Center for European, Governance and Economic Development Research
cege

Discussion Papers

Number 198 – March 2014

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ISSN: 1439-2305

The structure of Ethnic Networks and Exports: Evidence from Germany

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Abstract

This paper provides evidence of the effect of immigration-based networks on German trade. Germany presents a particular interesting case study to examine the effect of ethnic networks on exports due to its high export dependence and its reserved migration policy. According to our results, we find no trade creating effect from migrant networks on exports but on imports, highlighting the importance of the demand effect for Germany. Allowing for heterogeneous network effects shows that at least some migrant networks positively affect exports. However, the most efficient migrant networks do not originate from EU countries but from African or middle-eastern countries that do not have a large migrant network in Germany.

Key words: Migrants, Networks, Gravity

JEL-Code: F12, F1

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1. Introduction

In recent years the economic crisis had a strong impact on the amount and distribution of international migration, especially in Europe (OECD, 2011). While migration to Europe has decreased between 2007 and 2009 not all member countries were affected in the same manner. These countries, which were affected heavily by the crisis, have witnessed a strong decrease in immigration turning in some cases to an emigration surplus as in the southern EU countries or Ireland. On the other hand, countries that have withstood the economic crisis better have become particular interesting destination countries for migrants. According to destatis (2012), a sharp increase in the number of immigrants from EU countries can be observed in Germany, recently. Here, immigration from EU countries that are heavily affected by the financial crisis increased, as well as from countries that joined the EU in 2004 and 2007. In contrast, immigration from other European non-EU countries increased only slightly.

This is quite interesting because Germany cannot be considered as an immigration-friendly country with regard to its migration policy.

However, political efforts have been done to attract high-skilled workers from abroad to circumvent a shortage of workers. In the first half of 2012 labor migration channels for high skilled workers were broadened: For example, the "EU Blue Card" was introduced granting a renewable permit to tertiary-educated workers and also easy labor market access for their family members, without language requirements. In addition, job search periods for foreign university graduates were extended and a government program was designed that targets unemployed young skilled workers from EU countries (OECD, 2013).

Since Germany heavily depends on a rich and well developed workforce in order to maintain its economic strength as an export nation it has to attract foreign workers if there may be a shortage in the home workforce. This potential skill shortage problem is discussed quite often in German media and politics, as the country will face this problem eventually since the "greying of Germany" still continues. Next to solving the skill shortage problem there may be another advantage of attracting migrants and integrating them into the labor market, especially for an export nation. Migrants may affect trade in a positive way because they are able to reduce informal transaction costs associated with trade between two countries, which consist e.g. of information costs, language or communication barriers or also a low degree of contract enforcement. Migrants are more familiar with the legal system and culture of their

home country and speak the local language and can thus better identify market opportunities. In addition, they may introduce host country consumers to their home country products and may act as direct suppliers or intermediaries.

As Gould (1994) remarked, studies on migration issues have wide political implications for labor markets. Thus, one essential question is whether the distribution of the immigrants matters. Should a country accept many immigrants from one particular country or just a few people from several countries? This paper provides evidence of the effect of immigration-based networks on German trade using data at the federal state level.

This is a novelty since most papers use US state exports due to data availability (e.g. Co et al, 2004; Herander and Saavedra, 2005; Dunlevy, 2006; Bandyopadhyay et al, 2008). In the current paper we use export and import data at the federal state level, which are provided by destatis *(Statistisches Bundesamt)*. We construct a panel data set, which is guided by the data availability of state level exports as well as data on immigrants. Germany presents a particular interesting case study to examine the effect of ethnic networks on trade due to its high export dependence and its reserved migration policy. In this paper we study the impact of immigration in Germany on its trade patterns with 82 partner countries between 2005 and 2011. In addition to a wide cross-sectional dimension by using federal state data we also have a remarkably long time dimension that covers the beginning of the economic crisis. Secondly, we focus on country characteristics to attract immigrants in this paper. Thus, we analyze whether one can identify differences between ethnic networks over time since migration policy in Germany has changed and is now actively searching for immigrants from specific countries with certain job abilities. It is reasonable to believe that the home country of the migrants does matter for a "pro trade effect" as some countries may be more similar in terms of culture and institutions than others.

Methodologically, the present study follows the literature and applies theory founded gravity equations to estimate the effect of social networks (migrants) on German exports and imports.

The remainder of the paper is structured as follows: Section 2 discusses the relevant literature and economic theory. Section 3 provides an overview of the data set and gives some stylized facts over recent migration trends at the federal state level. Section 4 explains the empirical strategy and section 5 presents the results. The last section concludes.

2. Theory and Literature

According to the literature, migrant networks influence trade mainly because of two reasons. First, migrants reduce the transaction costs associated with trade between two countries. The second reason consists of the existence of a demand effect.

Trade between countries causes formal and informal costs. These informal barriers to trade consist of information costs (e.g. cultural or legal differences), language or communication barriers or also a low degree of contract enforcement. Especially information cost, which can be quite large, when a firm enters a new market, decreases, when a large group of migrants originating from this particular country, is already staying in the host country. This is due to the fact that migrants are more familiar with the legal system and culture of their home country and speak the local language. In addition, they have better knowledge of their home countries preferences and can thus better identify market opportunities. The *business and social network channel a´ la Rauch (2001)* builds upon this argument. Ethnic networks are likely to reduce at least some of these information costs because they match supply and demand due to their knowledge. Thus, they help to overcome incomplete information. In addition, networks may provide contract enforcement through sanctions. In this way, they can also mitigate problems due to asymmetric information.[1]

The network channel applies to exports and imports, since a decrease in information costs positively affects overall trade.

In addition, ethnic networks can influence trade though a so-called *transplanted home-bias effect or preference/demand channel*: Often, immigrants have developed preferences for certain products from their home country. Thus, they have the incentive to buy these products, even if they are more expensive and positively affect imports from their host country. Alternatively, they may introduce natives from the host country to their home country products, which also increase imports from the host country.[2]

Following the seminal contributions of Rauch (1999, 2001) an impressive literature has evolved searching for the empirical link between trade and immigrants.[3] The pioneering work

[1] However, the magnitude of a pro-trade effect also depends on immigrant's ability to relay information. The educational level of immigrants, their occupation, lengths of stay or the size of a particular immigrant community, are important determinants of a pro-trade effect. When immigrants work in export-oriented firms and positions they are also able to directly provide information to firms.

[2] The positive demand effect may be weakened if host country firms start to produce these introduced products due to the increased demand (import substitution) or if a third-country starts to produce these goods and compete with the migrant's home country exports to the host country.

[3] One can distinguish between three kinds of studies when analyzing the trade-migration nexus: The first group analyzes how trade between a single (host) country and many partner counties is influenced by the presence of migrants. The second group extends this question to a number of host countries but uses the same empirical

by Gould (1994) and Wagner (2002) set the standard for all following papers on empirical grounds that provided extensive evidence that migrants have a positive impact on exports and imports.

Generally, the empirical literature tests both the information and demand channel using the gravity equation. The trade elasticity of these two channels was rather intuitive expressed: Since the demand channel reflects only imports the difference between estimated export and import elasticity reflects the *information channel*. A common finding is that the import elasticity is higher than the export elasticity since both the demand and the information channel affect imports. However, it still remains an empirical problem to disentangle both channels. This would be of importance for identifying welfare gains since higher trade due to lower information costs leads to efficiency gains because resources could be reallocated.

Indeed, due to limited data availability, different estimation techniques and considered time spans, the range of estimates is quite wide spread. Thus, Wagner et al (2002) proposed to use migration and trade data at the regional level instead of the country level to mitigate some empirical problems as country-level studies do often suffer from an upward bias due to omitted characteristics.

Using panel data techniques solves this problem but a drawback of the fixed effects estimator is a loss of information leading to a magnification of measurement error. Using regional data has the advantage of having a wider cross-sectional dimension while not loosing the time dimension. Furthermore, regional level data can be used to deal with endogeneity bias that can happen due to spurious correlation or reverse causality. Finally, regional data mitigate the possibility of potential aggregation bias. There exist a growing number of studies at the regional level. Due to data availability most refer to the US and Canada (see e.g. Bardhan and Guhathakurta (2004); Co et al (2004); Dunlevy (2006); Milimet and Osang (2007); Bandyopadhyay et al (2008); Tadesse and White (2008) (Herander and Saavedra (2005); Helliwell (1997); Wagner et al (2002)). The obtained results support the pro-trade effects of ethnic networks.

In addition, a small number of regional-level studies exist for European countries. For example, Hiller (2011) uses firm-level data to examine the trade-immigration link in Denmark. She finds a positive effect of migration on Danish manufacturing trade within Europe, especially for small and medium sized enterprises. Combes et al (2005) look at

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methodology. The last group analyzes how the presence of migrants from one country in a number of different countries induces trade between these countries („third-country migrants“). The current paper belongs to the first group.

„intra-national“ trade in France, confirming the importance of ethnic networks to improve trade, even within a country. In addition, Briant et al (2009) assess the influence of foreign-born residents on the international imports and exports of the French regions where they are settled. They find that the trade-enhancing impact of immigrants is, on average, more salient when they come from a country with weak institutions. Differentiating between simple and differentiated products they find that immigrants increase complex imports regardless of their home countries institution quality while this is not the case for „simple“ products. Regarding exports, immigrants substitute for weak institutions on both simple and complex goods.
Exploiting data at the very fine *NUTS-3* level, Bratti et al (2012) find a positive link between immigration and export and import flows in Italy, confirming past literature. A novelty of their paper is the use of instrumental variables to account for possible endogeneity. Then, they only find a positive effect for imports, suggesting the importance of the preference channel. Hatzigeorgiou (2010) gives evidence of a trade-creating effect of immigrants in Sweden. In light of these results, he argues that migration issues should get higher attention in trade policy and economic policy considerations. Finally, Peri and Requena-Silvente (2010) analyze the existence of a trade-creating effect of immigrants in Spain. They quantify the impact of new immigrants on the extensive margin (number of transactions) and intensive margin (average value per transaction) of exports. They observe that immigrants increase exports and that the effect is almost entirely due to an increase in the extensive margin. Overall, all studies find trade-creating effects of immigrants highlighting the importance of certain immigrant’s and country characteristics and thus the importance of some channels and goods where the effects are higher. However, no study has considered analyzing the magnitude of the trade-immigration link in Germany using regional data, as far a we are aware of. The present study is filling this gap, as Germany is a particular interesting case due to its dependence on exports and its restrictive immigration policy in the past, which has slightly changed since the recent economic crisis.

3. Data and descriptive statistics

Our data set is obtained from two available data sets from the German National Statistical Institute *(destatis*). Bilateral export and import data come from 16 German federal states (Bundesländer) to 82 countries around the world, covering the period 2005-2011. Trade data are expressed in current euros. Gross regional product (GRP) is derived as well from destatis. GDP values of partner countries are taken from the World Development indicators 2013 (WDIs online database 2013). They are expressed in current US dollars. All original values in

Euro have been converted to US dollar, using the nominal exchange rate from the World Development indicators. Our data covers immigrants to Germany from a number of countries worldwide, covering the same time period. Immigrants are reported as the stock of foreign-born residents in each federal state at the 31 of December of each year. The summary statistics and descriptions of the variables are shown in table 1.

Table 1 Variable Description and Summary Statistics (2005 – 2011)

Variable	Description	Obs	Mean	Std. Dev	Min	Max
Ln Imports	Log of total value of imports in US dollars	8952	10.63	3.20	0.22	17.66
Ln Exports	Log of total value of exports in US dollars	9184	11.31	2.38	1.32	17.13
Ln product of GDPs	Log of total value of GDPs in US dollars, for a given country pair	9168	37.46	1.97	31.79	43.93
Ln Distance	Air Distance between capital cities, for a given country pair	9184	7.94	1.11	4.38	9.83
Ln Immigrant	Log of total number of immigrants, for a given country pair	7721	6.66	1.94	0	13.29

Since our dataset covers bilateral trade and immigrants from 82 partner countries the observed patterns can be viewed as representative for Germany. We observe very similar movements and size dimensions in our data as in the official data from destatis.

According to our data set, the number of immigrants steadily increased reaching a high inflow in 2011 that resulted in a stock of nearly 6 mill immigrants at the end of the year. Table A1 summarizes the top 20 source countries of immigrants to Germany. Most immigrants arrive from EU countries with Italy, Poland and Greece providing the highest stock of immigrants. However, the highest amount of immigrants is from Turkey having a share of around 30 % in the stock of immigrants over the considered time span. The ranking of the top 7 home countries is also quite stable over time. High differences in their placement can be found only for the countries that joined the EU in 2007: Romania which increased its ranking from 18 to 8 and Bulgaria (27 to 18). The stock of immigrants from both countries has also witnessed an exceptional high average growth rate. All other countries show relatively low average growth rates in the considered time span. Looking at the absolute change in the number of immigrants between 2010 and 2011 reveals that many trends are happening quite recently. For example, the high inflow from eastern European countries can

be attributed to the fact that transitional labor market restrictions on EU8 nationals ended in May 2011. The number of immigrants from southern EU countries increased. While their average growth rate is quite zero (Spain, Portugal) or even negative (Greece), the absolute number of immigrants increased relatively strong between 2010 und 2011. Interestingly is also a look at the distribution of immigrants at the federal state level.

Here, figure A1 and table A3 reveal some remarkable pattern: First, the highest stock of immigrants can be observed in four federal states: Nordrhine-Westpfalia, Baden-Würtemberg, Bavaria and Hessen. These are also the federal states that have the highest gross regional products in Germany. However, the highest average growth rate can be found in Berlin and the highest growth in absolute numbers between 2005 and 2011 is observed in Bavaria, Berlin, Baden-Württemberg and Nordrhine-Westphalia. Second, immigration policy seems to have an impact on the distribution of immigrants in the long run as well as geographical closeness like sharing a border: The top five home countries of immigrants are significantly different in the "new federal states" than in the "old federal states". In almost all old states, Turkey is the number one immigration source country followed by Poland. The other 3 or 4 top source countries share a high geographical proximity with the respective federal state. For example, a high number of immigrants in Lower Saxony (NI) come from the Netherlands while a similar pattern can be observed for Bavaria (Italy), Schleswig-Holstein (Denmark) or Saarland (Italy, France).

In contrast, the "new federal states" rank Poland, Russia and Vietnam as their top immigration source countries. The different political systems in west and eastern Germany have attracted immigrants from different countries due to their different ideologies, which resulted in different stocks of immigrants according to the source country at the federal state level. With regard to the eastern EU enlargement in 2004 and 2007 the inflow of eastern immigrants to "old federal states" has increased sharply but it has not been enough to significantly change the ranking of the immigrants source countries.

The next section presents the empirical methodology to formally test whether networks of immigrants have an impact on bilateral trade and if the country of origin does matter for the results.

4. Empirical Strategy

Following the literature we apply a theory-based Anderson and van Winccop (2003) gravity equation to estimate the trade-creating effect of migrant networks in Germany. However, we use the slightly modified utility function introduced by Combes et al (2005). They introduce source-country specific weights a_{rj} that reflect the attachment of a federal states household to imports from partncr country j. As will be shown, this approach allows identifying the information and preference channel in the gravity equation. Applying the usual assumptions of symmetric iceberg trade costs (and preference weights) one arrives at the traditional AvW gravity equation:

$$X_{rj} = \frac{Y_r Y_j}{Y_w}\left(\frac{T_{rj}}{a_{rj}}\right)^{1-\sigma}\left(\widetilde{P_r}\widetilde{P_j}\right)^{\sigma-1} \quad 1)$$

where the price indices $\tilde{P}$ solve

$$\left(\widetilde{P_j}\right)^{1-\sigma} = \sum_{j=1}^{C}\left(\frac{Y_r}{Y_w}\right)\left(\frac{T_{rj}}{a_{rj}}\right)^{1-\sigma}\left(\widetilde{P_r}\right)^{\sigma-1} \quad 2)$$

where r, and j are subscripts for the German federal states (regions), the foreign country and X_{rj} are the exports (or imports) from region r to country j. $Y_r Y_j$ are GRP and GDP, the subindex w refers to world income.

The multilateral price terms $\tilde{P}$ are generally unobservable. However, not controlling for them leads to biased results. One relatively easy way to control for these terms is by adding exporter and importer fixed effects. T_{rj} denotes trade costs between a trading pair. In line with our reasoning in the previous section, we assume that trade costs are a linear function of measures related to transportation costs (distance, continguity) variables, related to trade policy (e.g. EU membership) or cultural proximity. In addition, we assume that trade costs also (negatively) depend on immigrant networks. Formally, the log-linearized trade cost function can be written as:

$$\ln T_{rj} = a_T X_{rj} - \sum_k v_T^k N_{rj}^k \quad 3)$$

where X is a vector of trade cost related variables. N_{rj}^k measures the strength of the immigrant's k-ethnic network in federal state r. The associated coefficient v_T^k measures the

effect of networks on trade costs. A positive coefficient would imply that an immigrant network from ethnicity k would reduce trade costs thus representing the trade cost channel al à Rauch.

In addition, federal state r´s proximity to country j increases the weight of goods imported from j. Thus, the preference channel can be expressed as:

$$\ln a_{rj} = a_T X_{rj} + \sum_k v_a^k N_{rj}^k \qquad 4)$$

Evidence of a positive coefficient v_a^k would suggest the existence of a preference effect of immigrant networks.

Inserting equation 3) and 4) in the AvW gravity model and applying time subscripts t leads to the following empirical estimation:

$$X_{rjt} = exp\{\ln(Y_{rt}Y_{jt}) + a_b X_{rjt} + \sum_k \bar{v}^k N_{rjt}^k + u_{rt} + u_{jt}\} + \varepsilon_{rjt} \qquad 5)$$

ε_{rjt} is the classical error term. $u_{rt}$and u_{jt} are region and partner country fixed effects and substitute for the multilateral resistance terms. Since we have a panel data set these effects need to be time-varying. Recent literature has shown the importance to control for multilateral resistance terms. Baier and Bergstrand (2007) recommend that using fixed effects, which control for unobserved factors, can mitigate several problems leading to inconsistent results.[4]

However, it is debatable which combination of fixed effects is best suited in a particular context since the structure of fixed effects has an effect on the estimated coefficients.

We introduce several combinations of fixed effects $\propto$ whose inclusion could be justified to control for multilateral resistance terms:

$$\propto = \delta_{rj} + u_{jt}$$

$$\propto = \delta_{rj} + \theta_t$$

$$\propto = \gamma_r + \varphi_j + \theta_t$$

[4] They convincingly argue for the combination of country-pair as well as time-varying country and partner effects to control for omitted variable bias due to country heterogeneity and multilateral resistance terms in a panel data contcxt. Alternatively, first differencing and the inclusion of time-varying effects is recommended (see Baier and Bergstrand, 2007; Felbermayr and Joung, 2009).

where δ_{rj} are region x partner-country (trading-pair) fixed effects, θ_t are year effects, u_{jt} are time varying-partner country fixed effects. γ_r reflect unobservable effects at the federal state level while φ_j substitute for partner country effects.

Especially the inclusion of trading-pair and time-varying effects has been shown to be important for a precise estimation since they help to overcome endogeneity due to omitted (trading-pair specific) variable bias and correctly control for multilateral resistance terms in a panel data context.

The importance of fixed effects is demonstrated in table 2. Here, the adj R2 of regressing exports, imports and immigrants on different combinations of fixed effects is shown:[5]

Table 2: Adj. R^2 for models using different fixed effects

	Exports	Imports	Immigrants
region, partner, year	0.9299	0.8347	0.8946
regionXpartner , year	0.8938	0.8535	0.9299
regionXpartner, partnerXyear	0.9701	0.9448	0.9956
regionXyear, partnerXyear	0.9316	0.8302	0.8889

Note: Table reports the adjusted-R^2 obtained regressing, alternatively, imports, exports, and immigrants on different sets of dummies. In all cases the dependent variable is ln(x).

The inclusion of the less demanding region, partner and year effects captures already around 90 % of the variation in exports and the stock of immigrants. For imports just over 80 % of the variation is captured. The captured variation slightly increases when trading-pair effects and time-varying partner effects are included: Now, around 95 % of the variation of imports flows and nearly everything of immigration stocks, our main variable of interest, is explained. Interestingly, the explained variation remains nearly constant when time-varying region effects and/or time-varying partner effects are included although it is theoretically recommended. This suggests that most of the variation in our specific data is explained by trading-pair characteristics and not by variations in trade costs. Although including trading-pair and time-varying effects *and* trading-pair effects is recommended it is particular demanding. Furthermore, it is questionable if the effect of immigrants on trade can be identified, since it clashes with the very little variation left in the data. Thus, we will stick to controlling for multilateral resistance terms and clustered standard errors at the region-partner

[5] We follow Bratti/De Benedectic/Sarlatti (2012) with this exercise.

level. This will leave us with enough variation in the data to identify empirical effects.

Another problem in estimating the impact of migrant networks on trade may be a spurious relationship or simultaneity bias. With regard to simultaneity bias several studies present empirical evidence that causality runs from migration to trade. For example, Peri and Requena-Silvente (2010) using 2SLS find robust evidence for a causal effect from immigrants to export flows for Spanish provinces. In addition, Felbermayr and Jung (2009) provide evidence for the link running from migration to trade based on a F-test of strict exogeneity. Hatzigeorgiou (2010) recommends Gould's test of causality, which suggests, that immigration precedes trade. In the following empirical analysis, we thus expect a positive relationship between Immigration and trade.

According to the literature, the impact of immigrants is higher for imports than for exports because it reflects the network and demand channel. However, there may be ways that better identify the information and preference channel separately than a naïve comparison of coefficients. Taking Rauch (2001) as a starting point Felbermayr et al (2010) remind that co-ethnic networks consist of direct and indirect links. While direct links relate residents with ethnicity k in federal state i to residents in country j, their respective home country indirect links relate this individual to individuals in a third country. Thus, indirect links should only reflect the information channel because they do not relate to the country of origin. A further advantage of indirect links may be that there is less danger of endogeneity that with indirect links with regard to simultaneity between migration and trade.

To conclude the methodology section, we will use the PPML estimator. Santos Silva and Tenreyro (2006) have shown that a log-linear specification of the gravity equation may result in inconsistent estimates if the error term does not enter multiplicatively. This may be the case when there is considerable number of zero trade flows or immigration stocks. Then, the model will be misspecified which leads not only to false standard errors but also to inconsistent estimates.[6] Mayer and Head (2013) compare the consistency and efficiency of OLS, Poisson PML and Gamma PML in the presence of structural zeros. They demonstrate that the PPML estimator is the best choice if the variance to mean ratio is constant. If the

[6] However, the best approach to deal with this problem is still open to debate E.g. Bratti/De Benedectic/Sarlatti (2012), Coughlin and Wall (2011) add one to the bilateral trade flows (X) and immigration stocks (IMM) to solve this problem. An often-experienced problem of applying the PPML estimator may be problems of not achieving convergence due to the high number of dummy variables (fixed effects) in the regressions (see e.g. Bratti et al (2012). The same reasoning applies to other non- linear possibilities.

standard deviation is proportional to the mean one should prefer Gamma PML. For the sake of comparison we will also show results from a "biased" OLS regression.
Finally, in order to identify differences in the pro trade effects of ethnic networks, our second specification departs from the assumption of a constant $\bar{v}^k$ meaning we allow the effect of ethnic Networks to differ between countries.

We separately test for the existence of a pro trade effect for the 82 partner countries in order to yield the average effects of specific networks over time. We are primarily interested in the effects of EU country immigrant networks on German exports or imports. This exercise is somewhat difficult, since only a small number of observations are available for each country. Thus, we don´t aim to draw firm inferences with regard to point estimates at the country level, but rather to get a sense whether there exist differences with regard to immigrants source countries. Indeed, it is reasonable to assume that the network effect differs between different countries of origin. To the best of our knowledge, only the studies of Bandyopadhyay/Coughlin and Wall (2008) and Parsons (2012) have allowed for differences in ethnic networks in a single country study.[7]

[7] Like them, they we do not explain why there exist differences. However, a growing literature is concerned with the question which characteristics of migrants have the highest effect on trade. They find the skill-level (Felbermayr and Toubal, 2012) and trade-related occupations of migrants of particular importance (Aleksynska and Peri, 2011). It is still open to debate how much of the network effect is driven by migrants characteristics or their country of origin.

5. Results

5.1. Baseline Results

To get an impression of the relationship between immigrants and trade table 3 shows the basic results of estimating equation 5) using OLS and PPML for comparison.

Comparing the results for OLS and PPML demonstrates the latter ones better identification power. The coefficients and standard errors are much smaller using PPML than OLS.

Table 3: Baseline Results

	FE OLS		FE PPML	
	(1) Exports	(2) Imports	(3) Exports	(4) Imports
	OLS-FE	OLS-FE	PPML-FE	PPML-FE
Ln **IMMj**	0.141***	-0.761***	0.012***	-0.096**
	(0.025)	(0.144)	(0.003)	(0.026)
Ln (Y_rY_j)	0.885***	1.320***	0.086***	0.150***
	(0.045)	(0.117)	(0.006)	(0.022)
Ln dist	-0.727***	-1.411***	-0.057***	-0.110***
	(0.075)	(0.172)	(0.007)	(0.016)
Continguity	0.238*	0.142	0.003	-0.008
	(0.122)	(0.214)	(0.012)	(0.022)
Language	0.609***	-1.027*	0.075***	-0.048***
	(0.177)	(0.558)	(0.018)	(0.057)
EU15	0.274**	0.645*	0.060***	0.174***
	(0.134)	(0.391)	(0.017)	(0.062)
CEEC	0.837***	3.010***	0.092***	0.428***
	(0.170)	(0.658)	(0.021)	(0.113)
Adjusted R^2	0.946	0.859	0.937	0.828
Observations	7728	7549	7728	7549

* ** ** , , Statistically significant at the 10, 5 and 1 per cent level, respectively. Note:, i.e. export flows of region r to country j at time t. Time-varying region and partner-country dummies are included. Standard errors are clustered at the region by (importer or exporter) country level.

In essence, all coefficients have the expected signs. Economic size is highly significant and has a positive effect while distance exerts a stat. significant negative influence on trade. Being a member of the EU 15 or the CEEC has also a positive effect on trade with Germany. Language has a positive influence on exports but a negative effect on imports. Turning to our variable of interest, the *total* stock of immigrants from country j, we observe some puzzling results. While we find a (small) pro-trade trade effect for exports, immigrants seem to have a negative effect on Germanys imports. The choice of the estimation method does not affect

this main result. However, the magnitude of both effects is rather small when looking at the results from the PPML estimation. In the following estimations we prefer the PPML estimator since estimation results are more efficient as indicated by the low standard errors. We now turn to a deeper analysis of the hypothesized trade-creating effect of immigrant networks by splitting the immigration variable. The results presented in table 4 distinguish between the effect of the average network originating from country j and residing in region r and the effect of the average network originating from country j but not residing in the particular region r on trade between region r and country j.[8] We refer to the former effect as a direct effect of migrant networks on trade while the latter one can be interpreted as an indirect effect where trade is influenced though spillovers of migrant networks.

Table 4: Direct and indirect effects

	(1) Exports	(2) Exports	(3) Exports	(4) Imports	(5) Imports	(6) Imports
Ln IMMrj	0.001		0.002	0.016**		0.018**
	(0.003)		(0.003)	(0.007)		(0.008)
Ln IMMrk		0.007	0.017		-0.065	0.031
		(0.022)	(0.027)		(0.061)	(0.062)
Ln (Y_rY_j)	0.088***	0.087***	0.094***	0.129***	0.184***	0.137***
	(0.074)	(0.019)	(0.019)	(0.010)	(0.025)	(0.027)
Ln dist	-0.056***	-0.057***	-0.056***	-0.092***	-0.106***	-0.092***
	(0.008)	(0.008)	(0.008)	(0.018)	(0.017)	(0.018)
Continguity	0.002	0.004	0.005	-0.022	-0.021	-0.017
	(0.012)	(0.013)	(0.013)	(0.023)	(0.025)	(0.023)
Language	0.062***	0.061*	0.105	0.123***	0.188***	0.268***
	(0.019)	(0.036)	(0.142)	(0.035)	(0.039)	(0.100)
EU15	0.072***	0.075***	0.082	0.175***	0.204***	0.189***
	(0.018)	(0.028)	(0.074)	(0.034)	(0.042)	(0.071)
CEEC	0.153***	0.135***	0.126	0.513***	0.357	0.806***
	(0.029)	(0.032)	(0.148)	(0.074)	(0.272)	(0.031)
Adjusted R^2	0.937	0.937	0.937	0.828	0.828	0.828
Observations	7721	7727	7721	7542	7552	7542

*, **, *** Statistically significant at the 10, 5 and 1 per cent level, respectively. Note:, i.e. export flows of region r to country j at time t. Time-varying region and partner-country dummies are included. Standard errors are clustered at the region by (importer or exporter) country level.

[8] To be precise: IMMj = IMMrj + IMMoj, where o is the sum of all federal states minus federal state r.

As argued by Herander and Seervader (2005) or Peri and Requena-Silvente (2010) one would expect to find a stronger migrant effect for the direct network than for the indirect network since geographic proximity matters.

Columns (1) – (3) show the average effect of the average network on exports while the last three columns present the results for imports. Interestingly, and in contrast to the results of the FE-PPML regressions in the previous table we do not find any effect of migrant networks on exports. It does not matter whether one looks at direct effects (column 1), indirect effects (column 2) or at both effects (column 3). The coefficient turns out to be statistically insignificant as well as economically insignificant with a point estimate of around 0.002. However it is noteworthy, that despite this robust result, the coefficients of the language, EU15 and CEEC dummies loose their statistically significance in column (3) when both migrant network effects are controlled for. In addition, the magnitude of the indirect network effect increases as well as the language coefficient, maybe pointing to some collinearity problems between language and indirect networks when both network effects are included.

Turning to imports, we obtain again different results in contrast to the results in table 3): Looking at the direct network effect on imports in column 4) we see a positive coefficient that is statistically significant at the 5%-level. Furthermore, the dummies for language and EU15/CEEC membership are also positive and statistically highly significant. Turning to the indirect network effect in column (5) shows that these results are relatively robust. Controlling for both direct and indirect migrant network effects, these results are also obtained. However, the magnitude of the coefficient for language and in particular CEEC membership increases sharply when one compares the results obtained in column (4) and (5). These effects could not be observed on the export side showing that there are remarkable differences. Turning to the variable of interest, we observe a negative but statistically insignificant indirect network effect on import. Controlling both for direct and indirect network effects results in a statistically significant effect for the direct network coefficient and a positive but statistically insignificant indirect network coefficient.

At a first glance this change may seem puzzling. But a similar effect was found by Felbermay et al (2010) who analyze direct and indirect network links on exports:[9] When indirect and direct effects are negatively correlated but both individual effects are positive -which is the

[9] They use a different definition to measure direct and indirect network effects. While we differentiate at the federal state level (geographical proximity within Germany) they differentiate according to the migrant origin.

case in column (6)- omitting one variable from the specification would lead to omitted variable bias. The negative bias can be observed in the negative coefficient of the indirect effect in column (5).

To sum up, we find no effect of the average network on exports at a disaggregated level but positive effects on imports. Distinguishing between direct and indirect effects has no influence on the export side but direct effects mostly drive network effects on the import side. Furthermore, the differences in the magnitude and statistical significance of EU15/CEEC membership when comparing exports and imports point to the different impact of migrant networks on exports and imports according to their country of origin. We will investigate this possibility in the next section where we depart from the assumption that migrant networks are perfect substitutes.

5.2. Heterogeneous migrant Networks

In this section, we compute, for any immigrant network k, the bilateral trade creation effect of increasing the size of the immigrant network k by 1 % in the considered time span. For each network k, we estimate a separate regression.[10] The obtained results of coefficients that are statistically significant at least at the 10%-level are presented along with their standard errors and goodness of fit in tables A4 (exports) and A5 (imports), respectively.

Figure 1 represents the point estimates (increasing the size of network k of 1%) obtained for each immigration network from separate regressions as dark circles, thus showing the trade creating potential of a particular network k between 2005-2011.

All estimates shown are at least statistically significant at the 10%-level. In addition, the figure shows the *average* size of a particular migrant network in thousands of individuals.

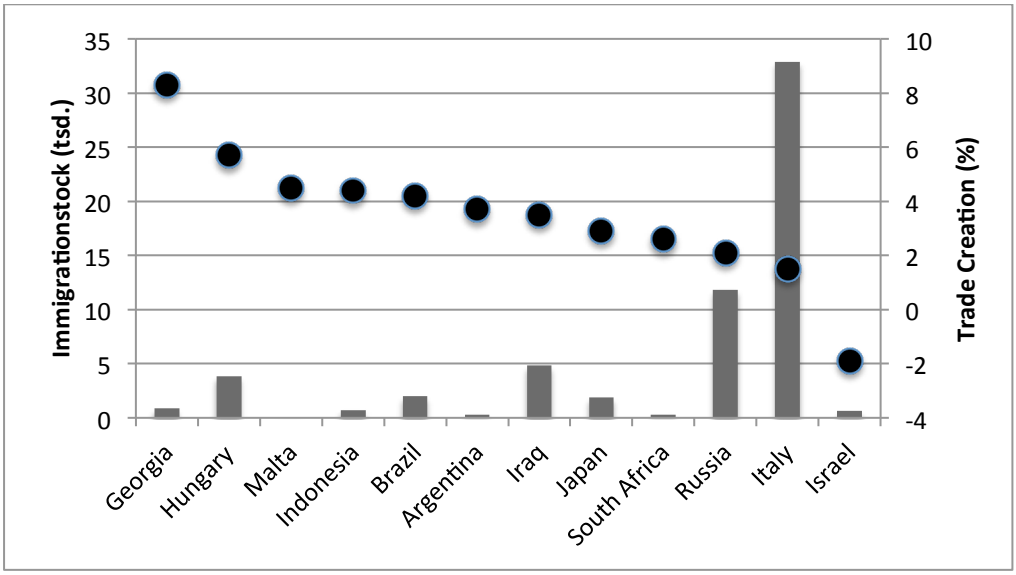
The results in figure 1 explain to a certain degree why our previous regressions found no pro-trade effect of migrant networks on exports.

Out of the 82 considered migrant networks, only 13 are statistically significant. The most powerful network seems to be that of Georgians in terms of trade creation, of whom around 0,8 thousand people live on average in Germany. The second and third most important networks are the eastern EU countries, Hungary and Malta. While the inflow of Hungarian migrants has increased sharply just over the last two years, the average size of the migrant

[10] We have also run a regression with all networks present in the same regression, thus allowing for k-specific coefficients. However, results are different regarding the sign and significance level of most EU-country coefficients, probably due to the high correlation between the different networks. Thus, we prefer the results from separate regressions.

network from Malta is almost negligible. Out of the old EU countries, only migrants from Italy seem to have a positive and significant effect on exports. In addition, the average size of this particular migrant network is the highest of all statistically significant networks.

Figure 1: Trade Creation of Different Migrant Networks (exports, average 2005-2011)



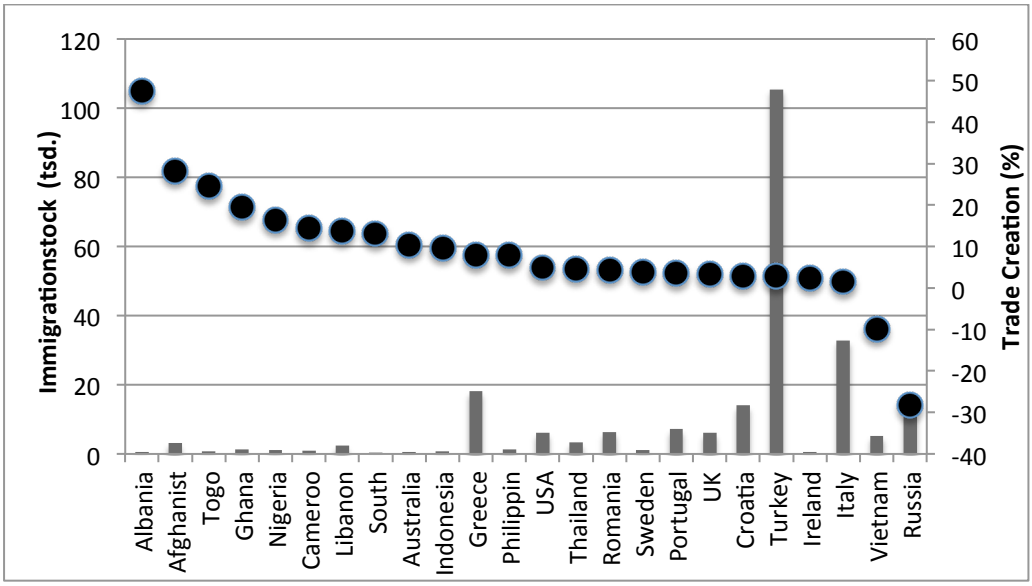
This underlines that one cannot say per se that the size of the migrant network matters for its strengths, also pointing to the nonlinear effects of networks. Another reason for the limited effects of immigrant networks on German exports may be the structure of the German economy and the characteristics of immigrants. Germany is characterized by having many SMEs, who contribute to growth and employment. However, the main share of exports is undertaken only by a small fraction of firms, which are generally the biggest in terms of sales and employment in certain manufacturing industries.[11] Thus, if migrants are mostly working in (non-exporting) SMEs or industries or are self-employed in e.g. service sectors this may one potential reason for the obtained results.

We now turn to the link between immigrant networks and imports. Figure 2 presents the obtained results for each statistically significant network. Here, 24 out of 82 networks have a statistically significant coefficient, explaining the previously obtained pro-trade effect of immigrants on imports. We find pro-trade effects for several EU-countries, in particular southern EU countries Greece, Portugal and Italy, as well as Romania, Ireland and Sweden. However, the most influential migrant networks do not come from these countries, which are

[11] See e.g. Bratti et al (2012) who found pro trade effects of immigrant networks on exports in Italy. However, the Italian economy differs from the German economy by many exporting SMEs in the textile industry, for example. Here, the probability of creating a link between immigrant networks and exports is higher than in the German case.

similar to Germany, regarding culture, institutions and political systems. On the contrary, the most influential networks for bilateral imports are migrants originating from middle-eastern countries or from African countries.

Figure 2: Trade Creation of Different Migrant Networks (imports, average 1995-2011)



It is remarkable, that the highest trade creating effects are again obtained from these countries, where the number of migrants is on average quite low. As for exports, those networks that are largest in terms of average the stock of immigrants, rank only in the middle or at the lower end of the obtained trade creating effects.

Thus, we conclude again that it is not (only) the size of the network that matters for a particular high pro trade effect. Of more importance seems to be the matching of migrants abilities and those sectors, where imports, either final or intermediates ones, are of high relevance.

6. Conclusion

The current paper examines the impact of migrant networks on bilateral trade between Germany and over 82 partner countries. To that end, we use trade and migration data at the federal state level. Our analysis extends the existing literature in several ways: First, in contrast to most existing papers we focus on Germany and a time period that covers the economic crisis. This allows identifying possible changes in Germanys trade patterns due to the recent increase in inflows of southern EU migrants. Second, we take into account that the trade-creating effects of immigrants may differ by immigrants' nationalities. Third, using

data at the federal state level and an extensive country coverage has at least two advantages with regard to empirical methodology: the risk of a spurious correlation between trade and immigration as well as sample selection bias stemming from the specific choice of the countries entering the analysis is minimized.

We find no trade creating effect from immigrant networks on exports but on imports, highlighting the importance of the demand effect for Germany. However, accounting for heterogeneous network effects shows that some migrant networks positively affect exports, in particular Georgia and Hungary. In contrast, many migrant networks, also from several southern EU countries positively affect imports. However, the most efficient migrant networks do not originate from EU countries but from African countries or middle-eastern countries that do not have an extensive network in Germany. This shows, that it is not per se the size or e.g. cultural and geographical proximity of a migrant network to positively and significantly bilateral trade. Rather, our results provide some hints that the economic structure of an economy and the characteristics of migrants (i.e. their skill level or their occupation) do matter. The export strength of German firms in in particular skill and technological intensive industries may explain the missing link of a pro-trade effect for exports, which is in contrast to results of other EU countries found in the literature.

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Appendix

Table A1: Partner Countries

Europe	**NA**	**SCA**	**CIS**	**Africa**	**ME**	**Asia**
Albania	USA	Argentina	Armenia	Algeria	Iran	Afghanistan
Austria	Mexico	Bolivia	Aserbaidschan	Cameroon	Iraq	Australia
Belgium		Brasilia	Georgia	Congo	Israel	China
Bulgaria		Chile	Kasachstan	Egypt	Syria	Hong Kong
Croatia		Columbia	Russia	Ghana		India
Cypris		Paraguay	Ukraine	Marokko		Indonesia
Czech		Peru		Nigeria		Japan
Republic		Uruguay		Togo		
Denmark		Venezuela		Tunesia		South Korea
Estonia				Libanon		Malaysia
Finland				South		New
				Africa		Zealand
France						Pakistan
Greece						Philippines
Hungary						Singapore
Island						Sri Lanka
Ireland						Taiwan
Italy						Thailand
Latvia						Vietnam
Lithuania						
Liechtenstein						
Luxemburg						
Malta						
Netherland						
Norway						
Poland						
Portugal						
Romania						
Slovakia						
Slovenia						
Spain						
Sweden						
Switzerland						
Turkey						
UK						
N = 33	N = 2	N = 9	N = 6	N = 11	N = 4	N = 17

Table A2: Immigrants by Country of Origin in Germany

Ranking in 2011	Country Of Origin	Number of immi. in 2011	% on total immi. In 2011	Change of Immi. (2011/2010)	Annual Growth Rate 05/11	Ranking In 2005	Number of Immi. in 2005	% on total Immi. in 2005
(1)	Turkey	1607161	27,09	-22319	-1,54	(1)	1764041	30,88
(2)	Italy	520159	8,77	2613	-0,65	(2)	540810	9,47
(3)	Poland	468481	7,90	49046	6,20	(3)	326596	5,72
(4)	Greece	283684	4,78	6999	-1,46	(4)	309794	5,42
(5)	Croatia	223014	3,76	2815	-0.44	(5)	228926	4,01
(6)	Russia	195310	3,29	4040	0,82	(6)	185931	3,26
(7)	Austria	175926	2,97	682	0,11	(7)	174812	3,06
(8)	Romania	159222	2,68	11128	13,87	(18)	73043	1,28
(9)	Netherland	137664	2,32	22948	2,52	(9)	118556	2,08
(10)	Ukraine	123300	2,08	-993	-0,96	(8)	130674	2,29
(11)	Portugal	115530	1,95	2322	-0,07	(10)	115606	2,02
(12)	France	110938	1,87	2263	1,37	(12)	102244	1,79
(13)	Spain	110193	1,86	4792	0,37	(11)	107778	1,89
(14)	USA	101643	1,71	3911	0,63	(13)	97864	1,71
(15)	UK	98406	1,66	2263	0,37	(14)	96245	1,68
(16)	Bulgaria	93889	1,58	7891	15,69	(27)	39153	0,69
(17)	China	86435	1,46	5104	2,68	(17)	73767	1,29
(18)	Vietnam	83830	1,41	9588	0,08	(15)	83446	1,46
(19)	Hungary	82760	1,40	13546	8,95	(24)	49472	0.87
(20)	Iraq	82438	1,39	2558	1,38	(16)	75927	1,33

Figure A1: Immigration to Germany at the federal state level

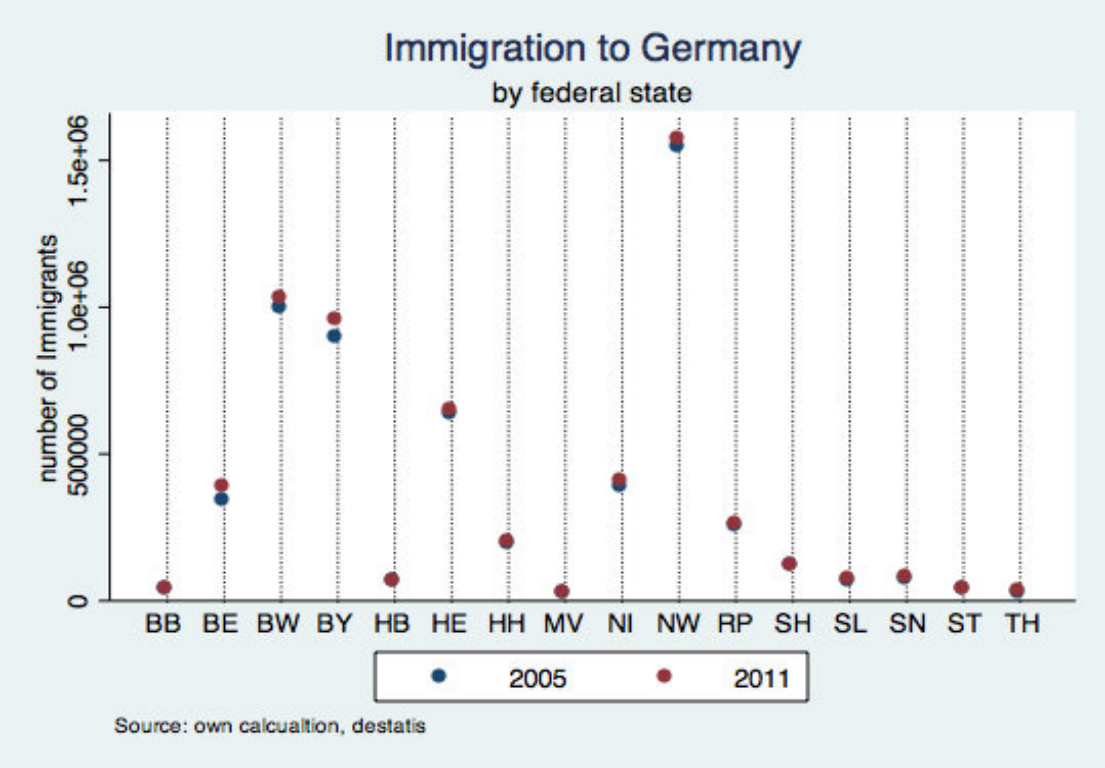

Table A3: Immigration to Germany, by federal state and country of origin

Federal State	Ranking in 2011	Country Of Origin	Number of immi. in 2011	% on total immi. In 2011
BB	(1)	Poland	8152	19,37
BB	(2)	Russland	4092	9,73
BB	(3)	Ukraine	3720	8,84
BB	(4)	Vietnam	3502	8,32
BB	(5)	Turkey	2247	5,34
BE	(1)	Turkey	114243	29,35
BE	(2)	Poland	36032	9,26
BE	(3)	Russia	16933	4,35
BE	(4)	Vietnam	15992	4,11
BE	(5)	USA	14960	3,84
BW	(1)	Turkey	278570	27,04
BW	(2)	Italy	159947	15,53
BW	(3)	Croatia	72527	7,04
BW	(4)	Greece	67189	6,52
BW	(5)	Poland	47444	4,61
BY	(1)	Turkey	210576	21,97
BY	(2)	Austria	82457	8,60
BY	(3)	Italy	77913	8,13
BY	(4)	Poland	58125	6,06
BY	(5)	Greece	55732	5,81
HB	(1)	Turkey	26113	38,48
HB	(2)	Poland	5764	8,50
HB	(3)	Russia	2713	4,00
HB	(4)	Bulgaria	2425	3,57
HB	(5)	Portugal	2310	3,41
HE	(1)	Turkey	169622	26,28
HE	(2)	Italy	62826	9,74
HE	(3)	Poland	53495	8,29
HE	(4)	Croatia	30641	4,75
HE	(5)	Greece	28693	4,45
HH	(1)	Turkey	51237	25,61
HH	(2)	Poland	18783	9,39
HH	(3)	Afghanistan	12312	6,15
HH	(4)	Russia	8072	4,03
HH	(5)	Portugal	7989	3,99
MV	(1)	Poland	4500	16,26
MV	(2)	Russia	3059	11,05
MV	(3)	Ukraine	2301	8,32
MV	(4)	Vietnam	2121	7,67
MV	(5)	Turkey	1312	4,74

Federal State	Ranking in 2011	Country Of Origin	Number of immi. in 2011	% on total immi. In 2011
NI	(1)	Turkey	97814	24,20
NI	(2)	Poland	47640	11,79
NI	(3)	Netherlands	29954	7,41
NI	(4)	Italy	22676	5,61
NI	(5)	Russia	17813	4,41
NW	(1)	Turkey	540976	34,46
NW	(2)	Poland	132723	8,45
NW	(3)	Italy	121561	7,74
NW	(4)	Greece	85266	5,43
NW	(5)	Netherlands	67169	4,28
RP	(1)	Turkey	63900	24,64
RP	(2)	Italy	26374	10,17
RP	(3)	Poland	25864	9,97
RP	(4)	Russia	8742	3,37
RP	(5)	France	7765	2,99
SH	(1)	Turkey	30770	25,49
SH	(2)	Poland	13642	11,30
SH	(3)	Denmark	6776	5,61
SH	(4)	Russia	5904	4,89
SH	(5)	Italy	3906	3,24
SL	(1)	Italy	18065	25,77
SL	(2)	Turkey	11830	16,88
SL	(3)	France	6590	9,40
SL	(4)	Poland	4055	5,79
SL	(5)	Luxemburg	2725	3,89
SN	(1)	Vietnam	8197	10,55
SN	(2)	Russia	7417	9,54
SN	(3)	Poland	6710	8,63
SN	(4)	Ukraine	6223	8,01
SN	(5)	Turkey	3829	4,93
ST	(1)	Vietnam	4262	11,35
ST	(2)	Russia	3408	9,07
ST	(3)	Poland	3395	9,04
ST	(4)	Ukraine	3021	8,04
ST	(5)	China	2416	6,43
TH	(1)	Russia	3075	9,69
TH	(2)	Vietnam	2877	9,07
TH	(3)	Poland	2157	6,80
TH	(4)	Ukraine	2026	6,39
TH	(5)	Turkey	1928	6,07

Notes: TH = Thuringia, ST = Saxony Anhalt, SN = Saxony, SL = Saarland, SH = Schleswig-Holstein, RP = Rhineland Palatinate, NW = North Rhine Westphalia, NI = Lower Saxony, MV = Mecklenburg-West Pomerania, HH = Hamburg, HE = Hessen, HB = Bremen, BY = Bavaria, BW = Baden Wurttemberg, BE = Berlin, BB = Brandenburg.

Table A4: Results by Partner-country: Exports

	Coefficient	Standard error	t-statistic	Observation	R2
Argentina	0.037*	0.021	1.78	112	0.852
Brazil	0.042**	0.016	2.55	112	0.909
Georgia	0.083***	0.019	4.45	112	0.862
Indonesia	0.044***	0.017	2.67	112	0.864
Iraq	0.035*	0.019	1.90	112	0.714
Israel	-0.019***	0.004	-4.72	112	0.891
Italy	0.015***	0.005	2.81	112	0.869
Japan	0.029*	0.016	1.88	112	0.827
Malta	0.045**	0.021	2.18	106	0.732
Russia	0.021*	0.012	1.73	112	0.941
South Africa	0.026*	0.014	1.84	112	0.800
Hungary	0.057***	0.018	3.20	112	0.857

* ** ** Statistically significant at the 10, 5 and 1 per cent level, respectively.Note. Standard errors are clustered at the region by (importer or exporter) country level. Only significant coefficients are reported.

Table A5: Partner-country: Imports

	Coefficient	Standard error	t-statistic	Observation	R2
Afghanistan	0.283***	0.052	5.45	88	0.502
Albania	0.475***	0.136	3.49	106	0.548
Australia	0.104***	0.039	2.63	112	0.734
Ghana	0.194***	0.038	5.10	107	0.669
Greece	0.079**	0.004	2.32	112	0.722
Indonesia	0.097***	0.034	2.87	112	0.822
Ireland	0.025**	0.010	2.42	112	0.824
Italy	0.016***	0.004	3.68	112	0.940
Cameroon	0.144***	0.051	2.84	102	0.315
Croatia	0.029**	0.015	1.98	112	0.815
Libanon	0.138***	0.138	2.95	109	0.463
Nigeria	0.164**	0.071	2.31	112	0.499
Philippines	0.078**	0.037	2.13	112	0.785
Portugal	0.035***	0.010	3.37	112	0.841
Romania	0.043*	0.023	1.89	112	0.822
Russia	-0.282**	0.117	-2.41	112	0.533
Sweden	0.038**	0.018	2.08	112	0.726
South Africa	0.131***	0.051	2.57	112	0.627
Thailand	0.046**	0.046	2.26	112	0.803
Togo	0.245**	0.103	2.38	96	0.239
Turkey	0.028*	0.017	1.63	112	0.809
UK	0.034*	0.019	1.74	112	0.796
USA	0.049***	0.016	3.02	112	0.859
Vietnam	-0.099***	0.034	-2.97	112	0.685

* ** ** Statistically significant at the 10, 5 and 1 per cent level, respectively. Note. Standard errors are clustered at the region by (importer or exporter) country level. Only significant coefficients are reported.