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The Employment Effects of the EU Eastern Enlargement in Germany¹

Causal Evidence from Linked Employer-Employee Data

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In this paper, we empirically analyse the employment effects of the EU Eastern Enlargement of the EU in 2004. The integration of Central and Eastern European countries involves a massive reduction in both import and export tariffs; however, most of it happens before the actual accession event. Consequently, a large number of German firms both increase their exports to and imports from the new EU member states in the time period between 1996 and 2010. The tariff reductions differ between industries and certain groups of firms are differently affected by the liberalisation. Exporters may benefit in terms of employment, while other firms might suffer from the increase in import competition.

Keywords: trade liberalisation, European integration, employment growth, linked employer-employee data

JEL Code:

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1 Introduction

In this paper, we carry out an empirical analysis of the effects of the first European Union (EU) Eastern Enlargement in 2004. We analyse how it has affected employment in German firms, differentiated by their trading behaviour and potential affectedness. In the case of Germany, the EU Eastern Enlargement is the source of an important variation in trading costs and, consequently, in trade flows. The entry of ten new member states into the EU – the first (2004) and second (2007) Eastern Enlargement – and their subsequent integration into the union was accompanied by an extensive liberalisation of the trade relations between these states on the one hand and the EU15 states on the other hand. Due to its geographic location and its history, Germany was particularly affected by this change.³

While previous studies have analysed the labour market effects of the eastern EU enlargement (e.g. Braakmann and Vogel, 2010, 2011; Schmillen, 2011; Fries, 2014), there remain several shortcomings, especially on identifying causality, and regarding attention to effect heterogeneity. The causal effects of the EU Eastern Enlargement can only be properly identified if we consider exogenous variation the European integration exerts on trade costs, reflecting, for instance, a reduction in tariffs. The literature, so far, has focused on instrumenting treatment intensity using border regions (Braakmann and Vogel, 2010, 2011), geographic distance (Schmillen, 2011), or firm productivity (Fries, 2014). However, more recent studies analysing the effects of trade liberalisation have proposed more promising methods of identification (e.g. Amiti and Davis, 2011; Autor et al., 2013). In addition, the literature so far can be extended by analysing longer term effects and by using better data to account for heterogeneity on the firm and employee level.

We apply the method of Amiti and Davis (2011) and combine linked employer-employee data from the IAB (LIAB) with information on industry-level tariffs during the time period of 1996-2010.⁴ Thus, our analysis clearly goes beyond those carried out in the aforementioned studies. Based on the underlying data, we are able to econometrically estimate how the international exposure of German firms – especially in the context of the EU Eastern Enlargement – affects their employment levels. As a measure of international exposure, we directly observe the export and import behaviour on firm level, where the export behaviour can be observed on both the extensive and the intensive margin, and also whether firms export into the new EU member countries in Eastern Europe or to other countries. The import behaviour can be approximated via the share of intermediate inputs on sales and via indicator variables whether a firm was engaged in offshoring activities prior to the EU Eastern Enlargement. Additionally, we follow Amiti and Davis (2011) in calculating yearly weighted averages of tariffs in different economic sectors as a measure of how strongly the firms are affected by the European Integration, where trade liberalisation obviously reflects in a reduction of these tariffs.

³ It is important to note, however, that trade liberalisation as such had already been partly anticipated by the EU agreements made in the 1990s, i.e. before the enlargement of the EU. With the empirical method we use, these concerns are considered.

⁴ LIAB is short for Linked Employer-Employee data of the Institute for Employment Research (IAB).

We can observe the observations, i.e. a random sample of German plants, over time.⁵ We are interested in the employment growth of firms differently affected by the EU Eastern Enlargement and calculate their job growth using the flow approach by Davis and Haltiwanger (1992). As our analysis is conducted at the firm level, which – as opposed to previous studies on the macro level – we can investigate the firm-specific trade exposure and firm heterogeneity in general. On the one hand, this is done by observing firm-specific characteristics such as ownership structures, legal form and corporate structures. On the other hand, we have panel data at our disposal, meaning that we can control for time-invariant firm heterogeneity (so-called fixed effects). Additionally, we consider institutional characteristics of the German labour market, collective bargaining coverage, for instance.⁶

The rest of this paper is structured as follows: we provide a literature analysis in Section 2. In Section 3, we present the data on which we base our analysis, before illustrating our methodical approach in Section 4. Section 5 contains the presentation and interpretation of our results and finally, we draw conclusions from them and provide political guidance in Section 6.

2 Literature Overview

2.1 Theory

Among all the potential effects of international trade, labour market effects, and especially effects on (un-)employment, are naturally of utmost importance for the public and economic policy makers. However, for a long time, the literature in the field of international economics has limited itself to welfare effects, induced by income changes, especially with regard to the increase in income inequality that can be observed in various countries – including Germany – for the past two decades. That said, traditional international trade theory had until recently completely disregarded labour market institutions; to the largest extent, it assumed perfect labour markets. This implies that employment effects had been entirely disregarded in most theoretical trade models as well as empirical macro studies.

In the past fifteen years, this has changed fundamentally through addressing different dimensions of heterogeneity (firms, employees) in theoretical models. Also, the phenomenon of underemployment and international differences in labour market institutions now play a significant role in modern international trade theory (see e.g. Davidson and Matusz, 2009; or Nunn and Trefler, 2013; Davis and Harrigan, 2011; Helpman et al., 2012). Empirics have developed methods that allow for a more precise identification of different labour market effects caused by recent trends in international trade (the rise of China, European integration, trade in intermediate inputs, see e.g. Lileeva and Trefler, 2010; Amiti and Davis, 2011; Autor et al., 2013; Dauth et al., 2014; or Ebenstein et al., 2014).

⁵ The single observation is a plant or establishment, i.e. a production unit within a company. We refer to these units as ‘firms’.

⁶ Trade unions play an important role for job growth in Germany, even though collective bargaining has lost significance (Brändle and Goerke, 2015). A current overview on the relationship between export status and collective bargaining coverage is provided by Capuano et al. (2014.). Empirical literature barely contains studies that aim at estimating the joint effects of collective bargaining and trade on other labour market outcomes. Felbermayr et al. (2014) is an exception.

The theory of international trade with heterogeneous firms according to Melitz (2003) emphasises the reallocation between firms within industries as a result of international trade. More simply put, low-productivity firms leave the market, while high-productivity firms expand and increase their exports. Through this reallocation to more productive (exporting) firms, overall productivity of the whole industry increases. However, this image can be blurred when considering labour market rigidities (for example using fairness preferences: Egger and Kreickemeier, 2009, 2012, search and matching frictions: Helpman and Itzhaki, 2010; Helpman et al., 2010; Felbermayr et al., 2011a; Kohler and Wrona, 2011; Mitra and Ranjan, 2010, or trade unions: Naylor, 1998; Bastos and Kreickemeier, 2009; Egger and Etzel, 2012). A second strand of the literature considers offshoring, meaning the increasing relocation intermediate inputs to cheaper production facilities abroad. It finds that the labour market effects are ambiguous, depending on certain conditions (Grossman and Rossi-Hansberg, 2008; Kohler and Wrona, 2011).

The theoretical literature implies three consequences for the underlying study. First of all, it shows that the labour market effects of market opening in international trade are ambiguous from a theoretical point of view, which means that this question indeed needs to be clarified by means of empirical analysis. Secondly, results indicating non-monotony, concerning both wage inequality and employment, imply that empirically established effects on the basis of concrete data cannot be generalised. Thirdly, theoretical literature has identified a variety of possible impact channels that partly lead to similar, but also to different results. One could try to identify the empirical significance of individual impact channels in isolation. However, if one is not interested in these impact channels per se, but rather in the overall effect of a particular market opening shock, then empirical analysis will have to rely on the estimation of reduced forms rather than on structural estimations. In this context, it is crucial to find a solution to the endogeneity problem. Fourthly, perhaps the most important conclusion that can be drawn from the existing literature for our purposes is the following: In order to be able to identify the labour market effects of market opening in international trade, it is essential to observe variation between different firms since the mechanisms emphasised by recent literature operates via firm heterogeneity.

2.2 Empirics

When looking at the employment effects of market integration, several studies exist on the macro level, which analyse welfare effects of trade liberalisation while recognising employment or unemployment changes (Dutt et al., 2009, Felbermayr et al. 2011b), or imperfect labour markets (Heid and Larch, 2014). These studies find that an increase in the openness of an economy reduces the long-term equilibrium unemployment rate, and that the inclusion of (positive) labour market effects results in an increase in the positive welfare effects of trade liberalisation.⁷

An overview on previous studies on the micro level, especially studies based on firm data, is – among others – provided by Wagner (2012), who lays particular emphasis on exports, as well as by Crinò (2009), who focuses on offshoring. Most of them lack a proper identification strategy. A number of more recent studies have examined the labour market effects of trade liberalisation using regional trade agreements, e.g. the CAN-US-FTA or the European Integration, or changes due to world trade changes, e.g. the rise of Chinese exports after joining the WTO. As an identifi-

⁷ Depending on the labour institutions present, there are, however, also countries which lose welfare, because negative employment effects over-compensate the positive wage effects.

cation strategy, the studies use such events as a trade shock that – despite the preceding trade liberalisation – was followed by an increase in trading volume. The literature on empirical trade mainly focusses on two recent approaches.

First, Autor et al. (2013) investigate the labour market effects of US imports from China in the manufacturing sector. Their identification strategy bases on the concept that different labour market regions (“commuting zones”) were affected by the “Chinese import shock” to different degrees. They instrument trading volumes between China and the USA by trading volumes between China and other industrial countries. They find that trading with China has led to less employment in the manufacturing sector, especially among low-skilled workers, which is linked to decreasing wages in all sectors. Dauth et al. (2014) apply the same method to Germany investigating the effects of trade with China and Eastern European countries. Their result is that increasing trade with Eastern European countries has created more employment than it has destroyed, thus leading to employment growth. However, this positive effect for the overall economy is split into positive effects export-oriented economic sectors and negative effects for sectors characterised by import competition.

Second, Amiti and Davis (2011) investigate the wage effects of trade liberalisation based on Indonesian firm data. They are able to identify the effects of trade liberalisation on the export and the import side separately by both potential and actual trading exposures for each firm. For the potential trade exposure they use the reductions in import and export tariffs given the products produced or imported by the firm. They find that tariff reductions on exported goods increase wages in strongly export-oriented firms, while decreasing wages in firms that are affected by import competition from foreign countries. Secondly, tariff reductions on imported goods have a positive impact on firms that depend to a large extent on foreign inputs. While the empirical analysis obtains relevant results for Indonesia, the transferability of this study on other countries – especially on Germany – is quite limited. The geographical location, the development status, and the educational standards of Indonesia fail to provide a framework comparable to Germany. Amiti and Davis (2011) are also unable to observe whether differences in wages are simply the result of heterogeneity between firms or whether heterogeneity between employees plays a role as well. In a similar way, Lileeva and Trefler (2010) analyse the productivity effects of trade liberalisation using data from Canadian firms which started to export into the U.S. after the CAN-US-FTA. They find positive effects, which are largest for firms which were small and unproductive before the trade agreement. The authors instrument the (potential) affectedness of firms by the trade agreement using a firm-specific measure of how much the firm was affected by tariff reductions. The productivity of the CAN-US-FTA effect is, for example, very small for firms which had already exported into the U.S. before the agreement. Additionally, Lileeva and Trefler (2010) analyse whether Canadian imports of final goods or intermediate inputs affect the results. Contrary to other studies, for example Dauth et al. (2014), they do not find large differences. The results from Lileeva and Trefler (2010) are based on a small sample of firms in 1984 and 1996, such that time-invariant heterogeneity could not be controlled for in their study.⁸

⁸ Additionally, Lileeva and Trefler (2010) need to acknowledge that their samples suffer from survival bias, as they only look at firms which are present in both waves of their survey.

In contrast, studies focussing on the effect of the European Integration or on labour market effects of trade liberalisation in Germany use different approaches to identify causal effects or none at all.

First, Braakmann and Vogel (2010, 2011) investigate the impact of the EU eastern enlargement at the firm level. They use data from the structure survey in the service sector as well as from the Establishment History Panel (BHP) of the IAB and apply combined regression-based and difference-in-difference methods. As an identification strategy, they choose firms which are located in border regions (or federal states with a border) to the Czech Republic and Poland. They find relatively weak effects concentrated on certain industries – for instance the retail industry.⁹ In their analysis, they only use a small number of control variables at the firm level; at employee level, abstain completely from including control variables. Furthermore they merely analysed short run effect from 2002 onwards, when most integration procedure was already done and tariffs had already been mostly abolished (see further below). All in all, the method of Braakmann and Vogel (2010, 2011) is useful to measure the particular effect of trade in border regions; however it is weak to measure trade effects of the EU enlargement in general. Trade liberalisation is very likely to affect all regions in Germany. The argument that transaction costs vary significantly between border and no-border-regions is not very convincing. The argumentation of Braakmann and Vogel (2010) that in a globalised world with low transport and communication costs, border regions should be more strongly affected by the EU eastern enlargement is also questioned by the results of Åslund and Engdahl (2013). They use data on existing ferry lines from Sweden to the new accession states in order to capture the effect of the EU eastern enlargement. However, they only find effects that can primarily be explained by migration flows and to a lesser extent by trade. Wassmann (2015) estimates the effect of the EU eastern enlargement for border regions in all old member states with the help of a synthetic control group and finds positive, but very heterogeneous effects on the economic performance of the respective regions. The method of using border regions in order to analyse trade liberalisation was successfully implemented by Brühlhart et al. (2012) for the case of Austria after the fall of the Iron Curtain in 1990. They observe that both employment and wages were significantly more strongly affected in border regions (radius of 50 km) than in other Austrian regions, which are mainly the alpine regions. However, the impact channel again works mainly via labour supply, namely migration or commuter flows, whereas in the case of the EU eastern enlargement, the labour market was liberalised at a later point in time.

Furthermore, Schmillen (2011) uses linked employer-employee data (the LIAB of the IAB, see further below) to show that various results founded in the existing literature thus far – such as, for instance, the conclusion that exporting firms pay higher wages – can indeed be questioned by means of a better data basis: Compared to the results based on pure firm data, those obtained from linked data are considerably smaller. Schmillen (2011) also addresses the question of whether the export destination influences the amount of the wage mark-up paid by exporting firms. His results show that higher wages are paid especially in firms that export over long distances. Thereby, he uses information on the distance between the firm and their respective export regions, for instance the new EU member states. Finally, Fries (2014) also analyses the LIAB dataset and estimates the employment effects of the EU eastern enlargement for productive and

⁹ Only tourism related industries gain significant results as this might be the result of “day shopping tourism” and “commuting migration”.

less productive firms using difference-in-difference models. He comes to the conclusion that the negative employment effects prevail, especially for low- and medium-skilled employees.

Second, before turning to the empirical analysis, we briefly discuss the most recent studies which investigate the relationship between trade and labour market outcomes for Germany. A current study that also uses elaborated methods and controls for particularities of the German labour market is Felbermayr et al. (2014). Using LIAB data, they show that exporting firms pay higher wages on average, even when varying total factor productivity of firms and differences at employee level are being controlled for. This is especially true for firms that are bound by collective bargaining agreements whose productivity is below average. It also applies to a limited extent to firms belonging to an open industry.

Baumgarten (2015) investigates the effects of international trade on the redistribution of jobs for the years 1999, 2001 and 2003, which corresponds to the period prior to the Eastern enlargement of the EU. He analyses the impact of export and import behaviour on worker flows, partly differentiated by the level of training. Furthermore, he distinguishes between firms that had already exported at the beginning of the period on the one hand and firms that have changed their status in this respect. It is shown that firms that had already exported before exhibit higher job growth. However, this effect can only be observed for small firms (<100 employees) and vanishes as soon as fixed effects at the firm level are controlled for. This hints at a selection effect rather than at a causal effect¹⁰.

Moser et al. (2010) examines the connection between international competitiveness and employment.¹¹ More precisely, they investigate the effect of real changes in the exchange rate on job flows in German firms. They find that compared to the USA, the effect is rather small and arises primarily due to a lower rate of job creation instead of a higher rate of job destruction¹². For their main results, the authors use a small balanced sample of 400 Western German firms from the IAB establishment panel, more precisely for the years between 1993 and 2005. They complement their analysis by firms that become insolvent, thereby observing that international competition affects reductions in employment in Germany (similar to the USA). Moser et al. (2010) explain their results by different labour market institutions in the two countries, but without investigating this any further.

In a more recent study, Moser et al. (2015) investigate the employment effects of offshoring, again based on the IAB establishment panel. They include the years 1999, 2001 and 2003 and use the variation of those variables that measure the intensity with which imported intermediates are used. They use a difference-in-difference approach combined with a kernel matching procedure and compare different groups of firms depending on whether an increased intensity of imported intermediates and restructuring measures took place simultaneously. They find significantly negative employment effects only for the few firms that restructure simultaneously

¹⁰ Baumgarten (2015: 606) states himself that future studies should consider exogenous variation in trading costs in order to establish a causal effect.

¹¹ In this study, international competitiveness is measured as the product of a change in relative labour costs between Germany and the rest of the world at the industry level and the share of sales attributed to exports ("openness").

¹² Comparable differences in the structure of change rates of employment between the USA and Germany, but also other European states, have already been found in previous literature (Klein et al., 2003).

("downsizing effect"). However, in the aggregate this effect is outweighed by the rest of the firms, such that the overall effect of offshoring on employment is positive. Nevertheless, this is primarily caused by direct rather than by indirect effects. Unfortunately, Moser et al. (2015) neglect the export side as well as different labour market institutions.

Lichter et al. (2015) also use the LIAB data to analyse whether exporting firms show a different wage elasticity of labour demand. They apply a labour demand estimation following Hamermesh (1993) and control for exporter selection using fixed effects and for endogeneity using the IV method invented by Autor et al. (2013). They find that exporting firms have a larger wage elasticity of labour demand, especially if they export to other industrialised countries and especially for employees in the middle of the skill distribution.

The existing studies clearly reflect the enormous significance of the identification strategy for capturing the effects of particular scenarios of trade liberalisation such as the EU eastern enlargement. They also show that the use of micro data can be very helpful for this purpose. After summarising the empirical literature, there remain a number of unanswered questions. Especially for Germany, there barely exist studies that (1) investigate employment effects, (2) make use of exogenous variation in trading costs, (3) simultaneously observe the export and the import side, and (4) investigate the effects of labour market institutions, especially centralised collective bargaining, and trade on labour market outcomes.

3 Data and Descriptive Statistics

3.1 LIAB

The main data basis of our analysis is the Linked Employer-Employee Dataset (LIAB). We use the LIAB Cross-Section Model 2 1993-2010¹³. These data are a combination of the IAB Establishment Panel and the social insurance data of the individuals employed at the firms contained in the panel. The IAB Establishment Panel is a representative yearly survey of German firms with at least one employee subject to social insurance contributions. From 1993 for West Germany and from 1996 for the whole of Germany, up to 16,000 firms stratified according to firm size, economic branch and region are surveyed, such that the data set contains roughly 1% of all firms and 7% of all employees in Germany. The survey is carried out in interviews with (personnel) managers of the firms and exhibits high response rate as well as low panel mortality. The questionnaire mainly concerns personnel and labour market economic issues, but also general information on the firm. We assess the data with the help of teleprocessing via the Research Data Centre (FDZ) of the IAB. The social insurance data are obtained from the Integrated Employment Biographies Sample (IEB) of the IAB. The employee data mainly contain socio-demographic variables and are of high quality; the wage payments are calculated from the social insurance contributions.

For our analyses, we use the years 1996 to 2010 and all firms that we are able to observe over a minimum of three waves and that provide information exports. Furthermore, we exclude firms in the agriculture and forestry sectors, in the banking, credit and insurance industries, in public administration services and all private households as employers. Our sample contains up to

¹³ For more precise information, see Heining et al. (2013, 2014).

19,221 firms with 111,245 observations. Each firm has to be observed for at least three waves in a row. In some specifications, observations are dropped, e.g. because of missing covariates.

The employment level of a firm or their development over time can be observed as the dependent variable. In doing so, employment growth is modelled in a similar way as in a large number of studies based on the Job Flow Approach (see Davis and Haltiwanger, 1992)¹⁴. We calculate employment growth at the firm level as the difference between the number of all employees x in year t and that in year $t - 1$ normalised by the average number of employees in both years:

$$y_{it} = \frac{x_{it} - x_{it-1}}{(x_{it} + x_{it-1})/2}$$

By standardising the growth rate by means of average employment, extremely large or small values remain the exception and the variable lies within the interval $(-2, 2)$. For employment in the previous year, we directly use the information on the last year's employment provided in the questionnaire¹⁵.

The annually available information on the firm's export behaviour is asked for as follows:

"How many percent of your sales in year XXXX can be attributed to the individual regions on this list?

[A] The former West German states approx. ...%;

[B] The newly-formed German states approx. ...%;

[C] The countries of the European Monetary Union (excluding Germany) approx. ...%;

[D] The EU accession countries approx. ...%;

[E] Other foreign countries approx. ...%."

This question has been partly modified in the course of time; for instance, the export shares attributed to the EU accession countries are only asked for the years 2004-2007, and from 2008 on, no distinction is made any longer between the European Monetary Union and other foreign countries. All firms that express their business volume in terms of their sales (as opposed to their balance sheet or total budget) are asked to answer this question. Different empirical studies have already made use of this information, for example in order to examine the relationship between export status and wage level or wage distribution (Schmillen 2011, Felbermayr et al. 2014, and Baumgarten 2015).

For our empirical analysis we differentiate between firms which have exported to the EU accession countries on the one hand, and firms which have not on the other hand. The former group should be affected stronger by the EU eastern enlargement. The latter group contains both ex-

¹⁴ Alternatively, labour demand was estimated (Labour Demand, see Hamermesh, 1993).

¹⁵ Baumgarten (2015) uses information on entries and exits from personal data. This may lead to an over- or underestimation if employees and firms are not matched in each year (problem of data quality) or, at least in his analysis, if employees change their status, e.g. from full-time to part-time work (sampling problem). Moser et al. (2010) use information on recruitments and separations from the IAB Establishment Panel. These are, however, only available for the first half year and can thus contain systematic errors.

porting and non-exporting countries.¹⁶ Alternatively, we have analysed all exporting firms versus non-exporting firms as a robustness check.

The information on the import behaviour of a firm is not given every year, but in two separate questions. The first is included in the years 1998, 2000, 2001, 2004, 2007, and 2010. Firms are asked to name organisational changes including inter alia the share of preliminary products:

"Have one or more of the following organisational changes taken place in your firm/department in the past two years?"

...

[B] More purchases of products and services... [yes/no]"

Moreover, in three waves prior to the EU eastern enlargement (1999, 2001, and 2003), the origin of the used material was asked:

"Where did you purchase the material used in production (raw and operating materials, preliminary products or trade items)? Please tell me for each region on this list whether you purchased your material from there.

In the year XXXX, the material used in production was [a] predominantly [b] partly [c] not at all purchased from:

[A] The former West German states

[B] The newly-formed German states

[C] The countries of the European Monetary Union (excluding Germany)

[D] Other foreign countries."

For our empirical analysis we focus on the second question and differentiate between firms which have increased the share of imported intermediates on the one hand, and firms which have not on the other hand. The former group consists of all firms which answer positively to one of the questions above. As opposed to the export information, we cannot identify whether the origin of the offshore production is in new EU member states. Alternatively, we have also compared firms which answered positively to the first question vs. non-importers as a robustness check.

3.2 Tariff Data

In order to calculate the Amiti and Davis (2011) treatment intensities, information on changes in tariffs is taken from the *World Integrated Trade Solution* (WITS) access point (<https://wits.worldbank.org/>), which contains four databases: *UNSD COMTRADE*, *UNCTAD TRAINS*, *WTO IDB* and *WTO CTS*. Especially the *UNCTAD TRAINS* database comprises annually available information on trading volumes and tariffs since 1988 for 102 countries as well as on non-tariff barriers since 1992. It includes customs data for the harmonised commodity class (HS). With the help of concordance tables, each good can be assigned to an industrial class (according to ISIC Rev. 3) that is compatible with the industrial class (WZ93) that we use.

Based on the tariff rate on intermediate goods for industry k , the goal is to determine a measure for the costs of German firms caused by tariff burdens of imported intermediaries; to be exact, it

¹⁶ We only consider firms which have non-missing information on the exporting variable in the years 2004 to 2007, and follow these firms over time.

is an industry-specific measure, τ_k^M . In doing so, we calculate a double-weighted average of tariff rates t_{Eli_k} .

Weight for good i_j over the different countries l :

$$t_{i_j}^M = \sum_{l=1}^L \frac{m_{Dli_j}}{\sum_{l=1}^L m_{Dli_j}} t_{Eli_j}$$

with weighting of the goods in industry class j :

$$t_j^M = \sum_{i_j=1}^{I_j} \frac{\sum_{l=1}^L m_{Dli_j}}{\sum_{i_j=1}^{I_j} \sum_{l=1}^L m_{Dli_j}} t_{i_j}^M$$

Determination of the tariff rate on intermediate goods for industry k by weighted summation of industry-specific tariff rates t_j :

$$Input_tariff_{k,t} = \tau_k^M = \sum_{j=1}^K \varphi_{kj} t_j^M,$$

where φ_{kj} represents the share of industry j of all intermediate goods and service made within industry k .

As for the tariff burden of German exports to the new EU accession countries, we again wish to use an industry-specific measure, t_k^X ; just as we did before, we determine the trade-weighted average of tariffs, in this case of t_k^X :

Weighting of good i_k over the different countries:

$$t_{i_k}^M = \sum_{l=1}^L \frac{x_{Dli_k}}{\sum_{l=1}^L x_{Dli_k}} t_{li_k}$$

Weighting of the goods within the industry class, which here corresponds to industry class k (three-digit WZ93):

$$Output_tariff_k = t_k^X = \sum_{i_k=1}^K \frac{\sum_{l=1}^L x_{Dli_k}}{\sum_{i_k=1}^K \sum_{l=1}^L x_{Dli_k}} t_{i_k}^M$$

l	Eastern European accession country, $l = 1 \dots L$ ($L = 10$)
i_k	Good within industry class k , $i_k = 1 \dots I_k$ (goods classification HS)
k, j	Industry class (from WIOD), $k, j = 1 \dots K$ (pursuant to 1/2-digit NACE rev 1)
t_{li_k}	Import tariff of country l for good i_k towards the EU (and thus Germany)
t_{Eli_k}	Import tariff of the EU for good i_k towards country l
x_{Dli_k}	German exporting volume of good i_k to country l
m_{Dli_k}	German (European) importing volume of good i_k from country l

This calculation follows the approach of Amiti and Davis (2011).¹⁷ However, we allow for additional asymmetric (preferential) tariff rates, as they were common in the case of the Eastern

¹⁷ We can also compare our method with the one by Lileeva and Trefler (2010). We have, however, no information on the goods produced by the firms. In contrast, we have yearly data on firms' exports and also on the intensive margin of exports.

European states. This means that EU tariffs were reduced and abolished earlier than those of the Eastern European accession countries¹⁸.

The export tariff ($Output_tariff_{k,t}$) is thus the tariff with which a German industry k was burdened on average for exporting its goods i to the new accession countries in Eastern Europe within a year t . Thereby, we weight by the trading volume x of the respective goods i and countries l . Conversely, the import tariff on foreign intermediate goods ($Input_tariff_{k,t}$) is the tariff which a German industry k had to pay on average for the import of intermediaries i from the new accession countries within a year t . These measures account for the origin of each industry's inputs. We additionally weight the input tariff using the factor φ_{kj} , i.e. for an industry which uses 50% of good i as an input, the respective input tariff consists to 50% of the respective industry input tariff. The weights φ_{kj} are based on 2005 WIOD industry-level data.¹⁹

Output tariffs are available on the 3-digit industry-level, while input tariffs are merely available on the 2-digit industry level because of the weighting procedure. These tariffs allow us to identify an employment effect of the EU eastern enlargement while acknowledging that different countries and industries have already started to liberalise tariffs before the actual enlargement event.

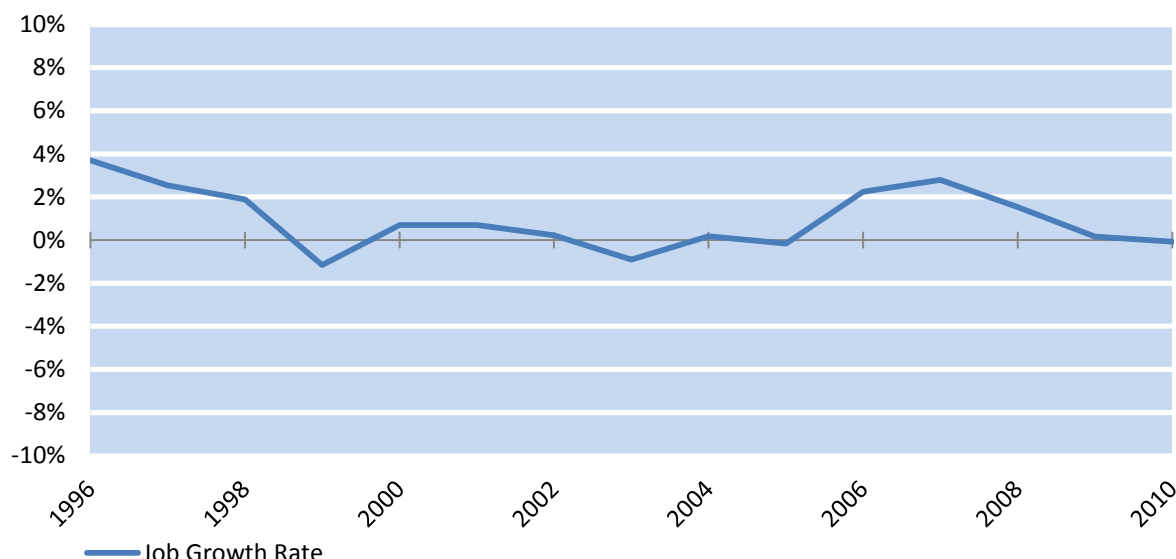
¹⁸ The exact regulations on the reduction of trade barriers can be taken from the respective EEA Agreement with the individual accession countries (for instance the agreement between the EU member states and Bulgaria:
(<http://eurlex.europa.eu/legalcontent/DE/TXT/?uri=uriserv:OJ.L .1994.358.01.0003.01.DEU>)).

¹⁹ The World Input-Output Database (WIOD) contains value-added data as of 1995 for all EU member states, 13 important economies and the rest of the world in the aggregate (see http://www.wiod.org/new_site/home.htm). For each economic branch of a country, the database contains the origin and the whereabouts of the goods produced in this country. This information is in turn available separately for countries and goods. In this way, value chains as well as the intensity of trade relationships can be analysed at the level of country-branch pairs (see Timmer et al., 2015).

3.3 Descriptive Statistics

In this section, we present some descriptive statistics on the dependent and independent variables of interest. All descriptive statistics use representative panel weights.²⁰ Our main dependent variable is job growth. The calculation is presented in Section 3.1. We also look at job creation, job destruction or job reallocation rates.

Figure 3.1: Job Growth in German Firms, 1996-2010



Source: Own calculations based on LIAB Cross-Section Model 2 1993-2010.

Figure 3.1 plots average job growth per year during the time span 1996-2010. Average job growth is 0.9%, ranging between 3.6% in 1996 and -1.2% in 1999. Following the business cycle, the years between 1999 and 2005 have been meagre, while Germany has experienced remarkable job growth in the late 2000s and also very stable job growth during the Great Recession of 2009 and thereafter; see for a discussion Dustmann et al. (2014).

However, the heterogeneity in job growth rates between firms is relatively large and can be explained by a couple of firm characteristics. For instance, firms with 20-50 employees have grown by about 2.6% over this time period, while large firms have only grown by about 0.5%.²¹ Small firms usually have higher job creation, but also higher job destruction rates; so that job reallocation is decreasing in firm size (see Figure A.2 in the Appendix). Also, in contrast to U.S. manufacturing employment, which has fallen by about 32% between 1991 and 2011 (cf. Acemoglu et al., 2016), German manufacturing employment has been quite stable during that time, even growing at a rate of about 0.2% per year on average, while still trawling behind service sector employment growth at 1.2% per year on average.

As our independent variables of interest, we look at two types of variables. First, we differentiate whether firms export to the new Eastern European member states. Between 2004 and 2007 on average 3.4% of all firms in the sample state that they export to new Eastern European member

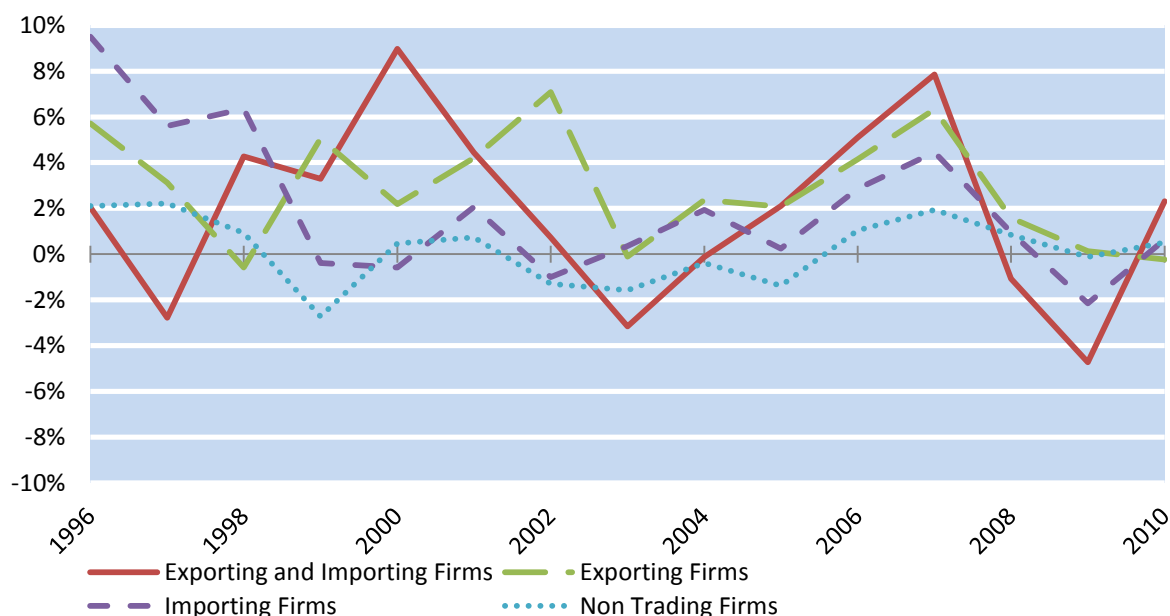
²⁰ Using these weights allows us to draw conclusions on the universe of all German firms with at least one employee subject to social security contributions (Heining et al., 2013).

²¹ Small and medium-sized enterprises, the so called German „Mittelstand“ are generally viewed as the growth engine of the German labour market.

states. These firms employ 15.5% of all employees. About one in three exporting firms supplies Eastern Europe.²² While we cannot observe changes in the exporting behaviour to Eastern Europe over time for the entire period, this is possible for exports in general, see Figure A.3. Note that there is a surge in the share of exporting firms of 2.1 percentage points between 2003 and 2005.²³ As regards import behaviour we differentiate whether firms have purchased the material used in production from outside Germany. This variable is asked in 1999, 2001 and 2003 and about 30.7% of all firms claim to do so. Again, we cannot measure this variable over time. Instead Figure A.3 displays the share of firms which had an organisational change that involved more purchases of products and services during the last two years. Note that this share does not necessarily increase over time.

If we combine this information, we can account for the heterogeneity in job growth rates by differentiating between firms according to their trading behaviour, see Figure 3.2). First, firms which export and import have the most volatile job growth, i.e. the job growth rates differ between the years (red line in Figure 3.2). Second, firms which neither export nor import have the least volatile job growth, but also relatively low average job growth of 0.2% per year, compared to exporting and importing firms with an average of 2.0% per year. Finally, firms which only export have higher job growth rates on average than firms which only import (2.9% versus 2.1%).

Figure 3.2: Job Growth in German Firms by Trading Behaviour



Source: Own calculations based on LIAB Cross-Section Model 2 1993-2010.

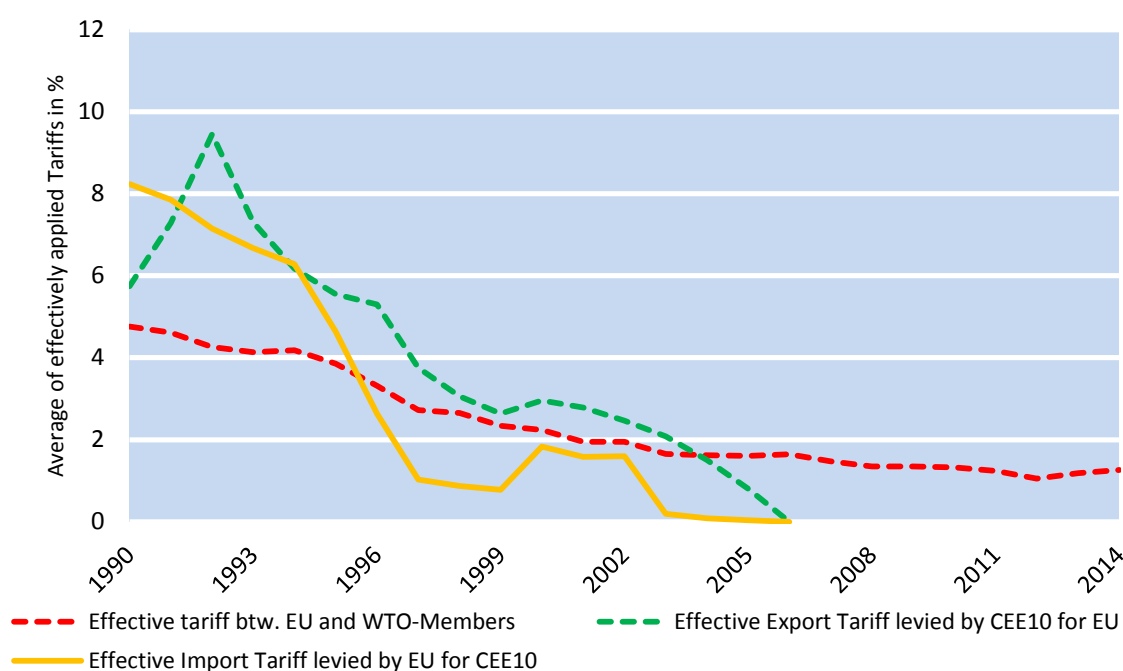
Now, we abstract from actual firm behaviour to the potential treatment intensity induced by effective tariffs on imported and exported goods between the old member countries of the European Union (EU15) and the new Eastern European member states (CEE10). Figure 3.3 plots the average effective import tariffs (yellow line) and export tariffs (green dotted line) during the

²² In the overall sample, 10.1% of all firms employing 30.1% of all employees are exporting firms.

²³ This is up from 9.0% exporting firms in 2003 to 11.2% exporting firms in 2005. The total export share in sales, including non-exporting firms, rises from 24.6% in 2003 to 29.8% in 2005.

time period between 1990 and 2014 across all industries. As a comparison, we also show the average tariffs between the EU and WTO member countries, weighted by import volume (red dotted line). We can see that both import and export tariffs between EU15 and CEE10 countries fall constantly from relatively high levels in the early 1990s to zero in 2006. Import tariffs from CEE10 to the EU15 countries fall more sharply. In 2002, two years before the first EU Eastern Enlargement, import tariffs are down from over 8% to 2% and reach almost 0% in 2003. For export tariffs, the rates fall from 9.5% in 1992 to 2.5% in 2002 and finally zero in 2005. From this picture it becomes clear that trade liberalisation is not a surprising, but a gradual process.

Figure 3.3: Effective Tariff Rates between EU15 and CEE10 Members



Source: Own calculations based on LIAB Cross-Section Model 2 1993-2010.

Finally, we present an overview of all variables in Table A.1 in the Appendix.

4 Econometric Method

Our empiric analysis answers the question of what are the (heterogeneous) employment effects of the EU Eastern Enlargement for German firms. In the literature on international trade, many empiric studies use information on firms' exporting behaviour, e.g. the share of exports on total sales, to estimate labour market effects of international trade (e.g. Felbermayr, Hauptmann and Schmerer, 2014). Kasahara and Lapham (2013) argue that this is a good measure of a firm's engagement in international trade, while Bernard et al. (2007) stress that exporting and importing/offshoring could be seen as complementary, such that observing only one of two sides leads to biased results.²⁴ A further problem arises as this information is most likely endogenous (see, e.g., Baumgarten, 2015, for a discussion).²⁵

Therefore, the new empirical trade models prefer to use exogenous variation in trade costs as the source of identification. This type of variation could stem from the conclusion of a trade agreement, such that trade costs fall at a specific date for all firms.²⁶ Previous studies have argued that the EU Eastern Enlargement constitutes such an event (Braakmann and Vogel 2010, 2011; Brühlhart et al. 2012). In this case, we could employ a difference-in-differences approach. In an ideal world, we would compare German firms affected by the trade liberalisation to firms which are unaffected, each before and after the event. There are two main critiques to that approach. First, of course, the trade liberalisation of the EU Eastern Enlargement has affected the German economy as a whole. Therefore, it is not possible to find *unaffected* firms as a control group. Second, trade liberalisation during the European Integration has been a steady process, reducing tariffs step by step and well before the actual ascension of the central and eastern European countries. Therefore, not all firms were affected by the same margin. However, it is plausible that trade liberalisation affects different firms to a different degree, allowing us to compare firms which are affected stronger, i.e. with higher treatment intensity, to firms which are less affected.

Why are firms differently affected by trade liberalisation? First, firms are to a different degree engaged in international trade. Firms which export can profit from falling trade costs, because their exports are getting cheaper; Firms which import can profit from falling trade costs, because their imports are getting cheaper. Firms which are unengaged in trade might suffer from falling trade costs, since they face an increase in import competition. Second, trade liberalisation is often asymmetric. This means that reductions in trade costs affect different products differently, e.g. depending on pre-liberalisation tariff rates. So some firms may experience large reductions in trade costs for specific products, while other firms are barely affected.

²⁴ This notion has been supported by the findings of, e.g., Amiti and Davis (2011) and Dauth et al. (2014). Looking at exports only would cause an upward bias, because the share of imported inputs could rise in reaction to reduced trade costs, resulting in lay-offs from offshoring jobs.

²⁵ Reverse causality could be one problem, if firms with higher employment growth are more likely to trade. This mechanism can be implied from a Melitz (2003) model, where more productive and therefore larger firms in an industry are more likely to export.

²⁶ Of course it has to be assumed that firms cannot influence the outcomes of trade agreements. This could be not the case for large firms, monopolies or oligopolies, or firms successfully engaging in lobbying. In fact, Stoyanov (2014) analysis this question using empirical evidence from the CAN-US FTA negotiations.

Using this information, our preferred measures of treatment intensity are, on the one hand, firms characterised by a different trading behaviour and, on the other hand, industry differences in pre-enlargement tariff rates. Our method therefore combines the approaches by Lileeva and Trefler (2010) and Amiti and Davis (2011).²⁷ It is very important for our analysis to have access on micro panel data, i.e. on single firms over time. This data structure allows us to utilise between- and within-level variation to identify causal effects.

Our basic econometric design constitutes a difference-in-difference (DiD) specification using different treatment intensity measures as well as fixed effects (FE) to control for time-invariant firm heterogeneity. We explain the yearly employment growth y_t for every firm i in industry, to capture the relative difference in employment between year t and year $t - 1$:

$$y_{i(j)t} = a + b_1 \cdot post_eu_{(ij)t} + b_2 \cdot export_{i(j)} + b_3 \cdot post_eu_{(ij)t} \cdot export_{i(j)} + b_4 \cdot import_{i(j)} + b_5 \cdot post_eu_{(ij)t} \cdot import_{i(j)} + c_k \cdot X_{i(j)t} + d_j + d_t + e_{i(j)t}$$

We compare firms' employment growth before and after the Eastern EU Enlargement (first difference) between firms which are differently affected by trade liberalisation (second difference). The first difference is captured by a before-after indicator variable $post_eu_{(ij)t}$, which takes a value of one in the years 2004 and thereafter (and a value of zero in the years 2003 and before). As a first measure of treatment intensity, we use the actual exporting and importing behaviour of the firms. The variable $export_{i(j)}$ captures whether a firm exports to the new EU member countries in the years 2004 to 2007 (see Section 3.1).²⁸ The variable $import_{i(j)}$ captures whether a firm has offshored parts of their production in the years 1999, 2001 or 2003, i.e. before the EU Eastern Enlargement.²⁹ Additionally, we control for a vector of firm characteristics $X_{i(j)t}$ including firm averages of employee characteristics. These variables control for observable time-variant heterogeneity, while unobserved time-invariant heterogeneity is captured by fixed effects on the industry level d_j , and in some specification on the firm level a_i . Macroeconomic effects such as business cycles are absorbed by yearly indicator variables d_t . Standard errors are clustered on the firm level.

Both treatment intensity measures enter the equation on their own and interacted with the before-after-indicator variable. The coefficients of the interactions can then be interpreted as a causal effect of the EU Eastern Enlargement following a number of assumptions.³⁰ The treatment

²⁷ Alternative approaches have been pursued by Dauth et al. (2014) or Lichter et al. (2015), who follow the methodology of Autor, et al. (2013). Amiti and Davis (2011) use information on tariff rates on the goods produced by the firms. We do not have information on which products a firms produces and instead calculate the average tariff rates on the sector level (see Section 3.2).

²⁸ While treated firms are relatively easy to assign, the design of the control group is less trivial. It could be the case that firms which export in other regions of the world could be affected differently by the EU Eastern Enlargement than non-exporting firms.

²⁹ This variable has also been used by Moser et al. (2010, 2015), but only on a small sample and only until the year 2005.

³⁰ DiD requires, in addition to the OLS model assumptions, the existence of a parallel or common trend between treatment and control group. In the DiD, the treatment effect is the difference between the observed value of y and what the value of y would have been with parallel trends, had there been no treatment. The DiD estimates are bias if something other than the treatment affects the treatment and

intensity measures per se can be interpreted as a selection effect, i.e. indicating whether these firms have differed in the employment growth before the EU Eastern enlargement.³¹ The coefficient b_2 captures the exporter selection effect and should be positive according to the Melitz (2003) model. Exporting firms are more productive and grow more quickly. If trade liberalisation has a positive effect on more affected firms, then we would also expect a positive coefficient b_3 . For the import side, coefficients b_4 and b_5 , we do not have ex ante expectation as the theoretical implications are ambiguous. According to Grossman and Rossi-Hansberg (2008), trade liberalisation increases productivity through cheaper imported inputs. This would imply a higher job growth. However, trade liberalisation could induce additional offshoring, which would reduce job growth. Depending on which effect is dominant, the coefficients b_4 and b_5 would be positive or negative. Finally, we would expect a positive coefficient for b_1 , because the years after 2003 are generally characterised by a more positive development on the labour market in Germany.

In a second step, we estimate an alternative DiD and finally a third difference (DiDiD) using the Amity and Davis (2011) measure of treatment intensity: the maximum pre-EU Eastern Enlargement tariff rates on the 3-digit industry level.³² We can interpret these coefficients in such a way that firms, which have been exposed to a higher tariff rate, should be more affected by the EU Eastern Enlargement.

5 Regression Results

We now present the results of the empirical analysis. We first present the results from the simple DiD model including export and import behaviour as treatment intensity variables. Then, we present the second model including pre-enlargement tariff rates as an alternative measure of treatment intensity as well as the full model including the third difference (DiDiD). The last model will not present evidence on the import side of trading behaviour.

5.1 Difference-in-Differences Estimations

Table 5.1 shows the results for estimating the employment effects of the EU Eastern Enlargement by using a simple difference-in-differences model. Our model, however, also controls for importing behaviour, in contrast to the literature so far. We gradually add the variables of interest throughout the specifications, but control in all specifications for fixed effects on the industry level, for year effects, and for firm-size effects using indicator variables for different firm size classes (see Section 3.3).

In specification (1) we use a simple before-after estimator. The indicator variable post-EU shows that firms grow on average 1.7 percentage points more after the EU Eastern Enlargement in 2004. However, this applies to all firms and may also be caused by other factors. Especially, in

control group differently. Also, when using the DiD model, several other issues may compromise the results, such as autocorrelation and Ashenfelter's dip.

³¹ As we assume parallel trends, this selection effect must be interpreted as a shifter of job growth, not affecting its slope.

³² The DiDiD approach follows Blundell und Costa Dias (2009) to compare the outcomes before and after an exogenous shock where the individual observations differ in the „shock intensity“. A similar estimation is used by Fries (2014), who uses the position in the pre-Enlargement productivity distribution as a measure of treatment intensity, regardless of firms' trade behaviour.

later specifications we can see that this effect becomes insignificant. In specification (2) we only include an exporter indicator variable. This specification checks whether exporting firms grow more strongly than non-exporting firms according to trade theory. We find an insignificant coefficient, suggesting that this does not seem to be the case naturally. However, when we check this coefficient in later specifications, we find the expected positive and significant exporter selection effect, which the Melitz (2003) model predicts.

Specification (3) is our first DiD-model. We interact the exporter indicator variable with the before-after indicator and, first, find that firms grow on average 1.2 percentage points more after the year 2004; we find, second, that exporting firms have grown 0.9 percentage points more before the EU Eastern Enlargement; and we find, third, that firms exporting to EU accession countries have grown less than non-exporting firms after the EU Eastern Enlargement, by about 1.1 percentage points. This would suggest a negative employment effect of the EU Eastern Enlargement on firms with higher treatment intensity. These results are surprising, but suggest that other factors may play a role here, which a simple DiD-model does not account for.

Table 5.1: Employment Effects of the EU Eastern Enlargement, simple DiD estimations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Method:	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Dependent Variable:	JGR	JGR	JGR	JGR	JGR	JGR	JGR
Post-EU	0.0169*** (0.044)		0.0125** (0.0058)		-0.0027 (0.0056)		-0.0064 (0.0064)
Exporting Firm		0.0016 (0.0020)	0.0086*** (0.0031)			0.0046* (0.0025)	0.0062* (0.0033)
Importing Firm				-0.0011 (0.0018)	0.0014 (0.0023)	-0.0022 (0.0020)	-0.0010 (0.0027)
Interaction Post-EU * Exporting Firm			-0.0108*** (0.0032)				-0.0032 (0.0037)
Interaction Post-EU * Importing Firm					-0.0061** (0.0028)		-0.0025 (0.0033)
Industry Fixed Effects	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***
Year Fixed Effects	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***
Firm Size Fixed Effects	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***
# of Observations	111254	90899	90899	72708	72708	58883	58883
# of Firms	19221	13437	13437	13384	13384	9259	9259
F-Test	24.15	16.90	16.72	15.91	15.68	12.31	12.09
R ²	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Note: *** p<0.01, ** p<0.05, * p<0.1. Post-EU is an indicator variable that takes a value of one for all years after 2004. Exporting firm identifies firms that have ever exported to the EU accession countries. Importing firms indicates whether a firm has increased the share of imported intermediate inputs before the EU enlargement. For a list of all indicator variables, see the Appendix. The calculated standard errors are clustered at the firm level.

Source: Calculations based on the LIAB cross section model 2 1993-2010.

Our first contribution is to look at the import side of trade behaviour. We do this in specifications (4) and (5). We first only use an importing firm indicator. According to economic theory, there could be also an importer selection effect, if more productive firms increase their imported inputs and therefore strengthen their employment growth. However, the direct negative employment effects of offshoring parts of the employees could counteract this effect. In fact, we see

an insignificant effect, suggesting that both effects more or less cancel out.³³ The importing firm indicator variable stays insignificant for the rest of our analysis. In specification (5) we interact the importing firm indicator variable with the before-after-indicator variable for a simple DiD model. There, we find a negative treatment effect of the EU Eastern Enlargement of -0.6 percentage points. This means that firms which have increased their share of imported inputs before the EU Eastern Enlargement are more negatively affected by this event in terms of employment.

Finally, specification (6) and (7) we simultaneously look at the exporting and importing behaviour of firms. First, specification (6) confirms a positive, albeit smaller, exporter selection effect of 0.5 percentage points and the absence of an importer selection effect. The last specification (7) finds that simultaneously looking at importing and exporting firms leads to insignificant treatment effects.³⁴ This may sound a bit disappointing, but can be a reflection of anticipation effects and the fact that trade liberalization with member states from Eastern Europe has largely occurred before the actual accession of these countries.

Two robustness checks have been performed in this context. First, the treatment and control group have been adjusted in such a way that the treatment group only contains firms which are actually exporter in the respective year, while the control group only contains firms that do not export. This does not change the results.

5.2 Difference-in-Differences-in-Differences Estimations

In a second step, we distinguish treatment intensity not only by firm behaviour, but by the actual reduction in pre-Enlargement tariff rates the firms have enjoyed after 2004. Using this approach, following Amity and Davis (2011) and Lileeva and Trefler (2010), should solve the endogeneity problems other studies suffer from when using observed firm characteristics, e.g. trade behaviour (Baumgarten 2015) or productivity (Fries 2014) as a measure of treatment intensity.

Two possible alternative methods can be discussed here. First, an alternative DiD model which uses tariff reductions instead of a before-after indicator. Second, an extension of the DiD model of the previous section by a third difference, i.e. a DiDiD model, which uses the pre-Enlargement export and import tariffs on the industry level as a further treatment intensity indicator. The latter approach has the advantage that we can differentiate between a pre- and a post-Enlargement effect, which helps to integrate our findings in the existing literature on the effect of the European Integration.³⁵ We only present results for the export side here, as the results for the import side are mainly insignificant.

³³ For a discussion on the different employment effects of offshoring, see Moser et al (2015).

³⁴ In fact, this specification does not control for exporting and importing vs. only exporting vs. only importing vs. no trade at all (cf. Baumgarten 2015). This has been done in a robustness check without different insights.

³⁵ In addition, the first approach suffers from the fact that after 2005, tariffs are mostly flat, such that it is not possible to use the yearly tariff reductions as a variable in the equation.

Table 4.5: Employment Effects of the EU Eastern Enlargement, DiDiD Estimations

Method:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent Variable:	OLS	OLS	OLS	OLS	OLS	OLS	OLS
	JGR	JGR	JGR	JGR	JGR	JGR	JGR
Post-EU	0.0169*** (0.044)			0.0125** (0.0058)	0.0218*** (0.0073)		0.0229** (0.0114)
Exporting Firm		0.0016 (0.0020)		0.0086*** (0.0031)		-0.011 (0.0024)	0.0065 (0.0047)
Pre-EU Enlargement Export Tariff			-0.0590*** (0.0211)		-0.0585*** (0.0226)	-0.0612 (0.0386)	-0.0540 (0.0421)
Post-EU * Exporting Firm				-0.0108*** (0.0032)			-0.0099** (0.0049)
Post-EU * Pre-EU Enlargement Export Tariff					-0.0042 (0.0468)		0.0402 (0.0916)
Exporting Firm * Pre-EU Enlargement Export Tariff						-0.0035 (0.0401)	-0.0365 (0.0467)
Post-EU * Exporting Firm * Pre-EU Enlargement Export Tariff							-0.0040 (0.1011)
Industry Fixed Effects	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***
Year Fixed Effects	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***
Firm Size Fixed Effects	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***
# of Observations	111254	90899	56399	90899	56399	48176	48176
# of Firms	19221	13437	13244	13437	13244	10826	10826
F-Test	24.15	16.90	12.40	16.72	12.15	10.32	9.79
R ²	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Note: *** p<0.01, ** p<0.05, * p<0.1. Post-EU is an indicator variable that takes a value of one for all years after 2004. Exporting firm identifies firms that have ever exported to the EU accession countries. Export tariff specifies the maximum export tariff rate before EU enlargement for the industry level. For a list of all indicator variables, see the Appendix. The calculated standard errors are clustered at the firm level.

Source: Calculations based on the LIAB cross section model 2 1993-2010.

Table 4.5 shows the results from the DiDiD model. Similarly to above, we start with a simple before-after estimator and include more additional variables step-by-step in further specifications. We will discuss each specification and its implications in the following.

In specification (1) we only include the before-after-indicator, which suggest that employment growth has been 1.7 percentage points higher in the years after 2004 than in the years before. In the following specification, this coefficient remains its significance and even rises to 2.3 percentage points. Specification (2) explores whether exporting firms generally grow faster. Using this indicator only leads to a positive, but insignificant coefficient. In later specifications, we see sometimes a positive exporter selection effect of up to 0.8 percentage points larger job growth per year on average. We first introduce the pre-Enlargement industry-level export tariff in specification (3). The negative coefficient suggests that a one percent higher export tariff is associated with a lower employment growth of 5.9 percentage points.

The next three specifications contain difference-in-differences specifications. Specification (4) performs a diff-in-diff estimation similar to Section 5.1. The interaction between the before-after-indicator and the exporting firm variable indicates a negative treatment intensity effect. Exporting firms grow 1.1 percentage points less after the EU Eastern Enlargement than non-exporting firms. Specification (5) interacts the before-after-indicator with the pre-Enlargement tariff rates. The insignificant coefficient suggests that after the EU Enlargement, firms in sectors with high pre-Enlargement tariffs do not grow more than firms with lower tariffs. This results

pools over all firms within an industry, however. It can be the case that potentially positive effects for exporters cancel out with potentially negative effects for non-exporters. Therefore, in the next specification (6), we look at the interaction between pre-EU Enlargement tariffs and exporting behaviour of firms. We find that controlling for tariffs reduces the exporting selection effect and also that exporting firms do not profit more or less from (the reduction in) pre-Enlargement tariffs.

Finally, specification (7) presents the triple difference estimations. The coefficient in the last column shows the treatment effect of higher pre-Enlargement tariff rates on firms with higher treatment intensity, i.e. exporting firms, before and after the EU Eastern Enlargement. The effect is insignificant, such that we would conclude that there are no relevant employment effects of the EU Eastern Enlargement. The other variables and double interaction variables are in line with earlier specifications.

5.3 Discussion

We have to acknowledge that our detailed analysis is restricted to the export side, since we do not have information on import destinations. Furthermore, the measurement of the export variable may lead to biased results, since it includes firms which always exported to Central and Eastern European countries as well as firms which only started to export there before the EU Eastern Enlargement.

6 Conclusion

The analysis of the employment effects of trade liberalization has not been in the focus of the international economics literature. This is astonishing since they play a prominent role in the context of policy debates and research in other social sciences and other fields of economics. This is due to, among other things, the fact that many theoretical trade models have assumed perfect labour markets and into the lack of suitable data bases for empirical analyses.

This study uses linked employer-employee data for Germany to analyse the effect of trade liberalisation on German firms. We use the EU Eastern Enlargement as an event study where tariffs between Germany and some of its main trading partners have been severely cut over the course of ten years, mostly prior to 2006. We identify the employment effects of market liberalization in foreign trade using employment growth rates in the period of 1996 to 2010. We employ modern econometric techniques namely the actual reduction in industry-level export and industry tariffs in conjunction with firm-level information on trading behaviour both in the import and export side (cf. Amiti and Davis 2011).

It is clear from the outset that trade liberalization has two sides: an export side, where one would expect a priori to have positive effects on employment growth, and an import side, with the multiple effects involved that partly counteract. First, there is the effect of import competition on the domestic product markets, which suggest a negative impact on employment. Then, there are also effects on the imported intermediates: on the one hand the direct displacement effect by "offshoring", which will also have a negative impact on employment, on the other hand the effect of cheaper imported inputs, which - in analogy to a positive productivity effect - should have a positive effect on employment.

We observe indeed a significant positive effect of export status limited on employment growth, but this effect remains on closer inspection limited to the periods before the actual EU Eastern Enlargement. This indicates significant anticipation effects of European Agreements concluded in the 1990s, which could precede the trade liberalization of the EU Eastern Enlargement itself. On the import side, we observe - in line with the expectation - hardly significant or negative effects. It could be the case that firms that had already increased the share of imported inputs before the EU Eastern Enlargement in 2004, grew initially stronger, but after enlargement more slowly.

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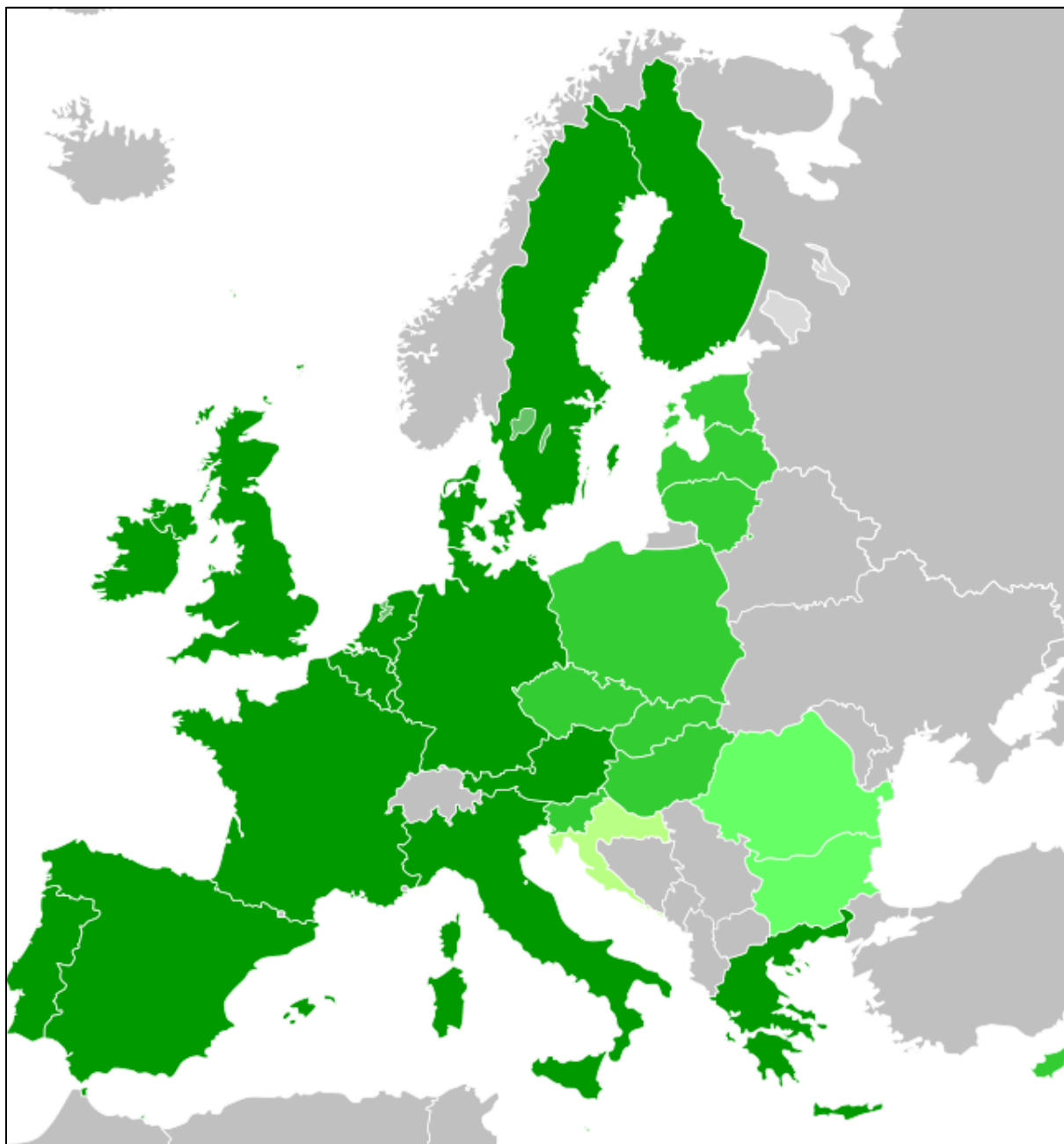
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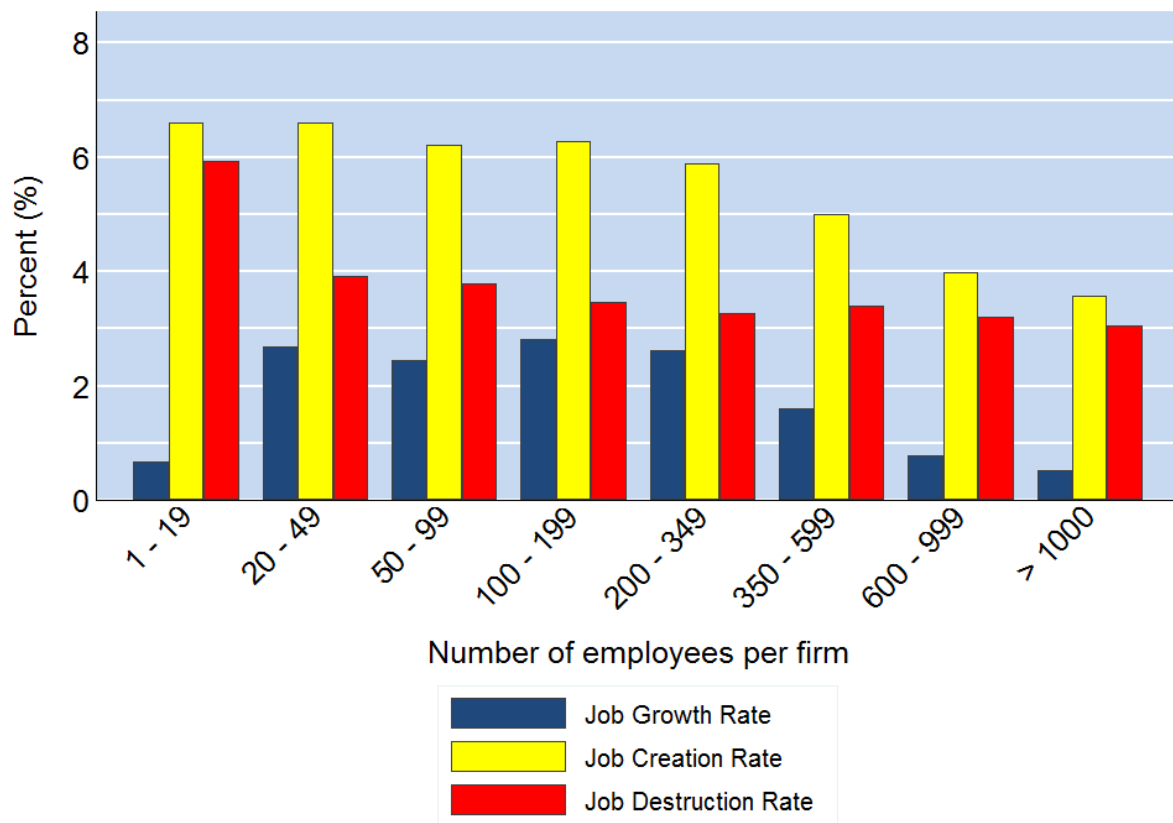
Appendix

Figure A.1: Map of the EU eastern enlargement



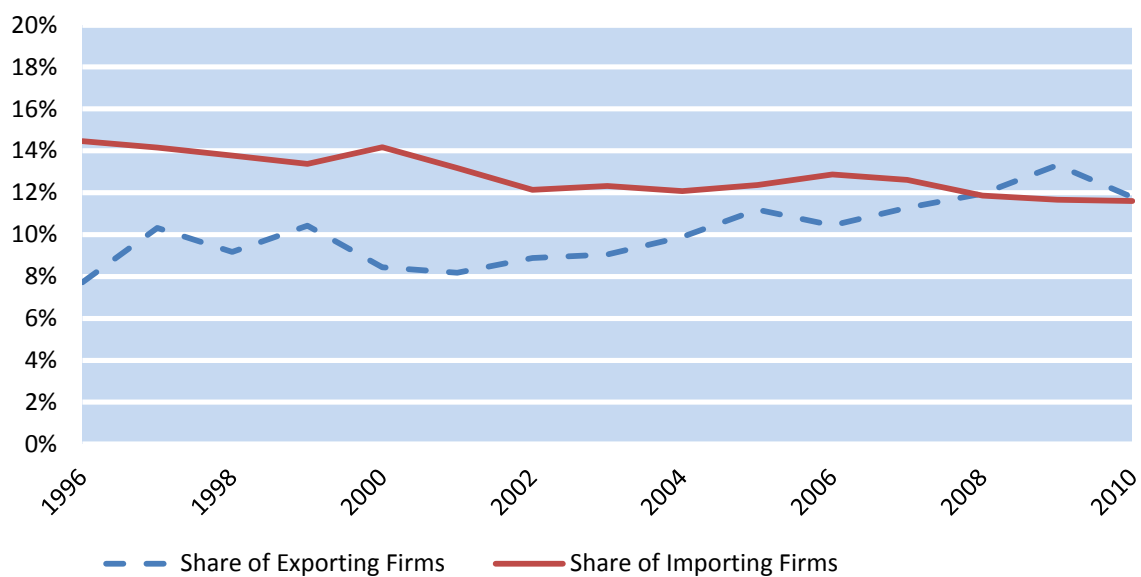
Source: WIKIPEDIA. Note: EU's enlargements in the 2000s: European Union Jan. 1995 - Apr. 2004, Joined the EU in May 2004, Joined the EU in Jan. 2007, Joined the EU in Jul. 2013.

Figure A.2: Job Flows Differentiated by Firm Size



Source: Own calculations based on LIAB Cross-Section Model 2 1993-2010.

Figure A.3: Share of Exporting and Importing Firms



Source: Own calculations based on LIAB Cross-Section Model 2 1993-2010.