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The Exporter Wage Premium Reconsidered

Destinations, Distances and Linked Employer-Employee Data

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Abstract

This study uses detailed, reliable and up-to-date linked employer-employee data that take account of both the demand and the supply side of the labor market to challenge the conventional wisdom of a universal exporter wage premium. It investigates whether for German establishments an exporter wage premium can be found irrespective of export destination and the distance between export origin and destination. As expected, it finds that exporters generally pay higher wages than non-exporters. But it also shows that only exporting to certain countries is associated with a wage premium. Moreover, such a premium exists only for establishments that ship goods over a relatively long distance.

JEL-Classification: F14, J31
Keywords: Exporter wage premium, Export destinations, Linked employer-employee data

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1. Introduction

Traditionally, models of international trade focused on the industry level and ignored firm heterogeneity. In a seminal study Bernard and Jensen (1995) used detailed micro data to show that this view omits important differences between firms engaged in export activities and those that only serve the domestic market — perhaps most prominently that exporters on average pay higher wages (and are accordingly more productive). During the last 15 years a growing body of literature — surveyed in Greenaway and Kneller (2007), Wagner (2007a) and Wagner (2011) — has used very diverse methods and datasets to test whether exporters really pay higher wages and overwhelmingly confirmed this assertion. What is more, starting with Melitz (2003) the New New Trade Theory has developed models where heterogeneous firms are explicitly included and the decision to export is endogenously determined on the firm level. The usual result of these models is that only the most productive firms become exporters. Thus they provide a theoretical rational for the empirical findings by Bernard and Jensen (1995) and subsequent research.[1]

This study's contribution is to empirically reconsider the exporter wage premium. It seeks to fill research gaps in three interrelated areas: First, the majority of the relevant empirical literature relies on firm data, omitting individual characteristics of workers that might influence their wages. In contrast, this study uses detailed linked employer-employee data that account for both the supply and the demand side of the labor market and allow to control for observed and unobserved worker heterogeneity. Second, although recent theoretical models by Eaton, Kortum and Kramarz (2008) and others suggest that the relationship between firm performance and exporting depends on the destination of exports, this has rarely been tested. This study belongs to the very small number of papers that employ linked-employer-employee data to distinguish between the exporter wage premia for different export destinations. Third, a straightforward extension of the Melitz model developed by Holmes and Stevens (2010) implies that the exporter wage premium depends positively on distance. This study is — to the author's best knowledge — the very first to explicitly consider the influence of the distance between an export's origin and its destination on the exporter wage premium in the context of heterogenous firms and endogenous exporting activity.[2]

This study's first result confirms the existing literature: Even if one controls for worker characteristics, exporters pay higher wages than non-exporters. Its second finding is more novel: For German firms only exporting to the eurozone and non-European economies is

[1] In many New New Trade Theory models labor is homogenous and payed its marginal product and though exporters are more productive than other firms, there is no room for an exporter wage premium. At the same time, it is a stylized fact from the literature on rent-sharing that more productive firms pay higher wages [cf. Blanchflower, Oswald and Sanfey (1996) and also Egger and Kreickemeier (2010) that explicitly model an exporter wage premium because of rent-sharing].

[2] In their whole study and especially in their (descriptive) empirical investigation Holmes and Stevens (2010, p. 8) focus on plant size instead of wages or productivities. They note that in the context of the Melitz model "(p)roductivity (...) scales up plant size". Besides, results by Ruane and Sutherland (2005) and Alcalá and Hernández (2010) could be interpreted as pointing to a positive relationship between distance and the exporter wage premium even though distance measures are not explicitly included in their regressions.

associated with a wage premium. Exporters to Central and Eastern European countries pay the same wages as non-exporters *ceteris paribus*. In a third step, a closer analysis of firms exporting to countries in the European Monetary Union and the New EU Member States shows that a positive exporter wage premium is always present for longer distances between an export's origin and its destination. But exporters located close to their destination pay the same or even lower wages than non-exporters.

The remainder of this study is structured as follows: Section 2 summarizes the related theoretical and empirical literature while Section 3 introduces the linked employer-employee dataset and its most important features. Section 4 contains the main results and Section 5 discusses their robustness in regard to variations of the empirical setup. Section 6 concludes.

2. Related Literature

2.1. Theoretical Background

One reason why exporters might be more productive and accordingly pay higher wages than other firms is given by the so-called "learning by exporting"-hypothesis elaborated for instance by Clerides, Lach and Tybout (1998). "Learning by exporting" models argue that exporting firms may increase their technological knowledge through the access to new production methods or new product designs from their buyers and thus become more productive than non-exporters.

An even more prominent explanations for the exporter wage premium starts with the premises that exporters are comparatively more productive even before they begin to export. In this context, the New New Trade Theory has developed models — starting with Melitz (2003) — that combine firm heterogeneity with a monopolistic competition framework. In these models, a firm's productivity is exogenous but the decision to export is endogenously determined on the firm level. The usual result is that only some firms are productive enough to bear the fixed costs associated with international trade and that these firms self-select into exporting.

A related framework developed by Bernard, Eaton, Jensen and Kortum (2003) also connects firm heterogeneity with exporting but does not rely on monopolistic but instead on oligopolistic Bertrand competition. As in the Melitz model only the most productive firms endogenously start to export. But this time the reason why only the most productive firms export is that they enjoy cost advantages over their competitors and therefore can fix lower prices.

Recently, various extensions of these relatively basic New New Trade Theory models have been developed. A prominent strand of literature introduces asymmetric countries and asymmetric fixed costs of exporting. Chaney (2008), Eaton, Kortum and Kramarz (2008) and Helpman, Melitz and Rubinstein (2008) develop models where for instance because of varying institutional structures, familiarity, language or — in the spirit of Bernard, Eaton, Jensen and Kortum (2003) — competitive pressure the fixed costs of exporting differ by export destination. As a result, productivity thresholds also differ from country to country, exporter self-selection operates market by market and a sort of hierarchy emerges among the various export destinations. Firms with a relatively low productivity threshold serve only those markets where the fixed costs of exporting are relatively low but more productive firms are able to sell their goods in more countries.

A modified version of the Melitz framework developed by Holmes and Stevens (2010) stresses the importance of distance. In addition to the sunk costs of international trade present in the basic model, Holmes and Stevens (2010) introduce sunk costs associated with distance. These are meant to capture costs — for instance for setting up a distribution network — faced by a firm that wants to sell its products far away from its location, irrespective of whether this means an engagement in intra- or international trade. In the

model, firms can make one investment to overcome distance barriers and a second one to overcome border barriers. Eventually, "(t)he larger market of a more productive plant will make it more willing to pay fixed cost (...) both with regards to the distance friction as well as the border friction" (Holmes and Stevens, 2010, p. 9). So those exporters that ship their goods over the greatest distance are expected to pay higher wages than other exporters.

Finally, Verhoogen (2008) adds quality differentiation to the Melitz framework. In his model firms endogenously decide not only whether to export or not but also whether to produce high- or low-quality goods. This new mechanism linking trade and wage inequality is used to explain how quality upgrading leads Mexican firms that export to the United States to pay higher wages than non-exporters. Brambilla, Lederman and Porto (2010) extend Verhoogen's (2008) framework to allow for different export destinations and also incorporate biases in factor demands along the lines of Matsuyama (2007).

2.2. Empirical Literature

This study is related to the large body of literature that during the last 15 years has used very diverse methods and datasets to test whether exporters really pay higher wages. This literature has been surveyed in Greenaway and Kneller (2007), Wagner (2007a) and Wagner (2011) and overwhelmingly confirms the existence of an exporter wage premium.

More specifically, this study is connected to the far smaller number of papers that use linked employer-employee data to investigate the exporter wage premium. These include Munch and Skaksen (2008) for Denmark, Alcalá and Hernández (2010) for Spain and Schank, Schnabel and Wagner (2007), Baumgarten (2010), Klein, Moser and Urban (2010) and Schank, Schnabel and Wagner (2010) for Germany.[3]

Another related strand of literature investigates the connection between the exporter wage premium and other features of firms like their ownership structure (Cole, Elliott and Virakul, 2010) or their size (Máñez-Castillejo, Rochina-Barrachina and Sanchis-Llopis, 2010). So far, only relatively few empirical studies have investigated whether the exporter wage premium varies by export destination. Here, Ruane and Sutherland (2005) find that destination matters and that the performance characteristics of Irish firms that export to markets beyond the UK differ from those that export "locally". Alcalá and Hernández (2010) — to the author's best knowledge the only existing study that employs linked-employer-employee data to distinguish between exporter wage premia for different export destinations — use Spanish data to confirm that different destinations are associated with distinctive wage premia. Additionally, Brambilla, Lederman and Porto (2010) document that only those Argentine exporters that export to high-income countries pay higher average wages than domestic firms while Wagner (2007b) and Verardi and Wagner (2010)

[3] The relationship is especially strong with Schank, Schnabel and Wagner (2007) who use the same data source but analyze a more dated time period and also differ concerning certain methodological issues and the exact focus. Still, this study's first set of contributions (described in Section 4.1) could be seen as a — successful — attempt to replicate the results by Schank, Schnabel and Wagner (2007).

find that German firms that export beyond the eurozone are (slightly) more productive than those that sell their goods only within the euro area.

This study is also related to the empirical exercise by Holmes and Stevens (2010). The authors investigate the role of the distance between export origin and destination in the context of a generalized Melitz framework and find that this distance indeed plays an important role. However, their analysis is purely descriptive and — in contrast to the majority of the relevant literature or this study — focuses on the relationship between exports and firm size (and not wages or productivities).

3. Data

This study relies on the cross-sectional model of the Linked Employer-Employee Data (LIAB) of the Institute for Employment Research, Nuremberg (IAB) [cf. Alda, Bender and Gartner (2005)]. The LIAB is created by the merger of two datasets. Its first source is the IAB Establishment Panel, an annual survey which asks German establishments about various topics ranging from the development of employment to business policies, investments, in-house innovations, wages, working hours and training programmes. The IAB Establishment Panel relies on a stratified sample of German establishments — where the strata are defined over industries and plant sizes — and has been conducted annually since 1993.

For the LIAB, the IAB Establishment Panel data are matched with individual data form the German Employment Register also collected by the IAB. Thus detailed data for all individuals employed by any establishment covered by the IAB Establishment Panel is available, including socio-demographic characteristics (like year of birth, nationality or education) as well as employment characteristics (gross earnings, occupation, etc.). Because records from the Employment Register are used to compute both social security contributions and unemployment benefits, data drawn from it are highly reliable.

Altogether, the LIAB covers up to 16,000 establishments with approximately 1.8 to 2.5 million employees per year. It seems to be ideally suited for a simultaneous analysis of the supply and demand sides of the German labor market.

This study focuses on the years 2003 to 2006 and two key variables: The log of wages as the dependent variable and the export status as the key regressor. Wage information is available both on the establishment and the individual level. For establishment level regressions information on the establishments' wages per employee are used while for individuals the Employment Register lists their wage levels subject to social security contributions. That is, individual wage information is only recorded up to the contribution assessment ceiling of Germany's social security system and right-censored at this ceiling. Not taking account of this censoring and estimating an ordinary least square regression of individual wages would lead to inconsistent results. In this study the homoscedastic single imputation algorithm based on a Tobit model suggested by Gartner (2005) is used to impute individual wages above the censoring point.

Concerning the export status, this study relies on a dummy variable that indicates whether or not an establishment exports at all in a given year. Additionally, the IAB Establishment Panel allows the distinction between exports to three country groups for the years 2003 to 2006: members of the European Monetary Union (EMU), New EU Member States (NMS) and the rest of the world (ROW).[4]

[4] Austria, Belgium, Finland, France, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain formed the EMU during the period covered (together with Germany). The New EU Member States encompass Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland and Slovakia. Slovenia adopted the euro in January 2007 but was listed as an EMU member in the questionnaire of the last wave of the IAB Establishment Panel considered here (for which interviews were conducted in 2007 with the relevant question focusing on 2006). Henceforth, it will be counted among the New EU Member States.

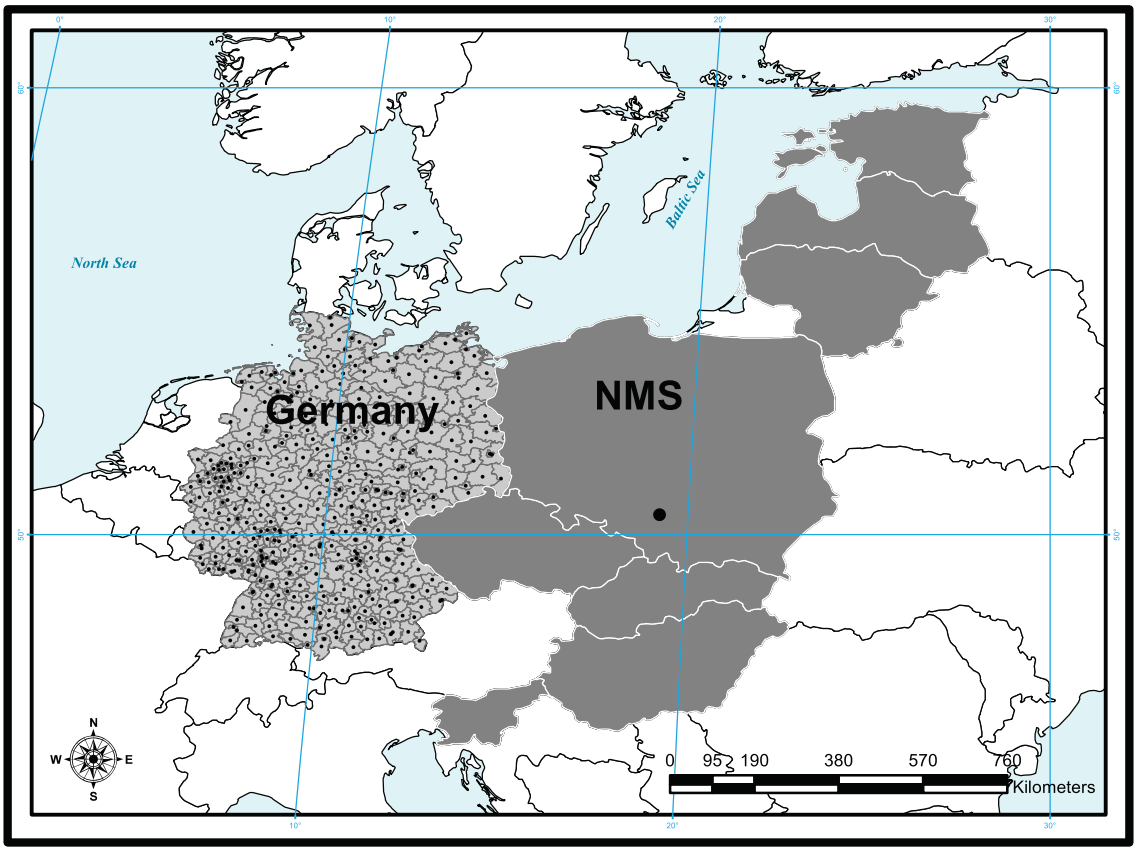

Figure 1: **Centroids of the New EU Member States and German counties**

Together with wages and the export status, this study's third central variable is the distance between the exporting establishment and the export destination. Following Holmes and Stevens (2010) and because the LIAB only allows the distinction of two meaningful export destinations — the eurozone and the New EU Member States — the focus is on the geographic variation inside Germany. Regressors measuring the distance between export origin and destination are obtained by the following four-step procedure: First, geographical centers of gravity are calculated for the eurozone, the New EU Member States and every German county. In order to identify economically meaningful centroids, the geographical data are weighted by countries' average GDPs for the time span 2003 to 2006 in euros (obtained from Eurostat) for both the EMU and the NMS centroids.[5] Second, the great-circle distance — which takes account of the fact that the Earth is approximately spherical — between each county's centroid and the centers of gravity of the two country groups is measured. Third, county codes available in the IAB Establishment Panel are used to merge this geographical information with the linked employer-employee data. Fourth, two dummy variables are created and set to one for all those establishments fur-

[5] The resulting centroid for the eurozone is located close to the French city of Lyon while the one for the New EU Member States lies in Southern Poland, not too far away from Katowice.

ther away from the EMU and NMS centroids than the respective median distance and zero for all other establishments.[6]

For German counties' distances to the NMS the whole procedure is visualized in Figures 1 and 2. Figure 1 shows boundaries and centroids of the New EU Member States and German counties. Figure 2 adds distances and the resulting binary classification of German counties. Similar figures could of course be drawn for German counties' distances to the EMU.

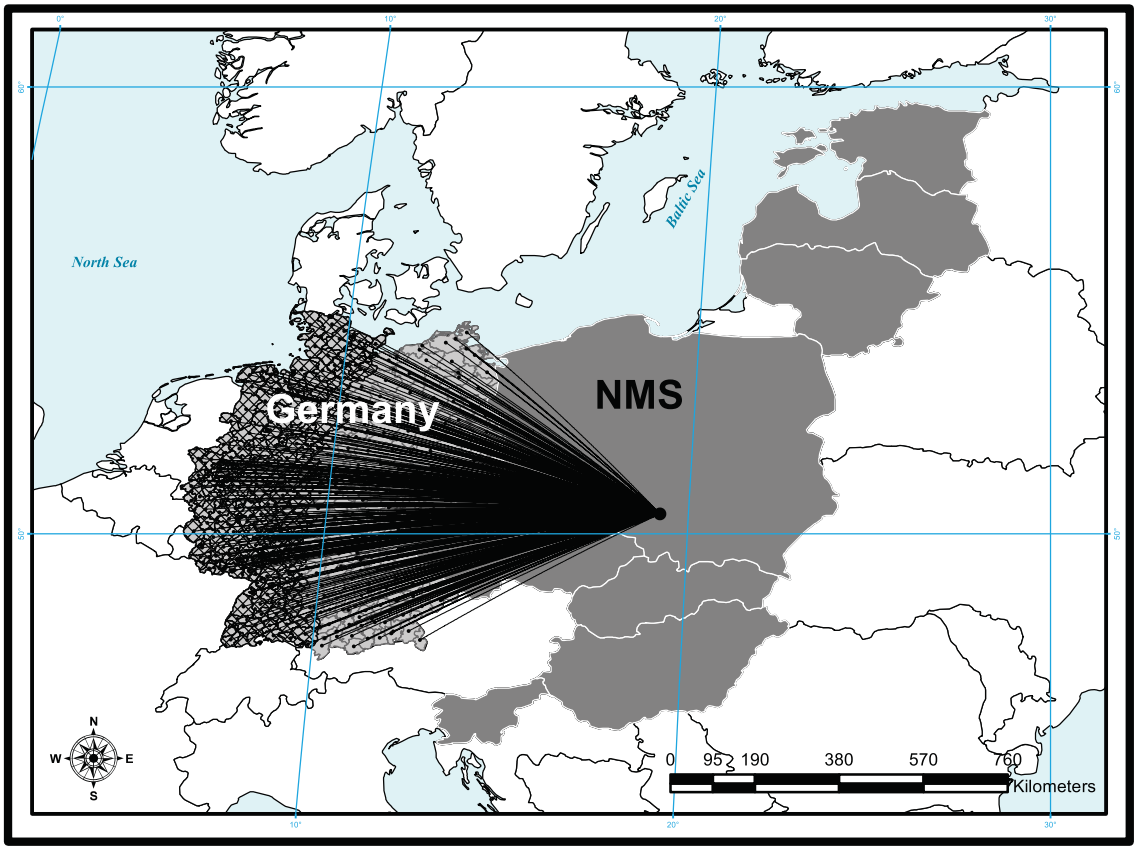

Figure 2: **Distances between centroids of the New EU Member States and German counties**

A number of other variables are included in the wage regressions in Section 4 as controls and also because assessing their effects on wages might be interesting in themselves: For the establishment-level regressions these are the number of employees subject to social security contributions, the square of this variable, the capital per employees subject to social security contributions and average weekly standard hours. Together with industry, state and year fixed effects, dummy variables are included for the existence of an industry- or an establishment-wide collective bargaining agreement and for the presence of a wage council.

[6] All geographical calculations are performed with Esri's ArcGIS. Data on the boundaries of countries and German counties stem from Esri and Germany's Federal Agency for Cartography and Geodesy, respectively.

For the individual-level wage regressions all establishment-wide control variables are again taken into account. Additionally, individual age, age squared, tenure, tenure squared and education level as well as dummies for German nationality and the status as master craftsman / foreman or white-collar worker are included. Moreover, following Abowd, Kramarz and Margolis (1999) "spell" fixed effects are included, where "spells" are defined as unique employee-establishment combinations. The inclusion of "spell" fixed effects means that both establishment and individual (time-invariant) unobserved heterogeneity is accounted for and that only those differences between two consecutive observations are used where the employee does not change his or her employer between the two periods.[7]

[7] See Appendix A for more information about control variables, summary statistics and issues concerning data selection and cleansing.

4. Results

4.1. Basic Exporter Wage Premia

Table 1 summarizes the results of two wage regressions for the basic exporter wage premium. The regressions differ with respect to their aggregation level: The one reported in Column (1) only uses the establishment data while the one listed in Column (2) relies on the whole linked employer-employee dataset.

The establishment-level wage regression confirms the existence of an exporter wage premium for the time period and dataset used here. The coefficient for the variable capturing whether an establishment is an exporter is positive and statistically significant on the one per cent level. Moreover, the exporter wage premium is not only statistically but also economically significant: Exporters pay almost five per cent higher wages than non-exporters *ceteris paribus*.

Column (2) of Table 1 makes it clear that the basic exporter wage premium found with the help of an establishment-level regression is not a result of biased estimates because of observed or unobserved worker heterogeneity. On the contrary, an individual-level regression again shows a coefficient for an establishment's export status that is both positive and statistically highly significant. What is different is the coefficient's size: According to the individual-level wage regression, exporters on average pay "only" 0.8 per cent higher wages than non-exporting establishments. However, this much lower coefficient comes as no surprise given the inclusion of spell fixed effects that capture a large part of the establishment-level wage variation. Individual-level wage regressions that do not include such fixed effects (available upon request) show coefficients for the exporter status variable that are in the same order of magnitude as those found for the estimation reported in Column (1) of Table 1.

Concerning the control variables, most of them exhibit a statistically significant coefficient with the expected sign: For instance, employees with longer tenure as well as master craftsmen and foremen and white-collar workers on average earn higher wages as do workers with tertiary education and German citizenship. More capital per employee and the existence of an establishment-wide bargaining agreement are also associated with higher wages (the latter in the same order of magnitude as the exporter wage premium). Besides, there is the expected inverse U-shaped relationship between wages and both an establishment's number of employees and the age of these employees.

A number of other covariates are not statistically significantly associated with the wage level or the sign of their coefficient varies between the establishment- and the individual-level wage regressions. This is the case for for the average weekly standard hours and for the dummies capturing the existence of an industry-wide bargaining agreement or a wage council.

Table 1: **Wage regressions for the basic exporter wage premium**

	(1)	(2)
	log (wages)	
exporting establishment	0.0461***	0.0061***
	(0.0126)	(0.0010)
log (number of employees)	0.1038***	0.1941***
	(0.0114)	(0.0094)
log (number of employees)^2	–0.0141***	–0.0155***
	(0.0015)	(0.0008)
log (capital per employee)	0.0775***	0.0032***
	(0.0040)	(0.0012)
average weekly standard hours	0.00002	–0.0003***
	(0.0003)	(0.00004)
industry-wide bargaining agreement	0.0220*	–0.0015
	(0.0122)	(0.0012)
establishment-wide bargaining agreement	0.0548**	0.0071***
	(0.0216)	(0.0012)
wage council	0.0646***	–0.0056***
	(0.0141)	(0.0017)
age	–	0.0163**
		(0.0079)
(age)^2	–	–0.0005***
		(0.00001)
tenure	–	0.0001***
		(0.00002)
(tenure)^2	–	$7.41\text{x}10^{-10}$***
		($1.24\text{x}10^{-10}$)
vocational training; no high school	–	–0.0038
		(0.0051)
high school; no vocational training	–	–0.0284
		(0.0185)
high school and vocational training	–	–0.0050
		(0.0127)
technical college	–	0.0540**
		(0.0257)
university	–	0.0660***
		(0.0252)
master craftsman / foreman	–	0.0721***
		(0.0064)
white-collar	–	0.0605***
		(0.0048)
German nationality	–	0.0056**
		(0.0027)
constant	7.0387***	3.8960***
	(0.0928)	(0.2406)
year fixed effects	yes	yes
state fixed effects	yes	no
industry fixed effects	yes	no
spell fixed effects	no	yes
N	8.079	729.930

Notes: Bootstrap standard errors with 200 replications in parentheses. *, (**), (***) indicates significance at the 10, (5), (1) per cent level. For a detailed description of variables used, see Section 3 and Appendix A.1.

Table 2: **Wage regressions for destination-specific exporter wage premia**

	(1)	(2)
	log (wages)	
establishment exporting to EMU	0.0315**	0.0025***
	(0.0131)	(0.0009)
establishment exporting to NMS	0.0005	0.0003
	(0.0161)	(0.0007)
establishment exporting to ROW	0.0284*	0.0020**
	(0.0156)	(0.0008)
establishment controls	yes	yes
individual controls	no	yes
constant	yes	yes
year fixed effects	yes	yes
state fixed effects	yes	no
industry fixed effects	yes	no
spell fixed effects	no	yes
N	8.079	729.930

Notes: Bootstrap standard errors with 200 replications in parentheses. *, (**), (***) indicates significance at the 10, (5), (1) per cent level. For a detailed description of variables used, see Section 3 and Appendix A.1.

4.2. Destination-Specific Exporter Wage Premia

Now the focus will be shifted to an extended framework that distinguishes between three different export destinations. Table 2 reports the results of two wage regressions that include three dummy variables for whether an establishment exports to the eurozone, the New EU Member States and the rest of the world as distinct regressors.[8] Again, separate regressions are reported for establishment-level wage regressions [Column (1)] and the whole dataset [Column (2)].

For all three country groups, results from the establishment- and individual-level estimations are qualitatively identical. In both specifications, exporting to the EMU and ROW is statistically significantly associated with higher wages. The corresponding exporter wage premia are also economically significant: The establishment-level regression shows that exporting to the EMU goes hand in hand with a 3.5 per cent increase in wages *ceteris paribus*. Exporters to the ROW on average pay 2.8 per cent higher wages than other establishments, a wage premium that does not differ statistically significantly from the one found for exporters to the EMU.

In contrast to what is found for the two other export destinations, exporters to the NMS do not seem to pay higher wages. This is a result that the majority of New New Trade Theory models cannot easily rationalize, not even those like Helpman, Melitz and Rubinstein (2008) that allow for productivity thresholds to differ by export destination. However, extensions of the Melitz model that incorporate quality differentiation — e.g. Verhoogen

[8] In this and the following sections, outputs for the establishment- and individual-level control variables are not shown. They are available upon request.

(2008) or Brambilla, Lederman and Porto (2010) — are able to explain how quality downgrading might attenuate, eliminate or possibly even reverse the wage premium of exporters from high-income Germany to the poorer New EU Member States.[9]

Table 3: **Wage regressions for exporter wage premia and distances to destination**

	(1)	(2)	(3)	(4)
	log (wages)			
establishment exporting to EMU	0.0468**	–0.0020	–	–
	(0.0186)	(0.0014)		
distance to EMU centroid	–0.2953	–	–	–
	(0.0282)			
establishment exporting to EMU x	–0.0036	0.0097***	–	–
distance to EMU centroid	(0.0207)	(0.0020)		
establishment exporting to NMS	–	–	0.0226	–0.0047***
			(0.0168)	(0.0010)
distance to NMS centroid	–	–	0.0279	–
			(.0178)	
establishment exporting to NMS x	–	–	0.0138	0.0098***
distance to NMS centroid			(0.0243)	(0.0013)
establishment controls	yes	yes	yes	yes
individual controls	no	yes	no	yes
constant	yes	yes	yes	yes
year fixed effects	yes	yes	yes	yes
state fixed effects	yes	no	yes	no
industry fixed effects	yes	no	yes	no
spell fixed effects	no	yes	no	yes
N	8.079	729.930	8.081	730.179

Notes: Bootstrap standard errors with 200 replications in parentheses. **, (***) indicates significance at the 5, (1) per cent level. For a detailed description of variables used, see Section 3 and Appendix A.1.

4.3. Exporter Wage Premia and Distances to Destination

This section analyzes the relationships between exporting, destinations and wages in greater detail. More specifically, the distance dummy variables introduced in Section 3 are added to two separate wage regressions that evaluate the wage effects of exporting to the eurozone and the New EU Member States, respectively. These distance dummies are interacted with the variables capturing an establishment's export status. The ultimate aim is to test an implication of the model by Holmes and Stevens (2010), namely that those exporters that ship their goods over the greatest distance are expected to pay higher wages than other exporters.

[9] An alternative comparison of establishments serving only the domestic market with those exporting to the eurozone and those also exporting to destinations outside the EMU — along the lines of Wagner (2007b) and Verardi and Wagner (2010) — shows that wages for exporters to the Euro area are higher than for domestic firms but equal to those that also sell goods outside the EMU.

While Columns (1) and (3) of Table 3 focus on the establishment-level, Columns (2) and (4) summarize the corresponding wage regressions for the whole dataset. This time, results differ markedly between the two levels of aggregation. This stresses the importance of using a linked employer-employee dataset for detailed investigations of the exporter wage premium.

Columns (1) and (3) of Table 3 report that in the establishment-level wage regressions almost none of the relevant regressors (export status, distance and their interaction) significantly differ from zero. In contrast, regressions that take account of both the demand and the supply side of the labor market — where the influence of distance as such is not identified because of the spell fixed effects — once again demonstrate the importance of export status for determining workers' wages. Interestingly, neither for the EMU nor for the NMS do establishments relatively close to their export destination pay higher higher wages than similar establishments that only serve the domestic market. On the contrary, those close to the NMS even pay a significantly negative wage premium.

Besides, interaction terms between distances and the respective export dummies are positive and statistically significant for both the EMU and the NMS. Thus establishments exporting to but located relatively far away from these destinations pay higher wages than other exporters. They also pay higher wages than non-exporters *ceteris paribus*.

A combination of the models by Verhoogen (2008) and Holmes and Stevens (2010) might be the starting point for explaining why only those German exporters that are located far away from their destination pay higher wages than non-exporters. In particular, small fixed costs of exporting inside the European Union and a low willingness to pay for quality in EMU economies relative to Germany might lead to an insignificant wage premium for German exporters shipping their goods to these countries over only a small distance. If — as the last section suggests – consumers from New EU Member States are even less willing to pay for quality than those from the eurozone, this might explain why exporters to the NMS located close to this region pay a negative wage premium. At the same time, sunk costs associated with distance could rationalize why establishments further away from their destination pay higher wages than other exporters and also non-exporter.

5. Robustness

This section checks whether the results presented above are robust to variations of the empirical setup. Outputs are reported in Tables 4 and 5 which — for the sake of brevity — focus on individual-level wage regressions. Table 4 deals with the basic exporter wage premium and with destination-specific exporter wage premia. Table 5 is concerned with the relationship between the exporter wage premium and the distance between export origin and destination.

Both tables report results for alternative specifications where all observations with right-censored wages are excluded from the regressions. Following Schank, Schnabel and Wagner (2010) this is meant to make sure that results are not artificially generated by the imputation of wages above the contribution assessment ceiling of Germany's social security system.

Table 4: **Wage regressions for basic exporter wage premium and destination-specific exporter wage premia (robustness)**

	(1)	(2)
	log (wages)	
exporting establishment	0.0062***	–
	(0.0008)	
establishment exporting to EMU	–	0.0038***
		(0.0009)
establishment exporting to NMS	–	–0.0003
		(0.0006)
establishment exporting to ROW	–	0.0024***
		(0.0006)
	no right-censored wages	
N	585.962	585.962

Notes: Establishment controls, individual controls, constant, year fixed effects and spell fixed effects always included. Bootstrap standard errors with 200 replications in parentheses. *** indicates significance at the 1 per cent level. For a detailed description of variables used, see Section 3 and Appendix A.1.

A number of other sensitivity checks evaluate whether the distance measures used in Section 4.3 correctly reflect the distance between export origin and destination. This might be questioned on the grounds that these measures are based on German establishments' exports to rather broad country groups instead of specific economies.

A first alternative specification shown in Table 5 relies on centroids of the eurozone and the New EU Member States that are calculated by weighting countries' GDPs at Purchasing Power Parity instead of converting them to euros at going exchange rates.

Next, the median distance to the EMU/NMS centroid is no longer used to determine the cutoff for classifying an establishment as "close to" or "far away from" its export destination. Instead, either one of two alternative dummies are included in the wage regressions: The first is set to one only for those establishments that are further away from

their export destination than 75 per cents of establishments. For the second, the value of one is assigned to all but the 25 per cent of establishments closest to the respective export destination.

Finally, all establishments are dropped for which it is not really clear whether they are far away from their export destination or not. More specifically, for pairs of every single NMS country and all German counties dummy variables are created that take a value of one if the country-county distance is greater than the median distance between the country and all German counties. Next, for every county the arithmetic mean of these dummy variables (weighted by NMS countries' GDPs in euro) is calculated. This gives a measure of whether a certain county is far away from the universe of New EU Member States or not. In a final step, only establishments located in those German counties are included in a wage regression for which this measure is greater than 0.75 or smaller than 0.25. That is, only establishments are included which are either comparatively close to or comparatively far away from the large majority of NMS. An analogue procedure is followed for the eurozone.

As Tables 4 and 5 show, all results are qualitatively and also quantitatively robust to the alternative specifications presented here. The basic exporter wage premium continues to be confirmed and even if observations with right-censored wages are excluded exporters to the EMU and ROW countries still pay comparatively higher wages while those to the NMS do not. Moreover, exporters further away from their destination pay higher wages than other exporters and non-exporters in nine out of ten alternative specifications. Also in nine out of ten alternative specifications, exporters which are relatively close to their destination continue to pay the same or even lower wages than non-exporters.[10,11]

[10] The one result that does not match, concerns exporters to the eurozone: if one only classifies those establishments that are further away from the EMU centroid than 75 per cents of establishments as "far" away from the eurozone, the signs of both relevant coefficients are reversed.

[11] In addition to the alternative specifications summarized in Tables 4 and 5, one might wonder what would happen if the observation period was expanded. While detailed information on exports to the NMS are not available in the LIAB for years other than the ones used throughout this study, the dataset allows an extension of the sample period for the basic exporter wage premium. In stark contrast to economic theory [but in line with results by Baumgarten (2010)] the more the observation period is extended back into the 1990s, the weaker the basic exporter wage premium becomes, until it finally ceases to be statistically significant.

Table 5: **Wage regressions for exporter wage premia and distances to destination (robustness)**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	log (wages)									
exporting to EMU	–0.0017	–	–0.0011	–	–0.0061***	–	0.0049***	–	–0.0035**	–
	(0.0012)		(0.0014)		(0.0019)		(0.0011)		(0.0016)	
exporting to EMU x	0.0112***	–	0.0079***	–	0.0131***	–	–0.0060**	–	0.0121***	–
distance to EMU centroid	(0.0018)		(0.0020)		(0.0022)		(0.0026)		(0.0023)	
exporting to NMS	–	–0.0048***	–	–0.0048***	–	–0.0046***	–	–0.0013*	–	–0.0059***
		(0.0007)		(0.0009)		(0.0013)		0.0008		(0.0009)
exporting to NMS x	–	0.0100***	–	0.0097***	–	0.0068***	–	0.0141***	–	0.0116***
distance to NMS centroid		(0.0010)		(0.0012)		(0.0014)		(0.0022)		(0.0012)
	no right-censored wages		GDP weighted by PPP		lower distance threshold		higher distance threshold		only certain counties	
N	585.962	586.156	729.930	730.179	729.930	730.179	729.930	730.179	543.499	574.838

Notes: Establishment controls, individual controls, constant, year fixed effects and spell fixed effects always included. Bootstrap standard errors with 200 replications in parentheses. *, (***) indicates significance at the 10, (1) per cent level. For a detailed description of variables used, see Section 3 and Appendix A.1.

6. Conclusions

This study used detailed, reliable and up-to-date linked employer-employee data that take account of both the demand and the supply side of the German labor market to reconsider the exporter wage premium. It found that exporters pay higher wages than non-exporters *ceteris paribus*. However, it also found that for German firms only exporting to the euro area and destinations outside Europe is associated with a wage premium while exporters to the New EU Member States do not pay higher wages than non-exporters. A closer analysis of firms exporting to European Monetary Union countries and the New EU Member States showed that a positive exporter wage premium is always present for longer distances between an export's origin and its destination but that exporters located close to their destination pay the same or even lower wages than non-exporters.

The basic confirmation of an exporter wage premium is in line with standard New New Trade Theory models like Melitz (2003). In contrast, some of the other findings challenge the conventional wisdom. The most parsimonious New New Trade Theory models cannot easily explain why exporters to certain countries or those located relatively close to their export destination should pay the same or even lower wages than non-exporters *ceteris paribus*. However, these results are in line with richer models that combine heterogenous firms and endogenous exporting activity with asymmetric countries, quality differentiation or sunk costs associated with distance [cf. Verhoogen (2008), Brambilla, Lederman and Porto (2010) and Holmes and Stevens (2010)]. More research — and preferably even better data than those used here — is needed to further disentangle the interdependence between these factors.

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A. Appendix: Data and Variables

A.1. Control Variables

On the establishment level the following control variables are included in the wage regressions of Sections 4 and 5:

- The number of employees subject to social security contributions and the square of this variable. Larger establishments could be expected to be more productive and therefore to pay higher wages in the presence of rent-sharing, a view theoretically derived by Bernard, Eaton, Jensen and Kortum (2003) and others and empirically confirmed for instance by Máñez-Castillejo, Rochina-Barrachina and Sanchis-Llopis (2010).

- The capital per employees subject to social security contributions. The IAB Establishment Survey does not directly contain any information on establishments' capital stocks. Therefore this study relies on the capital stock approximation method developed by Müller (2008). This method relies an a modified perpetual inventory approach and provides reliable measures for capital input when a short panel is used and no direct information on capital input is available. *A priori* one might expect more capital-intensive establishments to pay higher wages.

- The average weekly standard hours. For years where this information is not available in the IAB Establishment Panel the average value of the preceding and following years are used for those establishments that are covered by the Panel during all three years. Otherwise, a missing value is attributed to this variable. Higher average standard hours should — more or less mechanically — be associated with higher wages.

- Dummy variables for the existence of an industry- or establishment-wide collective bargaining agreement. The existence of such collective bargaining agreements might be associated with rent-sharing between an establishment and its employees and therefore with higher wages.

- A dummy variable for the presence of a wage council. The existence of a wage council might again be a sign of rent-sharing between an establishment and its employees.

When the whole linked employer-employee dataset is used, a number of additional control variables are included in order to account of observed individual heterogeneity. These are:

- Individual age and the square of this variable. A positive but decreasing wage premium of age is a stylized fact from human capital theory and can also be expected here.

– Job tenure and the square of this variable. Human capital theory would predict a positive (but possibly decreasing) effect of tenure on wages

– The education level captured by five dummy variables that measure whether an individual holds a degree from vocational training but no high school diploma, a high school diploma but no degree from vocational training, a high school diploma and a degree from vocational training, a degree from a technical college or a university degree. The control group consists of those individuals that hold neither a high school diploma nor a degree from vocational training. As with age and tenure, education is included because human capital theory predicts that it should influence wages. More specifically, better-educated workers should earn higher wages *ceteris paribus*.

– A dummy variable for German nationality. Especially because of possible discrimination by employers, German citizens might earn higher wages than other workers.

– Dummy variables for the status as master craftsman / foreman or white-collar worker. Employees who have the status of a master craftsman or a foreman or are employed as white-collar workers could *a priori* be expected to earn higher wages.

Moreover, this study captures possible industry effects by including 33 industry dummies in the establishment-level regressions. In order to account for region-specific effects, establishment-level regressions also include dummy variables for Germany's 16 federal states. Additionally, year dummies are present in both establishment- and individual-level regressions. The latter also include "spell" fixed effects, where "spells" are defined as unique employee-establishment combinations. This approach was proposed by Abowd, Kramarz and Margolis (1999) and accounts for both establishment and individual (time-invariant) unobserved heterogeneity.

A.2. Data Selection and Cleansing

Concerning data selection and cleansing, non-competitive industries [as defined by Müller (2008)] are excluded from the analysis. Also, only those establishments are analyzed that report the volume of sales as the measure of their business volume (as opposed to total assets or similar measures used by some financial corporations).

On the individual level, most employees not covered by social security — like civil servants, family workers and self-employed persons — are not included in the IAB register data. Additionally, spells of marginal employment and home-work are excluded as are employment spells with a wage below the marginal part-time income threshold. It is likely that for many of these employment spells the wage information is corrupt. Spells during which the individual works as an apprentice, an intern or is in partial retirement are not considered either.

After all this data cleansing and in particular the exclusion of observations with missing values for one or more variables, the estimation sample consists of 8079 data points on the establishment level. On the individual level, the sample size is 729,930.

A.3. Summary Statistics

Table 6 presents summary statistics on this study's main variables on the establishment and individual level. It shows amongst many other things that about 33 per cent of the establishments covered export in any given year. One should, however, keep in mind that the IAB Establishment Panel relies on a stratified sample of German establishments — where the strata are defined over industries and plant sizes — and that this stratification probably overestimates the propensity to export.

Table 6: **Summary statistics for establishment- and individual-level variables**

variable	mean	std. dev.	minimum	maximum
exporting establishment	0.32	–	0	1
ratio of total exports to sales	10.06	20.99	0	100
establishment exporting to EMU	0.29	–	0	1
ratio of EMU exports to sales	5.26	12.14	0	100
establishment exporting to NMS	0.13	–	0	1
ratio of NMS exports to sales	1.00	4.03	0	93
establishment exporting to ROW	0.20	–	0	1
ratio of ROW exports to sales	3.80	11.99	0	100
log (wages per employee)	7.96	0.51	5.69	11.76
log (number of employees)	3.21	1.65	0	10.54
log (capital per employee)	10.77	1.63	3.17	18.07
average weekly standard hours	39.13	2.19	13.0	80.0
industry-wide bargaining agreement	0.42	–	0	1
establishment-wide bargaining agreement	0.07	–	0	1
wage council	0.29	–	0	1
log (wages)	4.59	0.42	2.53	6.45
age	41.59	9.75	16	79
tenure	3898.64	2940.09	1	11504
no vocational training; no high school	0.14	–	0	1
vocational training; no high school	0.69	–	0	1
high school; no vocational training	0.01	–	0	1
high school and vocational training	0.04	–	0	1
technical college	0.05	–	0	1
university	0.07	–	0	1
master craftsman / foreman	0.04	–	0	1
white-collar	0.38	–	0	1
German nationality	0.93	–	0	1

For a detailed description of variables used, see Section 3 and Appendix A.1.