{\tau^j_{Ekt}/\tau^j_{Dkt}}{\tau^j_{Ek(t-1)}/\tau^j_{Dk(t-1)}}\right),$$

and taking the average over the N_k different markets k yields

$$\Delta\bar{\epsilon}_{jt} = \log\left(\frac{z^j_{Et}}{z^j_{E(t-1)}} \cdot \frac{z^j_{D(t-1)}}{z^j_{Dt}}\right) - \frac{(\sigma-1)}{N_k}\sum_k \log\left(\frac{\tau^j_{Ekt}}{\tau^j_{Ek(t-1)}} \cdot \frac{\tau^j_{Dk(t-1)}}{\tau^j_{Dkt}}\right) \tag{A.8}$$

The term $\Delta\bar{\epsilon}_{jt}$ can be interpreted as the average increase in East's competitiveness relative to Germany, as recovered from relative export flows to various high-income third markets. Exponentiating this term,

$$\widetilde{\Delta\bar{\epsilon}}_{jt} = \exp^{\Delta\bar{\epsilon}_{jt}} = \frac{\left(\frac{z^j_{Et}/z^j_{Dt}}{z^j_{E(t-1)}/z^j_{D(t-1)}}\right)}{\Pi^{N_k}_{k=1}\left(\frac{\tau^j_{Ekt}/\tau^j_{Dkt}}{\tau^j_{Ek(t-1)}/\tau^j_{Dk(t-1)}}\right)^{\frac{\sigma-1}{N_k}}}$$

we can introduce a different measure for regional import exposure in Germany, using this implied gain in relative competitiveness computed from gravity residuals:

$$\Delta IPW^{grav}_{it} = \sum_j \frac{E_{ij(t-1)}}{E_{j(t-1)}} \cdot \frac{\widetilde{\Delta\bar{\epsilon}_{jt}} \cdot M^j_{t-1}}{E_{i(t-1)}}, \tag{A.9}$$

That is, instead of the actual (observed) changes in sectoral imports from the East as in eq. (1) in the main text, we use a hypothetical increase in imports, constructed from the initial import *level* (M^j_{t-1}) multiplied by the implied increase in relative competitiveness of the East on other markets.

Gravity measure for export exposure One of the contributions of our approach is to consider exports to the East. Our argument is that, due to the rise of that area, German producers are not only displaced in their home markets and in other foreign markets. Germany can also export to the East, because rising income there also implies higher demand for German products. This aspect – the rise of new markets for German exporters – is missing in the gravity exposure measure A.8, because export flows from Germany to the East are neglected there.

To tackle this issue, we develop an analogous gravity measure for local export exposure in Germany. This new measure captures the differential rise of the attractiveness of the East as a destination market for Germany, relative to other possible destinations to which Germany may export. Starting from the same gravity equation as above, we can write

$$\log X^j_{DE} = \log\left[\frac{1}{Y^j_W}\cdot\frac{y^j_D}{(P^j_D)^{1-\sigma}}\right] + \log\left[\frac{y^j_E}{(P^j_E)^{1-\sigma}}\right] - (\sigma-1)\log\tau^j_{DE}$$
$$\log X^j_{Dk} = \log\left[\frac{1}{Y^j_W}\cdot\frac{y^j_D}{(P^j_D)^{1-\sigma}}\right] + \log\left[\frac{y^j_k}{(P^j_k)^{1-\sigma}}\right] - (\sigma-1)\log\tau^j_{Dk}$$

Hence, German industry j exports to the East relative to some other country k are

$$\log X^j_{DE} - \log X^j_{Dk} = \left(\log z^j_E - \log z^j_k\right) - (\sigma-1)\left[\log\tau^j_{DE} - \log\tau^j_{Dk}\right], \quad \text{(A.10)}$$

Estimating a similar gravity equation as before, where relative German (log) exports to the East and to other countries k are regressed on fixed effects for industry j (denoted α^μ_j) and destination market k (denoted α^μ_k), the residual now has the following interpretation:

$$\mu_{jkt} = \left[\log\left(\frac{z^j_{Et}}{z^j_{kt}}\right) - \alpha^\mu_j\right] + \left[-(\sigma-1)\log\left(\frac{\tau^j_{DEt}}{\tau^j_{Dkt}}\right) - \alpha^\mu_k\right] \quad \text{(A.11)}$$

Again taking the difference of μ_{jkt} over a ten-year period, and then taking the average across the k different other countries, we have

$$\Delta\overline{\mu_{jt}} = \frac{1}{N_k}\left(\sum_k \log\left(\frac{z^j_{Et}}{z^j_{E(t-1)}}\cdot\frac{z^j_{k(t-1)}}{z^j_{kt}}\right)\right) - \frac{(\sigma-1)}{N_k}\left(\sum_k \log\left(\frac{\tau^j_{DEt}}{\tau^j_{DE(t-1)}}\cdot\frac{\tau^j_{Dk(t-1)}}{\tau^j_{Dkt}}\right)\right) \quad \text{(A.12)}$$

The measure A.12 thus captures the increase of the East's attractiveness from a German perspective, relative to the "average other country". This gain in attractiveness can be driven either by a differential increase in income/expenditure, or by a relatively strong decline in trade costs from Germany to the East. Exponentiating, $\widetilde{\Delta\overline{\mu_{jt}}} = \exp^{\Delta\bar{\mu_{jt}}}$, and multiplying it with the initial level of German exports , we hence obtain a gravity-based measure for local export exposure:

$$\Delta EPW_{it}^{grav} = \sum_j \frac{E_{ij(t-1)}}{E_{j(t-1)}} \cdot \frac{\widetilde{\Delta\overline{\mu}_{jt}} \cdot X_{t-1}^j}{E_{i(t-1)}}, \tag{A.13}$$

as opposed to the raw measure of export exposure from eq. (2) in the main text that uses the observed increases in German exports.

Implementing a gravity-based measure for net export exposure Using (A.9) and (A.13), we derive the following theory-based gravity measure for net export exposure:

$$\Delta NET_{it}^{grav} = \sum_j \frac{E_{ij(t-1)}}{E_{j(t-1)}E_{i(t-1)}} \cdot X_{t-1}^j \cdot \underbrace{\left(\widetilde{\Delta\overline{\mu}}_{jt} - \widetilde{\Delta\overline{\epsilon}}_{jt} \cdot \underbrace{\frac{M_{t-1}^j}{X_{t-1}^j}}_{\equiv \rho_{t-1}^j} \right)}_{=\Delta \Xi_{jt}^{grav}} \tag{A.14}$$

In (A.14), ρ_0^j indicates whether Germany was a net exporter ($\rho_{t-1}^j < 1$) or a net importer ($\rho_{t-1}^j > 1$) of good j in the initial period. Using (A.8) and (A.12), the industry-specific term in parentheses can be expressed in the following way:

$$\begin{aligned} \Delta \Xi_{jt}^{grav} \;=\; & (1-\rho_{t-1}^j)\log\left[\frac{z_{Et}^j}{z_{E(t-1)}^j}\right] + \rho_{t-1}^j \log\left[\frac{z_{Dt}^j}{z_{D(t-1)}^j}\right] - \frac{1}{N_k}\sum_k \log\left[\frac{z_{kt}^j}{z_{k(t-1)}^j}\right] \\ & -(\sigma-1)\log\left[\frac{\tau_{DEt}^j}{\tau_{DE(t-1)}^j}\right] + \rho_{t-1}^j \frac{(\sigma-1)}{N_k}\sum_k \log\left[\frac{\tau_{Ekt}^j}{\tau_{Ek(t-1)}^j}\right] \\ & -(1-\rho_{t-1}^j)\frac{(\sigma-1)}{N_k}\sum_k \log\left[\frac{\tau_{Dkt}^j}{\tau_{Dk(t-1)}^j}\right] \end{aligned} \tag{A.15}$$

This expression in (A.15) neatly shows how different exogenous changes affect German net exports of industry j-goods in general equilibrium. First, and most importantly, an improvement of East's competitiveness in industry j ($z_{Et}^j/z_{E(t-1)}^j > 1$) raises net German exports, ceteris paribus, only if $\rho_{t-1}^j < 1$, i.e., if Germany was a net exporter of this good. Otherwise, if $\rho_{t-1}^j > 1$, the improvement of the East lowers net German exports. This highlights the double-edged effect of the "rise of the East" on German trade: Import exposure rises as Eastern firms become more competitive, while exports exposure rises as consumers in the East become richer and demand more German goods. Which effect dominates is ambiguous, a priori. Moreover, decreasing access costs from Germany to the East ($\tau_{DEt}^j/\tau_{DE(t-1)}^j < 1$) clearly improve German net exports, while an improvement of the East's access to other countries hurts German net exports, but less so the higher is the net export level (the smaller is ρ_{t-1}^j).

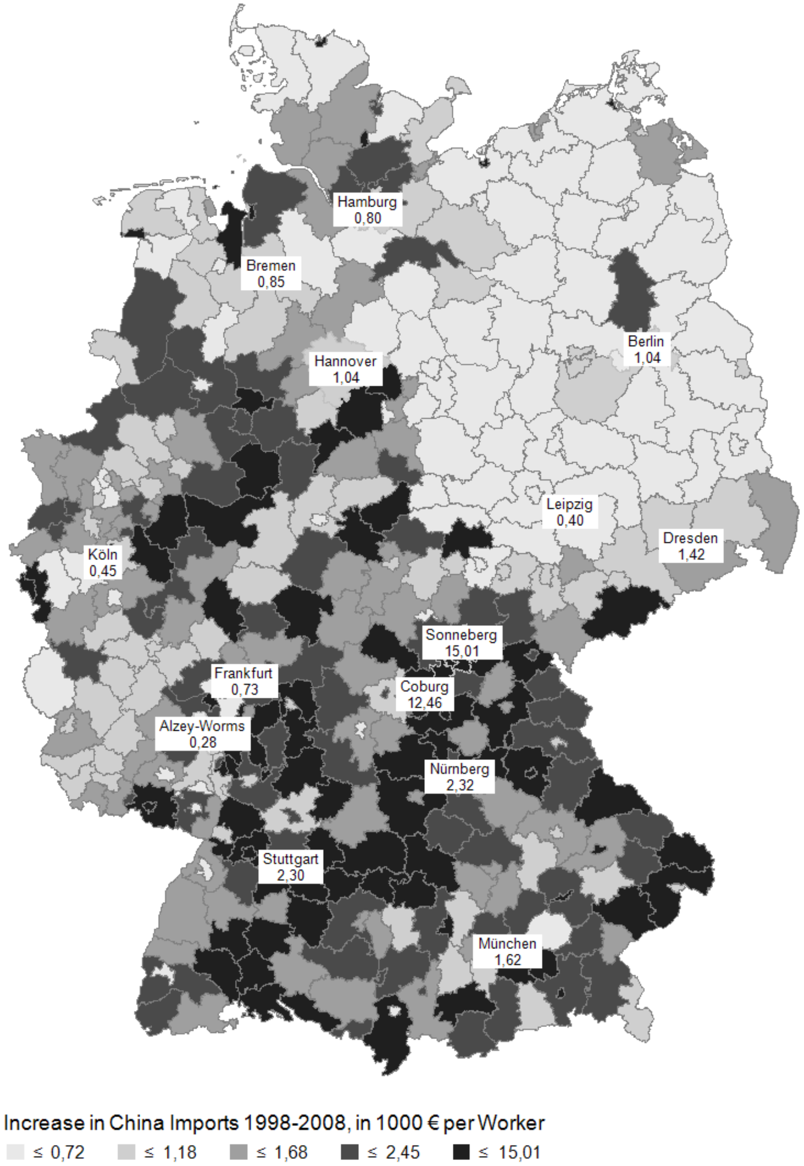
In subsection (3.2), we then perform an OLS estimation using this gravity-based measure for local trade exposure from (A.15), see column 4 of Table 2 . As destination markets k we again use the Western European EU members, but results hardly change if we additionally add the US and the "instrument countries" to that list. Notice that we can estimate eq.(3) by OLS, since the gravity approach by construction identifies the rise of East's competitiveness and accessibility, and sterilizes the impacts of possible confounding shocks.

D) Final versus intermediate goods

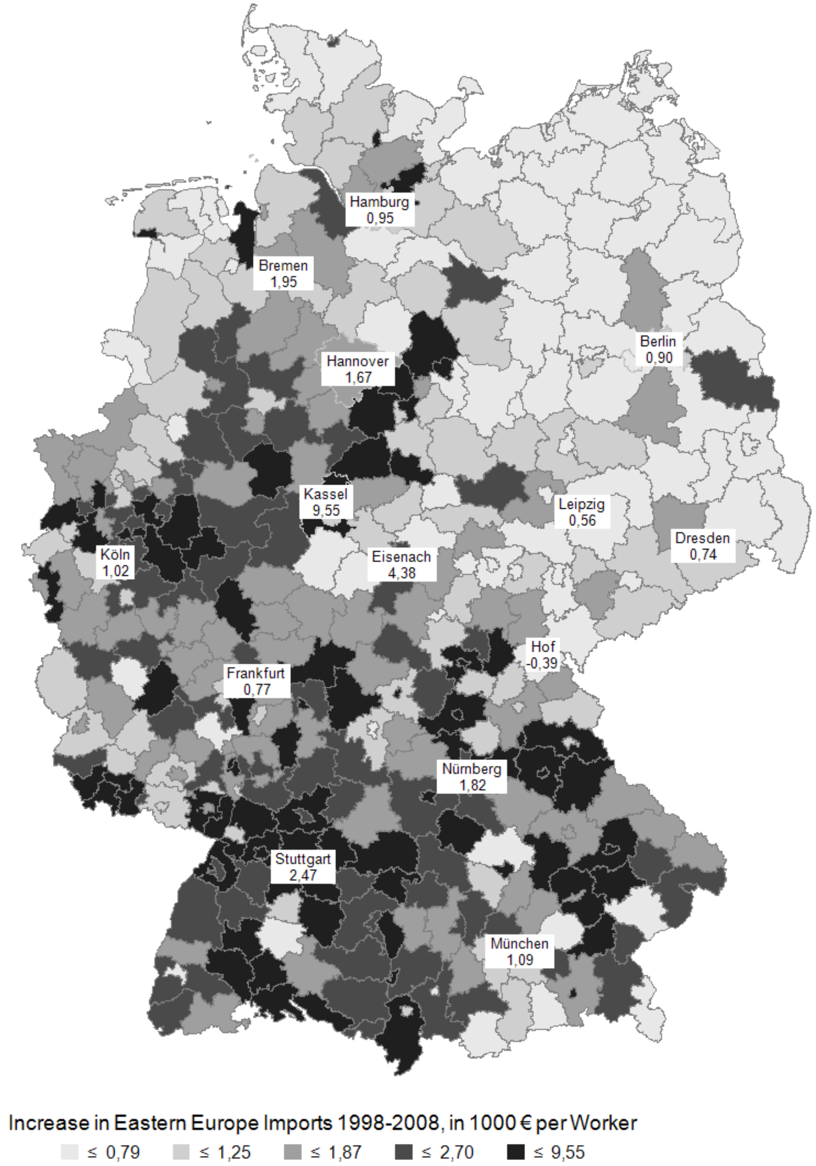
In Section 4 we distinguish final and intermediate goods, see column 4 of Table 3-B. To distinguish between these two goods categories, we adopt a similar approach as *ADH*, see their Table 10, panel C. We use the 1998 input-output table provided by the German Federal Statistical Office. At the level of 72 products that can be matched to our industry classification, this table provides information on use of a good's production or imports. We use the information on the shares of World imports that are used for consumption or investment rather than as an input by any industry. We multiply these shares with the German imports from Eastern Europe or China. This gives us a measure on the share of each sector's imports in final goods.

We then follow an analogous approach to separate exports of intermediate versus final goods, but now use only information on domestic production that is not exported. This distinction should work reasonably well if two assumptions hold: first, the shares of inputs and final goods in imports from Eastern Europe and China should be similar to the corresponding shares in total imports. Second, German goods should be similarly divided into final and intermediate goods in Eastern Europe and China as they are in domestic production and consumption.

That information then allows us to net total trade from intermediate goods in order to arrive at a measure for final goods trade exposure.

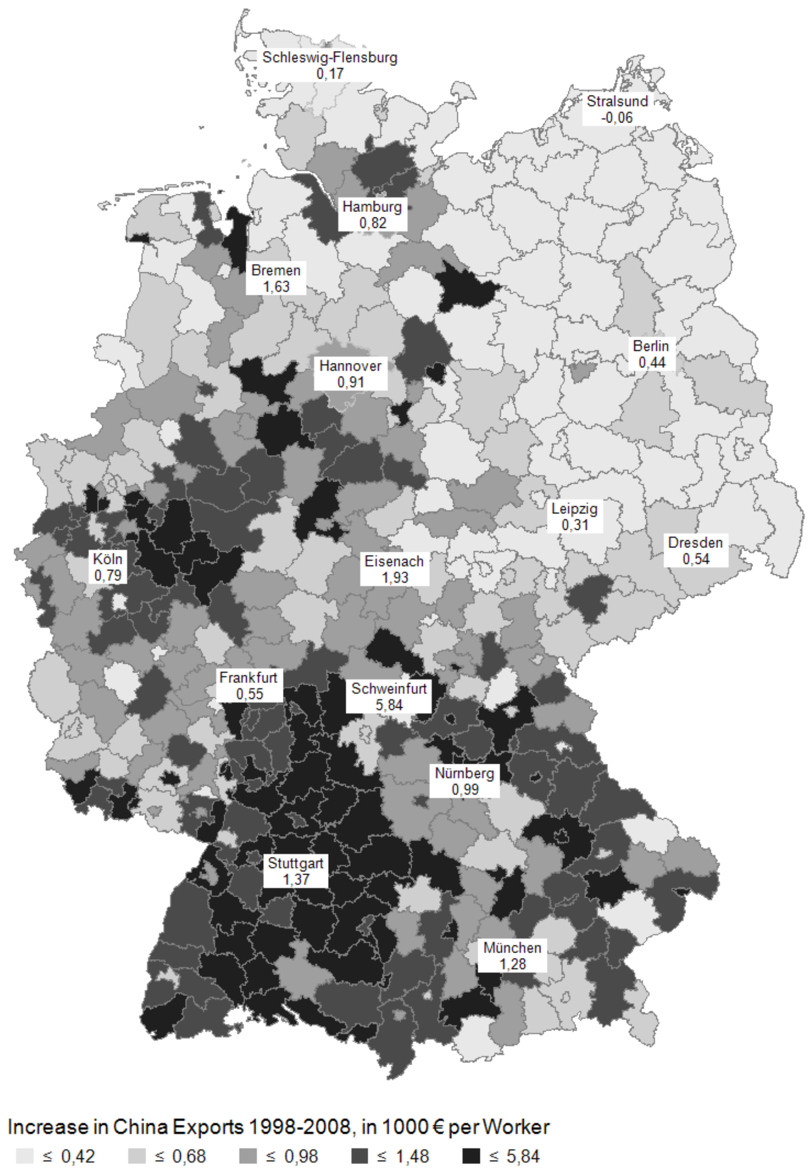


(a) China

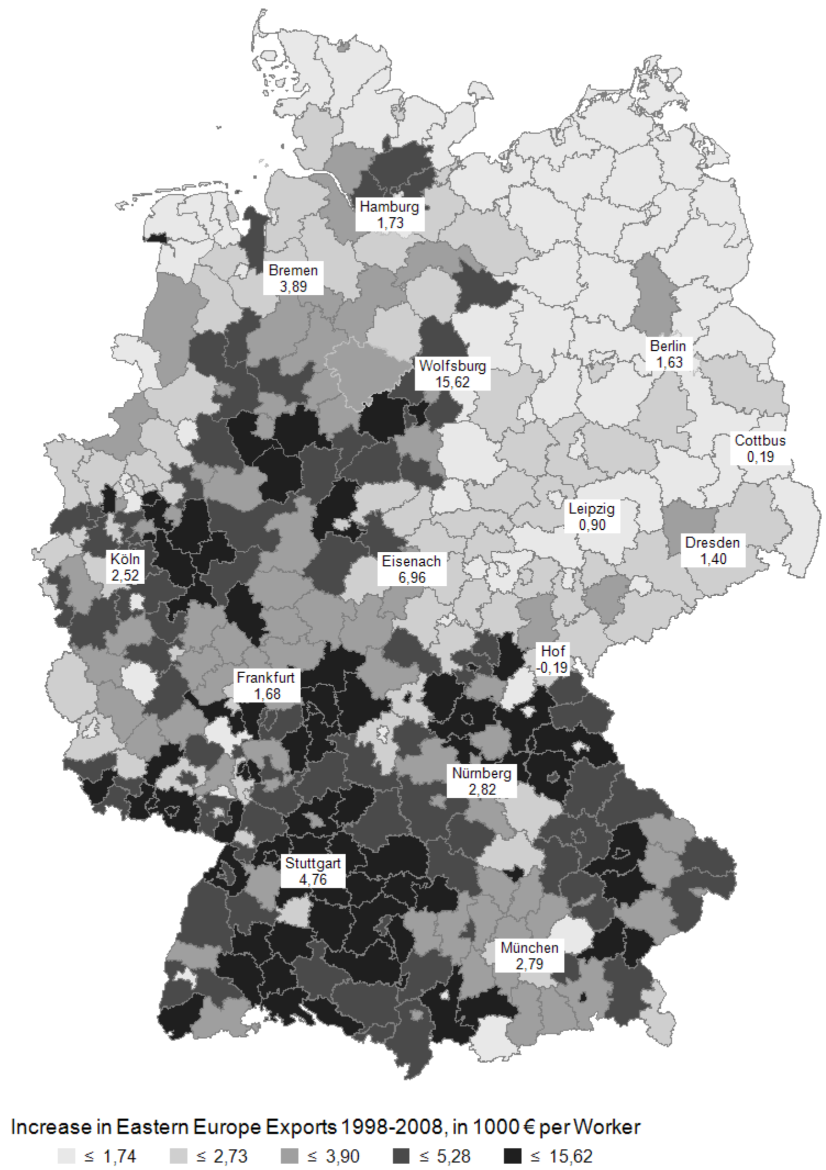


(b) Eastern Europe

Figure A.1: Change in import exposure 1998-2008



(a) China



(b) Eastern Europe

Figure A.2: Change in export exposure 1998-2008

Appendix Tables

Table A.1: Trade volumes with Eastern Europe, top-5 manufacturing sectors

	Industry	2008	1998	1988
Imports from Eastern Europe				
341	Manuf. of motor vehicles	7100	4440	76
343	Manuf. of parts and accessories for motor vehicles and their engines	6830	1610	11
274	Manuf. of basic precious and non-ferrous metals	4280	1940	992
271	Manuf. of basic iron and steel and of ferro-alloys (ECSC1)	3510	949	402
316	Manuf. of electrical equipment n.e.c.	3350	1260	26
Exports to Eastern Europe				
341	Manuf. of motor vehicles	13300	3970	248
343	Manuf. of parts and accessories for motor vehicles and their engines	9180	2610	92
295	Manuf. of other special purpose machinery	7830	3400	1250
291	Manuf. of machinery for the production and use of mechanical power, except aircraft, vehicle and cycle engines	5390	1500	413
252	Manuf. of plastic products	5280	2090	577

Industry level trade volumes measured in Million Euros of 2005. Sorted by trade volume in 2008.

Table A.2: Trade volumes with China, top-5 manufacturing sectors

	Industry	2008	1998	1988
Imports from China				
300	Manuf. of office machinery and computers	8630	1160	12
182	Manuf. of other wearing apparel and accessories	4950	1900	704
365	Manuf. of games and toys	3280	658	46
323	Manuf. of television and radio receivers, sound or video recording or reproducing apparatus and associated goods	2930	700	171
321	Manuf. of electronic valves and tubes and other electronic components	2920	123	2
Exports to China				
341	Manuf. of motor vehicles	3530	238	209
295	Manuf. of other special purpose machinery	3220	1050	590
291	Manuf. of machinery for the production and use of mechanical power, except aircraft, vehicle and cycle engines	2740	248	108
294	Manuf. of machine-tools	1900	376	306
343	Manuf. of parts and accessories for motor vehicles and their engines	1640	114	31

Industry level trade volumes measured in Million Euros of 2005. Sorted by trade volume in 2008.

Table A.3: Descriptive statistics of the main variables at the regional level

	1988-1998		1998-2008	
	Dependent Variable			
Δ manuf. employment / working age pop.	-2.507	(2.707)	-0.150	(2.213)
	Trade exposure			
Δ imports per worker$_{t=0}$				
China	0.592	(0.522)	1.903	(1.885)
Eastern Europe	1.804	(1.001)	1.848	(1.299)
Both	2.396	(1.322)	3.751	(2.649)
Δ exports per worker$_{t=0}$				
China	0.134	(0.110)	1.037	(0.816)
Eastern Europe	2.174	(1.009)	3.714	(2.269)
Both	2.308	(1.055)	4.752	(3.003)

Notes: Mean values and standard deviations (in parentheses). Dependent variable in %-points.

Trade exposure variables constructed according to equations 1 and 2 in 1000 Euros of 2005 per worker.

Table A.4: Correlations of regional import and export exposure measures for China and Eastern Europe trade

		China		Eastern Europe	
		import exp.	export exp.	import exp.	import exp.
China	import exp.	1			
China	export exp.	0.3945	1		
Eastern Europe	import exp.	0.3281	0.5032	1	
Eastern Europe	export exp.	0.4559	0.8354	0.7490	1

Notes: Correlation coefficients.

Table A.5: Robustness Checks – Regional classification and instrument group

	Dependent variable: 10-year change manufacturing employment / working age pop. in %-points			
Panel A: Change in Regional Aggregation				
	Drop East Germany		Labor Market Regions	
	(1)	(2)	(3)	(4)
Δ import exposure	-0.255***	-0.229***	-0.234***	-0.212***
	(0.08)	(0.07)	(0.08)	(0.08)
Δ export exposure	0.428**	0.418**	0.367***	0.380***
	(0.21)	(0.21)	(0.12)	(0.11)
Region × time	Yes	–	Yes	–
State × time	–	Yes	–	Yes
First stage results, dependent variable: Δ import exposure				
Δ import exposure	0.236***	0.238***	0.284***	0.291***
(other countries)	(0.06)	(0.06)	(0.05)	(0.05)
Δ export exposure	0.115***	0.115***	0.121*	0.128*
(other countries)	(0.04)	(0.04)	(0.07)	(0.07)
R-squared	0.759	0.767	0.846	0.857
F-test of excluded instruments	16.057	15.166	20.047	18.746
First stage results, dependent variable: Δ export exposure				
Δ import exposure	0.003	0.004	0.020	0.025
(other countries)	(0.02)	(0.02)	(0.02)	(0.02)
Δ export exposure	0.403***	0.401***	0.352***	0.348***
(other countries)	(0.07)	(0.07)	(0.07)	(0.07)
R-squared	0.822	0.827	0.880	0.887
F-test of excluded instruments	21.410	21.280	14.864	14.087

Panel B: Change in Instrument Group	Over-identified	Leave out UK	Add USA	Add DK, NL, BE, LU, FR, CH, AT
	(5)	(6)	(7)	(8)
Δ import exposure	-0.142***	-0.191***	-0.200**	-0.173**
	(0.05)	(0.07)	(0.08)	(0.07)
Δ export exposure	0.406**	0.397*	0.366*	0.328*
	(0.16)	(0.22)	(0.22)	(0.17)
First stage results, dependent variable: Δ import exposure				
Δ import exposure		0.301***	0.096***	0.163***
(other countries)		(0.08)	(0.03)	(0.04)
Δ export exposure		0.108***	0.092***	0.050*
(other countries)		(0.03)	(0.03)	(0.03)
R-squared	0.789	0.749	0.721	0.759
F-test of excluded instruments	53.412	20.025	9.807	9.447
First stage results, dependent variable: Δ export exposure				
Δ import exposure		-0.002	-0.000	-0.016
(other countries)		(0.02)	(0.01)	(0.01)
Δ export exposure		0.393***	0.282***	0.325***
(other countries)		(0.08)	(0.05)	(0.03)
R-squared	0.899	0.812	0.812	0.854
F-test of excluded instruments	123.259	16.984	19.193	48.867

Notes: N=652 (column 1 and 2), N=259 (column 3 and 4), and N=739 (columns 5–8). In panel B, the instruments are adjusted to entail the reported countries. All regressions include the full set of control variables from the benchmark model of table 1, column 5. Standard errors clustered at the level of 50 aggregate labor market regions in parentheses. Levels of significance: *** 1 %, ** 5 %, * 10 %.

Table A.6: Robustness check: Federal State Dummies

	Dependent variable: 10-year change manufacturing employment / working age pop. in %-points			
	(1)	(2)	(3)	(4)
Δ import exposure	-0.158**	-0.160**	-0.190***	-0.180***
	(0.07)	(0.06)	(0.07)	(0.07)
Δ export exposure	0.425**	0.426**	0.399*	0.394*
	(0.21)	(0.20)	(0.21)	(0.21)
% manuf. of other tradable goods	-0.073***	-0.078***	-0.068***	-0.073***
	(0.02)	(0.02)	(0.02)	(0.02)
% manuf. of cars	-0.081**	-0.083**	-0.074**	-0.076**
	(0.03)	(0.03)	(0.03)	(0.03)
% high skilled	-0.042	-0.065	-0.039	-0.065
	(0.04)	(0.04)	(0.04)	(0.05)
% foreigners	-0.159***	-0.161***	-0.162***	-0.167***
	(0.04)	(0.04)	(0.04)	(0.04)
% women	-0.061***	-0.060***	-0.060***	-0.058***
	(0.01)	(0.01)	(0.01)	(0.01)
% routine occupations	-0.021	-0.029	-0.014	-0.023
	(0.03)	(0.03)	(0.03)	(0.03)
Time dummy	Yes	Yes	–	–
Region dummies	Region	State	–	–
Interactions	–	–	Region × t	State × t
First stage results, dependent variable: Δ import exposure				
Δ import exposure	0.281***	0.281***	0.252***	0.253***
(other countries)	(0.06)	(0.06)	(0.06)	(0.06)
Δ export exposure	0.153***	0.154***	0.105***	0.105***
(other countries)	(0.03)	(0.03)	(0.03)	(0.03)
R-squared	0.822	0.824	0.763	0.772
F-test of excluded instruments	47.499	47.059	16.361	15.358
First stage results, dependent variable: Δ export exposure				
Δ import exposure	0.043*	0.043*	0.002	0.003
(other countries)	(0.02)	(0.02)	(0.01)	(0.02)
Δ export exposure	0.484***	0.486***	0.393***	0.391***
(other countries)	(0.06)	(0.06)	(0.06)	(0.06)
R-squared	0.852	0.853	0.826	0.832
F-test of excluded instruments	40.773	40.451	22.280	21.862

Notes: N=739. All regressions include the full set of control variables from the benchmark model of table 1, column 5. Standard errors clustered at the level of 50 aggregate labor market regions in parentheses. Levels of significance: *** 1 %, ** 5 %, * 10 %.

Table A.7: Eastern Europe versus China (I): Import and export exposure separately

	Dependent variable: 10-year change manufacturing employment / working age pop. in %-points	
	(1) Eastern Europe	(2) China
Δ import exposure	-0.973***	-0.149*
	(0.34)	(0.08)
Δ export exposure	0.900***	0.536
	(0.32)	(0.93)
% manuf. of other tradable goods	-0.070**	-0.046**
	(0.03)	(0.02)
% manuf. of cars	-0.070*	-0.036
	(0.04)	(0.03)
% high skilled	-0.012	-0.051
	(0.05)	(0.04)
% foreigners	-0.168***	-0.155***
	(0.03)	(0.03)
% women	-0.059***	-0.060***
	(0.01)	(0.01)
% routine occupations	0.012	-0.025
	(0.04)	(0.03)
First stage results, dependent variable: Δ import exposure		
Δ import exposure	0.563***	0.234***
(other countries)	(0.12)	(0.06)
Δ export exposure	-0.057	0.041
(other countries)	(0.04)	(0.04)
R-squared	0.655	0.703
F-test of excluded instruments	11.172	9.399
First stage results, dependent variable: Δ export exposure		
Δ import exposure	0.352***	-0.012***
(other countries)	(0.12)	(0.00)
Δ export exposure	0.508***	0.103***
(other countries)	(0.04)	(0.02)
R-squared	0.804	0.712
F-test of excluded instruments	93.149	12.256

Notes: N=739. Δ *import exposure* and Δ *export exposure* comprise only trade with Eastern Europe (column 1) and China (column 2), respectively. All regressions include the full set of control variables from the benchmark model of table 1, column 5. Standard errors clustered at the level of 50 aggregate labor market regions in parentheses. Levels of significance: *** 1 %, ** 5 %, * 10 %.

Table A.8: Eastern Europe versus China (II): Net exposure, Eastern Europe and China separately

	Dependent variable: 10-year change manufacturing employment / working age pop. in %-points			
	(1) Benchmark	(2) 1988-1998	(3) 1998-2008	(4) Final goods only
Δ net exposure EE	0.874***	1.005*	1.131*	1.377**
	(0.34)	(0.59)	(0.65)	(0.59)
Δ net exposure CN	0.080	-0.268	0.098	0.237
	(0.14)	(0.75)	(0.14)	(0.15)
% manuf. of other tradable goods	-0.072***	-0.092***	-0.066	-0.059***
	(0.02)	(0.02)	(0.05)	(0.02)
% manuf. of cars	-0.077***	-0.063**	-0.127	-0.045**
	(0.02)	(0.03)	(0.10)	(0.02)
% high skilled	-0.015	-0.131	-0.033	-0.021
	(0.05)	(0.08)	(0.06)	(0.05)
% foreigners	-0.169***	-0.171***	-0.114***	-0.164***
	(0.03)	(0.05)	(0.04)	(0.04)
% women	-0.059***	-0.086***	-0.021	-0.059***
	(0.01)	(0.02)	(0.02)	(0.01)
% routine occupations	0.011	-0.019	0.020	0.016
	(0.04)	(0.04)	(0.06)	(0.04)
First stage results, dependent variable: Δ net exposure EE				
Δ net exposure EE	0.488***	0.483***	0.275**	0.474***
(other countries)	(0.07)	(0.16)	(0.11)	(0.10)
Δ net exposure CN	-0.005	0.098***	-0.008	-0.015
(other countries)	(0.01)	(0.03)	(0.02)	(0.01)
R-squared	0.670	0.363	0.738	0.544
F-test of excluded instruments	30.833	14.089	5.511	14.322
First stage results, dependent variable: Δ net exposure CN				
Δ net exposure EE	0.101	0.021	-0.237**	0.012
(other countries)	(0.07)	(0.05)	(0.11)	(0.09)
Δ net exposure CN	0.218***	0.145***	0.252***	0.242***
(other countries)	(0.05)	(0.01)	(0.06)	(0.06)
R-squared	0.509	0.711	0.521	0.557
F-test of excluded instruments	11.851	49.216	8.281	9.427

Notes: N=739 (column 1), N=326 (column 2), N=413 (column 3). Δ *net exposure* is constructed by subtracting (1) from (2). See online appendix for the categorization of final goods. All regressions include the full set of control variables from the benchmark model of table 1, column 5. Standard errors clustered at the level of 50 aggregate labor market regions in parentheses. Levels of significance: *** 1 %, ** 5 %, * 10 %.

Table A.9: Robustness checks: Drop most important industries for trade with Eastern Europe and China

	Dependent variable: 10-year change manufacturing employment / working age pop. in %-points				
Omitted industry	Automotive	Spec. purp. machinery	Mach. for prod. of mech. power	Basic chemicals	Gen. purp. machinery
Δ net exposure EE	0.778*	0.864***	0.849**	0.760**	0.853**
	(0.45)	(0.33)	(0.33)	(0.32)	(0.34)
Δ net exposure CN	0.082	0.101	0.073	0.185	0.084
	(0.13)	(0.14)	(0.14)	(0.11)	(0.14)
First stage results, dependent variable: Δ net exposure EE					
Δ net exposure EE	0.324***	0.487***	0.492***	0.498***	0.488***
(other countries)	(0.09)	(0.07)	(0.07)	(0.07)	(0.07)
Δ net exposure CN	-0.001	-0.009	-0.009	-0.012	-0.005
(other countries)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
R-squared	0.554	0.650	0.661	0.668	0.663
F-test of excluded instruments	9.938	29.200	30.108	30.924	30.691
First stage results, dependent variable: Δ net exposure CN					
Δ net exposure EE	-0.099	0.096	0.106	0.089	0.100
(other countries)	(0.09)	(0.07)	(0.07)	(0.07)	(0.07)
Δ net exposure CN	0.227***	0.216***	0.213***	0.224***	0.218***
(other countries)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
R-squared	0.499	0.509	0.525	0.513	0.509
F-test of excluded instruments	10.340	11.479	11.852	11.382	11.871
Omitted industry	Office machines	Wearing apparel	Communication devices	Electrical equipment	Furniture
Δ net exposure EE	0.890***	0.865***	0.917***	0.872**	0.825***
	(0.33)	(0.32)	(0.33)	(0.34)	(0.32)
Δ net exposure CN	0.059	0.042	0.104	0.061	0.109
	(0.20)	(0.14)	(0.14)	(0.12)	(0.12)
First stage results, dependent variable: Δ net exposure EE					
Δ net exposure EE	0.487***	0.499***	0.492***	0.488***	0.498***
(other countries)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Δ net exposure CN	0.005	-0.003	-0.004	-0.001	-0.008
(other countries)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
R-squared	0.670	0.629	0.675	0.672	0.681
F-test of excluded instruments	34.683	35.795	29.821	32.124	32.568
First stage results, dependent variable: Δ net exposure CN					
Δ net exposure EE	0.115*	0.102	0.089	0.125*	0.091
(other countries)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Δ net exposure CN	0.225***	0.214***	0.214***	0.241***	0.226***
(other countries)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
R-squared	0.534	0.487	0.484	0.586	0.516
F-test of excluded instruments	17.253	11.944	9.236	12.142	11.383

Notes: N=739. All trade exposure variables and instruments are constructed by omitting the respective industries. All regressions include the full set of control variables from the benchmark model of table 1, column 5. Standard errors clustered at the level of 50 aggregate labor market regions in parentheses. Levels of significance: *** 1 %, ** 5 %, * 10 %.

Table A.10: Impact on non-manufacturing industries

	Dependent variables: 10-year change in employment / working age pop. in %-points		
	cons-truction	personal services	business services
Δ import exposure	0.008	-0.059	-0.050
	(0.01)	(0.04)	(0.04)
Δ export exposure	0.027	-0.012	0.188**
	(0.02)	(0.05)	(0.09)

Notes: N=739. The dependent variables are constructed analogously to the dependent variable of the benchmark model as the percentage point change of the number of workers in each of the denoted subsectors relative to the working age population. All regressions include the full set of control variables from the benchmark model of table 1, column 5. Standard errors clustered at the level of 50 aggregate labor market regions in parentheses. Levels of significance: *** 1 %, ** 5 %, * 10 %.

Table A.11: Descriptive statistics of the main variables at the worker level

	1988-1998		1998-2008	
	Dependent variables			
Cumulative years of employment:				
total	7.637	(2.957)	7.886	(2.837)
in original establishment	6.174	(3.679)	5.516	(3.898)
in original 3-digit industry	6.444	(3.627)	6.142	(3.815)
in original region	7.219	(3.231)	7.176	(3.327)
	Trade exposure			
Δ imports per worker$_{t=0}$				
Eastern Europe	4.689	(4.719)	6.610	(9.411)
China	1.404	(3.590)	6.578	(20.171)
Both	6.092	(6.797)	13.188	(23.170)
Δ exports per worker$_{t=0}$				
Eastern Europe	5.882	(5.391)	13.163	(10.816)
China	0.395	(0.980)	3.858	(4.408)
Both	6.277	(5.835)	17.021	(13.538)

Mean values and standard deviations (in parentheses) for manufacturing workers. Cumulative years of employment based on employment data with daily precision. Trade exposure measured in € 1,000 per worker

Table A.12: Trade exposure and individual employment biographies

	Dependent variable: 100 x cumulative years of employment over 10 year period			
	2SLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)
	total	plant	3-digit ind.	region
	A: Low Skilled			
Δ Imports	-0.369*	-0.708**	-0.712**	-0.499**
per worker$_{t=0}$	(0.20)	(0.28)	(0.28)	(0.22)
Δ Exports	1.212***	1.550**	1.275*	1.601***
per worker$_{t=0}$	(0.43)	(0.78)	(0.69)	(0.51)
N	42179	42179	42179	42179
1st Stage F-statistic IP	95.884	95.884	95.884	95.884
1st Stage F-statistic EP	25.849	25.849	25.849	25.849
	B: Medium Skilled			
Δ Imports	-0.307***	-1.262***	-1.143***	-0.805***
per worker$_{t=0}$	(0.10)	(0.22)	(0.21)	(0.19)
Δ Exports	1.105***	2.593***	2.458***	2.383***
per worker$_{t=0}$	(0.26)	(0.76)	(0.66)	(0.47)
N	116202	116202	116202	116202
1st Stage F-statistic IP	256.148	256.148	256.148	256.148
1st Stage F-statistic EP	38.479	38.479	38.479	38.479
	C: High Skilled			
Δ Imports	-0.301**	-1.055**	-0.993**	-0.521
per worker$_{t=0}$	(0.15)	(0.47)	(0.48)	(0.38)
Δ Exports	1.211**	0.383	2.198	1.924*
per worker$_{t=0}$	(0.60)	(2.68)	(1.82)	(1.11)
N	11476	11476	11476	11476
1st Stage F-statistic IP	143.292	143.292	143.292	143.292
1st Stage F-statistic EP	25.068	25.068	25.068	25.068
	D: Younger than 38			
Δ Imports	-0.354***	-1.101***	-1.096***	-0.743***
per worker$_{t=0}$	(0.12)	(0.24)	(0.26)	(0.19)
Δ Exports	1.461***	2.489***	2.239***	2.344***
per worker$_{t=0}$	(0.25)	(0.78)	(0.69)	(0.45)
N	88714	88714	88714	88714
1st Stage F-statistic IP	175.149	175.149	175.149	175.149
1st Stage F-statistic EP	36.485	36.485	36.485	36.485
	E: Older than 38			
Δ Imports	-0.282**	-1.117***	-0.987***	-0.599***
per worker$_{t=0}$	(0.12)	(0.25)	(0.21)	(0.20)
Δ Exports	1.022***	2.152***	2.223***	2.001***
per worker$_{t=0}$	(0.34)	(0.81)	(0.69)	(0.47)
N	88939	88939	88939	88939
1st Stage F-statistic IP	249.733	249.733	249.733	249.733
1st Stage F-statistic EP	37.828	37.828	37.828	37.828
	F: Female			
Δ Imports	-0.366**	-1.002***	-0.842***	-0.652***
per worker$_{t=0}$	(0.17)	(0.29)	(0.27)	(0.21)
Δ Exports	0.986**	2.086**	1.326	1.731***
per worker$_{t=0}$	(0.44)	(0.89)	(0.85)	(0.57)
N	48000	48000	48000	48000
1st Stage F-statistic IP	166.369	166.369	166.369	166.369
1st Stage F-statistic EP	42.950	42.950	42.950	42.950
	G: Male			
Δ Imports	-0.244***	-1.117***	-1.034***	-0.587***
per worker$_{t=0}$	(0.09)	(0.21)	(0.22)	(0.21)
Δ Exports	1.321***	2.450***	2.524***	2.327***
per worker$_{t=0}$	(0.26)	(0.81)	(0.66)	(0.45)
N	129653	129653	129653	129653
1st Stage F-statistic IP	258.596	258.596	258.596	258.596
1st Stage F-statistic EP	28.769	28.769	28.769	28.769

Control variables include dummy variables for start of period tenure, plant size, year of birth and region $\times$ time interactions. Models (2) – (4) consider cumulative employment only within the original establishment, 3-digit industry, and region, respectively. Standard errors clustered by 1,279 industry $\times$ federal state cells in parentheses. * $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$

Table A.13: Trade exposure and individual employment biographies

	Dependent variable: 100 x cumulative years of employment over 10 year period			
	2SLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)
	total	plant	3-digit ind.	region
A: Plant larger than sample median of same industry/state				
Δ Imports	-0.248**	-1.171***	-1.078***	-0.743***
per worker$_{t=0}$	(0.12)	(0.39)	(0.31)	(0.25)
Δ Exports	0.744**	1.359	1.801*	1.891***
per worker$_{t=0}$	(0.31)	(1.12)	(0.94)	(0.47)
N	88181	88181	88181	88181
1st Stage F-statistic IP	237.705	237.705	237.705	237.705
1st Stage F-statistic EP	57.110	57.110	57.110	57.110
B: Plant smaller than sample Median same industry/state				
Δ Imports	-0.393***	-1.126***	-1.052***	-0.633***
per worker$_{t=0}$	(0.13)	(0.23)	(0.21)	(0.20)
Δ Exports	1.765***	3.450***	2.872***	2.666***
per worker$_{t=0}$	(0.33)	(0.76)	(0.65)	(0.58)
N	89472	89472	89472	89472
1st Stage F-statistic IP	366.998	366.998	366.998	366.998
1st Stage F-statistic EP	68.879	68.879	68.879	68.879
C: Plant median wage higher than population median of same industry/state				
Δ Imports	-0.327***	-1.197***	-1.133***	-0.657**
per worker$_{t=0}$	(0.11)	(0.25)	(0.31)	(0.29)
Δ Exports	1.037***	2.534**	2.660***	1.982***
per worker$_{t=0}$	(0.29)	(1.01)	(0.77)	(0.53)
N	93203	93203	93203	93203
1st Stage F-statistic IP	263.107	263.107	263.107	263.107
1st Stage F-statistic EP	33.686	33.686	33.686	33.686
D: Plant median wage lower than population median of same industry/state				
Δ Imports	-0.313**	-0.926***	-0.878***	-0.642***
per worker$_{t=0}$	(0.14)	(0.31)	(0.23)	(0.18)
Δ Exports	1.452***	2.039**	1.767**	2.347***
per worker$_{t=0}$	(0.33)	(1.02)	(0.83)	(0.53)
N	84450	84450	84450	84450
1st Stage F-statistic IP	147.394	147.394	147.394	147.394
1st Stage F-statistic EP	34.900	34.900	34.900	34.900

Control variables include dummy variables for start of period tenure, plant size, year of birth and region × time interactions. Models (2) – (4) consider cumulative employment only within the original establishment, 3-digit industry, and region, respectively. Standard errors clustered by 1,279 industry × federal state cells in parentheses. * $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$

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ISSN 2190-9938 (online)
ISBN 978-3-86304-126-7