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Recruiting abroad: the role of foreign affinity and labour market scarcity

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Contents

Abstract

I study the recruiting behaviour of German establishments with regard to the use of foreign labour markets. Applying instrumental variable strategies, I find foreign affinity and labour market scarcity to stimulate the use of foreign markets. Regional labour market scarcity is particularly relevant to small firms, and the effect of foreign affinity is largely driven by the share of foreigners in leading positions in large establishments. The results indicate that shortages are functional and foster the use of foreign labour markets, but the large effect of foreign affinity also reveals that the potential of immigrant workers is used selectively.

JEL classification: F22, J23, J61, M51

Keywords: Recruiting, Immigrant workers, Scarcity

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1 Introduction

While most European countries suffer from an increasing unemployment rate, in Germany, the unemployment rate declined by 40 % within the 6-year period from 2005 to 2011, decreasing from, on average, 11.7 % in 2005 (Federal Employment Agency (2006)) to 7.1 % in 2011 (Federal Employment Agency (2012)). This substantial recovery of the labour market led to a major change in the labour market structure: the market became more demand oriented, which, in turn, led to an increasing shortage of skilled labour. This skilled labour shortage is well documented in Germany. In June 2011, 27 % of all German firms reported a current or upcoming demand for skilled labour, and in total, more than 800,000 vacant positions were reported across Germany.[1] This development has led to an ongoing public discussion about the skilled labour shortage phenomenon. Because of the contrary development of labour markets in other European countries, German chancellor Angela Merkel argued in favour of a European labour market to solve the skilled labour shortage in Germany (ZEIT Online (2012)). Within the European Union (EU) the "free labour market agreement" allows a European citizen to work in other countries of the EU (European Union (1968)). If a firm[2] wants to recruit a worker from outside the EU, it has to prove that it could not find an appropriate domestic applicant for the vacant position. Although the legal hiring requirements across borders have been simplified, such hiring requirements are still one of the primary explanations of why firms hesitate to recruit immigrant workers. Another reason is the increasing size of the labour force over the past few decades. The number of people in the labour force has steadily increased such that firms have not had to search for workers in other labour markets. In Germany, the demographic structure of the labour market is now at a turning point: the labour force is at an all-time high, but it is projected to decrease in the near future (Fuchs/Söhnlein/Weber (2011)). These labour market developments put pressure on firms' recruitment behaviour. Firms have to search for new strategies and markets to satisfy their labour demands.

Derived from the increasing shortage in the labour supply, the first research question of the present article concerns whether labour market scarcity enhances the use of foreign labour markets for recruiting. The second research question concerns the question of whether firms recruit immigrant workers, and it examines whether foreign affinity, represented by immigrant workers and foreign ownership, increases the probability that firms recruit abroad. Using the 2011 cross-section of the IAB establishment panel, I apply linear and nonlinear regression methods, where the dependent variable is an indicator for recruiting abroad. I find positive effects for the share of foreign employees and foreign ownership, which both support the hypothesis that foreign affinity influences whether firms recruit workers from foreign labour markets. The results also show that the demand for skilled personnel and a low unemployment rate, both representing labour market scarcity, enhance the use of foreign labour markets. Further analyses show that the positive effect of the share of foreigners is largely driven by the share of foreigners in leading positions in establishments, and thus, like Giuliano/Levine/Leonard (2009), I find that the foreign affinity

[1] The results are weighted averages obtained from the 2011 IAB establishment panel.

[2] While I use the term "firm" in the introductory and theoretical part of the article, I use establishment-level observations in the empirical analysis.

of managers is a crucial factor for the use of foreign labour markets.

The model of interest suffers from direct reverse causality because recruiting abroad also has an impact on the number of foreign employees in a firm. At the same time, substantial measurement error might exist in the measurement of the share of immigrant workers in a firm. While reverse causality may lead to an upward bias in simple regressions, measurement error causes a downward bias in the estimate. I resolve the problem of biased estimates by using an instrumental variable (iv)[3] approach in which the lagged share of foreigners in neighbouring firms serves as an exogenous instrument. Conditional on regional controls, I assume the independence of the instrument from the structural equation and claim causality for the results. I obtain the effects from a binary iv probit, which is an iv estimation procedure for binary dependent variables. The iv probit requires restrictive assumptions for consistency but addresses the nonlinearity of the dependent variable. I show that the results obtained from the iv probit estimation are robust to an overidentified specification, the omission of East German establishments and a simple 2SLS procedure.

While most of the existing literature on firms' recruitment behaviour concentrates on the recruitment channel[4] or uses qualitative case studies[5], quantitative evidence on the demand for immigrant workers is rare. The few studies that investigate why firms recruit international workers include Bauer/Kunze (2004), Epstein/Kunze/Ward (2009), and Winkelmann (2002), all of which use the IZA International Employer Survey 2000, which contains information on firms in Germany, France, the Netherlands and the UK. These studies find that workers from the EU are complements to domestic employees, whereas workers from outside the EU are hired because of skilled personnel shortages and are thus substitutes (Bauer/Kunze (2004)). Looking at demand factors at the firm level, these studies fail to show a positive impact of multinational companies and foreign ownership on foreign worker hiring (Winkelmann (2002)). Using individual level data, Dustmann/Glitz/Schönberg (2011) investigate the recruitment of international workers by German firms and show that a large share of foreign workers in a firm increases the likelihood that newly hired workers are foreign (Dustmann/Glitz/Schönberg (2011)). The authors interpret this result as evidence for referral-based job networks, where networks operate along ethnic groups of workers.

Another sub-field in economic research also examines firm-level effects induced by immigrant employees but concentrates on trade as the outcome of interest. Using firm-level data from Denmark, Hiller (2013) shows that firms expand exports when the share of foreign workers increases. I continue this line of research but focus on foreign recruitment and find an effect induced by foreign employees even after controlling for trade activity.

In general, it is possible to differentiate among firms that recruit foreigners domestically, i.e., individuals who have already immigrated, firms that recruit foreigners abroad through the channel of internationally connected establishment sites and, finally, firms that recruit foreigners directly from the foreign labour market (Fellini/Ferro/Fullin (2007)). While I concentrate on the latter dimension only, that is, firms that actually recruit in the foreign mar-

[3] Instrumental variable (iv) in the first occurrence and iv in the second occurrence onwards.
[4] Among others, see Russo et al. (1997) for empirical investigations on firm recruitment channels.
[5] Among others, see Hussein/Stevens/Manthorpe (2011), Rodriguez (2004) and Salt (1992).

ket, studies by Dustmann/Glitz/Schönberg (2011), Winkelmann (2002), and Bauer/Kunze (2004) do not differentiate among these dimensions of international recruiting. Therefore, this is the first empirical study to investigate the firm demand for immigrant workers with respect to recruitment from foreign labour markets.

2 Hypotheses

In analysing the demand for immigrant workers with respect to firms' recruiting strategies, two hypotheses are of particular interest.

Hypothesis 1 *Labour market scarcity enhances the recruitment of immigrant workers.*

The argument underlying this hypothesis is straightforward: if skilled labour is scarce in the labour market, it is difficult to find appropriate candidates for open positions and to find good matches of potential hires. Thus, firms have to broaden their search in the sense that they have to expand the markets in which they recruit. Therefore, firms might also widen the geographic range of labour markets for recruiting. Hence, the likelihood of recruiting immigrant workers increases because of labour market scarcity. In the empirical part of the article, I measure labour market scarcity with two variables: first, an indicator representing the firm demand for high-skilled personnel and, second, the district unemployment rate.

Hypothesis 2 *Foreign affinity enhances the use of foreign labour markets.*

In the empirical part of the article, I use the share of foreign employees and an indicator describing foreign ownership as explanatory variables and claim that both measures represent the foreign affinity of a firm. The channel through which both variables affect the recruitment of immigrant workers remains open. Nevertheless, I expect both to have an enhancing effect. As in Dustmann/Glitz/Schönberg (2011), one primary theoretical channel through which foreign employees might influence firms' recruiting behaviour is job search networks. Firms with large shares of foreign employees are likely to have more pronounced networks abroad, which might be used for recruiting.

Other theoretical explanations should be considered. According to signalling theory, an employee signals a certain quality of her type to an employer (Altonji/Pierret (2001)), and therefore, the employee may reduce uncertainties about employees of that type. If types of workers are differentiated by ethnic groups, currently employed workers can signal that workers of their origin are of good quality. This positive signal leads to recruiting behaviour that favours this type of worker. Foreign employees may also reduce the workplace integration cost such that recruiting foreign workers becomes more desirable.

Furthermore, a channel enhancing the recruitment of immigrant workers could also be pure foreign affinity by firm leaders (Giuliano/Levine/Leonard (2009)). This channel is supported if foreign ownership and the share of foreigners in leadership positions are important factors driving the use of foreign labour markets.

3 Data and Model

The primary data source of the analysis is the 2011 **IAB establishment panel**. The IAB establishment panel is a large annual panel study on general firm policies and personnel developments. The dataset includes more than 15 000 observations each year, which makes it one of the most comprehensive establishment panels in Germany. The survey's gross population units are all establishments located in Germany with at least one employee. The sample represents almost 1 % of all establishments in Germany but, due to sample stratification in size, more than 6 % of the total employees. The sample selection is also representative for German states (Bundeslaender) and industries. Establishments are representatively drawn from the provinces and industries, but the sample is skewed towards large establishments to observe a meaningful number of large establishments in Germany.

In all, 73 % of the interviews are face-to-face interviews conducted by professional interviewers who are trained for this particular survey and procedure. The response rates are above 83 %, which makes it a reliable data source for German establishments. In this article, I use the 2011 cross-section of the IAB establishment panel, which contains information for the date of June 30th, 2011. In this cross-section, for the first time establishments were asked whether recruiting from abroad is used. A more comprehensive data description of the IAB establishment panel can be found in Fischer et al. (2009).

The second data source is the **German Establishment History Panel** (German abbreviation: BHP), which is an panel including the entire population of German establishments with at least one employee subject to social security on June 30th of each year since 1975. The BHP is constructed from the German Employment History, which contains compulsory social security reports to the federal employment agency. Thus, the BHP is an establishment panel that is constructed from a major administrative data source for employment information in Germany such that the individual employment information is aggregated at the establishment level. The dataset includes structural information, such as location and industry, as well as employment-specific information, such as total employment and number of employees by nationality. I use the BHP to exploit the information on the number of employees to calculate a share of foreign employees, which is one of the primary explanatory variables in this article. A comprehensive data description of the BHP is provided in Spengler (2008)).

For the present analysis, I merge the BHP with the 2011 cross-section of the IAB establishment panel.[6][7] I restrict the analysis to establishments with at least 5 employees[8] and

[6] It is possible to merge all but 1058 establishments, which leaves a sample size of 14 226 establishments. Observations are lost if the unique BHP identification number changes in years after it was drawn for the IAB establishment panel for its first panel interview.

[7] Currently, the 2011 wave of the BHP is not publicly available, but the IAB provided me with the underlying individual data from the German Employment History. This allows calculating the share of foreign employees which is a major explanatory variable. Furthermore it allows to calculate the share of foreign employees from the top decile of wages (within establishments), which I use as a proxy for foreigners in leading positions.

[8] I restrict the analysis sample to establishments with at least 5 employees because the share that is variable (share of foreign employees) is less sensitive to changes in employment size when the smallest firms are

nonpublic establishments[9], leaving a sample size of 8937 establishments.

The primary variable of interest is a dummy variable indicating whether recruiting from abroad is a strategy for hiring skilled workers. I take the variable from the IAB establishment panel, in which establishments are asked whether recruiting abroad is a strategy for recruiting skilled workers. Because I am not interested in the importance of recruiting abroad compared with other recruiting channels, but only whether a firm uses recruiting from abroad, I use both "major strategy" and "minor strategy" as affirmative answers ($for\_rec = 1$) and "no strategy" as a negative answer ($for\_rec = 0$). Thus, the binary indicator captures information on whether recruiting abroad is used as a firm strategy.[10]

To investigate hypothesis 1, whether labour market scarcity enhances the use of foreign labour markets, I use the demand for skilled workers (*hq_demand*) as an explanatory factor. I take this information from a question in the IAB establishment panel that asks whether the establishment will have a demand for skilled workers for the upcoming two years. The estimated coefficient suffers from an omitted variable bias if fast-growing or innovative minded firms are an omitted characteristic. These firms have a high demand for skilled personnel and might seek the international expertise of migrant workers. To obtain an exogenous effect, I use a second variable that captures whether the demand for skilled workers is solely due to the retirement of elderly workers. I assume that the retirement of elderly workers is an exogenous reason for the demand for skilled personnel. Reported regression coefficients are the linear combination of the two variables, the general demand for skilled personnel and the demand for skilled personnel due to retirement.

The second variable used to capture the effect of labour market scarcity is the regional unemployment rate (*uer*), which is available from the federal employment agency for all 411 districts in Germany. I assume that the district unemployment rate is exogenously given to a firm.

For hypothesis 2, whether foreign ownership increases the probability of a firm recruiting abroad, I use a dummy variable indicating foreign ownership (*for_owner*) as an explanatory variable. It takes a value one if either the single firm owner is foreign or the majority of shares are owned by foreigners.[11]

The main variable taken from the German Employment History is the share of foreigners employed in the firms, which is another primary explanatory variable of interest. The variable is based on the individual citizenship of all employees, which is reported by firms as part of their social security report. I use a simple distinction between Germans and non-Germans, where the variable for_share is the number of foreign employees as a share

omitted. Second, recruiting abroad is negligible among the smallest establishments. Only 2.8 % report to recruit abroad. Nevertheless, the results are not sensitive to this restriction.

[9] The exclusion of public establishments is based on the legal form.

[10] To exploit all the information contained within the categorical variable, I use a control function approach, as proposed by Rivers/Vuong (1988)) and Wooldridge (forthcoming), in which the reduced form equation is estimated from a ordered probit. The results all have the same signs as in the binary case and have similar significance levels such that only binary results are presented here.

[11] I take this information from the IAB establishment panel, which differentiates between public and private ownership as well as among West German, East German and foreign ownership.

of the total number of employees. In the effect heterogeneities, I also calculate the share of foreigners among highly paid employees only, which approximates the share of foreign managers.[12]

Altogether, the empirical model of interest can be specified as follows:

$$for\_rec_i = \beta_0 + for\_share_i * \beta_1 + for\_owner_i * \beta_2 + hq\_demand_i * \beta_3 + uer_i * \beta_4 + x_i' * \beta_5 + \epsilon_i \quad (1)$$

We interpret equation 1 as the linear probability model or the structural equation. The subscript *i* represents firm-level observations for all the variables, and ϵ_i is an iid error term. The vector of control variables x_i contains dummy variables for whether the establishment is a subsidiary of a larger corporation, as well as the legal form (5 categories), research activity, export activity (4 categories)[13], firm size (8 size groups)[14] and industry (43 categories based on the two-digit industry codes) of the establishment, as specified in the establishment panel.

4 Descriptives

To gain a first impression of the analysis, sample descriptive statistics are presented in table 1. Examining the descriptive statistics provides a first impression of the use of foreign labour markets for recruiting.

[Table 1]

As presented in table 1, the analysis sample comprises 8 937 establishments located in Germany with at least 5 employees. In all, 15 % of the establishments report using foreign labour markets to recruit immigrant workers. The use of foreign labour markets is much more common among large establishments, which indicates that firm size is an important barrier to overcoming the fixed costs associated with using foreign markets for recruitment. In all, 52.7 % of the establishments report a skilled labour shortage, which is also much more common among large establishments. The two variables defining the foreign affinity of establishments are foreign ownership and the share of foreign employees. Of all the establishments, 6.6 % have foreign ownership, whereas 11.7 % of large establishments have foreign ownership. The share of foreign employees is 5.5 %, which is stable across firm sizes. The pair-wise correlations between the incidence of recruiting abroad and the demand for skilled personnel as well as the variables indicating foreign affinity all have positive and statistically significant correlation coefficients. Because the pair-wise correlations only provide a first indication of a relation but do not allow for causal interpretations, I apply multivariate regressions.

[12] The variable is calculated from employees in the top decile of wage earners within a firm.

[13] The 4 categories for export activity are "no exports", "up to 10 % of sales", "more than 10 % of sales" and "missing export information".

[14] The establishment size categories are 5-19 employees, 20-49 employees, 50-99 employees, 100-199 employees, 200-499 employees, 500-999 employees, 1 000-4999 employees and at least 5 000 employees.

5 Identification

Turning to the multivariate specification, such as in equation 1, the share of foreigners employed at a firm is highly endogenous to the dependent variable. The source of endogeneity is reverse causality, as recruiting abroad leads to a direct increase in the share of foreign workers. Another important issue is measurement error in for_share, which also leads to biased estimates. Measurement error occurs because the actual explanatory variable that corresponds to the theory is migration status, not individual citizenship. If the theoretical explanations operate through migration background or ethnicity, citizenship is only a proxy for migration background and contains measurement error. The reverse causality indicates an upward bias in the estimate, while the measurement error biases the coefficient towards zero. Both sources of bias can be resolved with the iv if the variation of the instrument is exogenous and uncorrelated with the measurement error.

The iv is the lagged share of foreigners employed at neighbouring firms (all other firms of the same district). The regions are distinguished on the basis of German municipalities, i.e., the smallest regional distinction possible in the data. The logic underlying the instrument is that firms located in a geographic neighbourhood have all hired their employees in the past and have used the same regional labour market and pool of applicants, which today exogenously determines the composition of the work force. It is a market-based instrument where the past composition of the regional labour market is used to explain the current share of foreigners in a firm.

Excluded from the instrument $for\_municipality_{-i,t-1}$ are firm *i*'s own employees, denoted by subscript $-i$ such that its own share of foreign employees does not have a direct impact on the variable $for\_municipality$. I calculate the variable $for\_municipality$ using the BHP. Thus, $for\_municipality$ contains information for all establishments in Germany, and thus, the share of foreign employees within districts is likely highly accurate.[15] To use $for\_municipality$ as a valid instrument, it should have enough variation to explain differences in the share of foreigners across firms. Fig. 1 shows the share of foreigners employed in a selection of German municipalities. The figure presents the 5 municipalities with the lowest share of foreigners, 5 municipalities around the median and the 5 municipalities with the highest share of foreigners. We observe a large variation between districts.[16] At the lower end, the share of foreign employees is less than 1 %, and at the upper end, more than 15 % of the employees have foreign citizenship. We observe a high share of foreign employees among cities in West Germany, whereas the share of foreign employees is low among small East German municipalities.

[Figure 1]

In the first-stage regression of the iv approach, I use the share of foreigners employed at other firms in the respective municipality to exogenously explain the share of foreigners. An

[15] For 2010, the full sample of the BHP consists of 2 855 371 firm-level observations.

[16] See also Burkert/Niebuhr/Wapler (2008) for the large variation in the share of foreign employees across German regions.

economically and statistically meaningful first-stage result is one of the main assumptions (Angrist/Pischke (2009)). Because most of the employees live and have been recruited in the same district, a high positive conditional estimate is expected. Table 2 shows the results of first-stage OLS regressions where for_share_i is the dependent variable and $for\_municipality_{-i,t-1}$ is the exogenous explanatory variable. Column 1 shows the unconditional bivariate regression results, whereas the estimate in column 2 is conditional on establishment and regional controls. Columns 3 and 4 use $for\_manager$ as the dependent variable. This variable measures the share of foreign employees among highly paid employees only. In table 2, the t-statistic for the relevance of the single instrument is well above 3 in all the specifications[17] , which statistically shows that $for\_municipality$ is a meaningful predictor in the first stage.

[Table 2]

The second main assumption to be fulfilled is the exogeneity of the instrument, which implies that it is uncorrelated with the error term in the structural model. The exogeneity of the instrument makes the obtained IV estimates superior to the OLS estimates because it leads to unbiased and consistent results. This crucial assumption is not testable, but it is necessary to assume that there is no direct effect on the dependent variable other than through the channel of the instrumented explanatory variable (Angrist/Pischke (2009)).

Moreover, for exogeneity the dummy instrument should be assigned exogenously (Angrist/Pischke (2009)), which implies that the regional share of foreigners is randomly assigned to firms. The assignment of the share of foreigners to a district should not be selective in any dimension that is correlated with a firm's decision making. To assess this additional requirement, fig. 2 presents the share of foreigners in a map of regions in Germany. Again, we observe substantial variation across districts. Districts with high shares of foreigners are orange, and districts with low shares are dark blue. From visual inspection, two important findings can be observed, which potentially violate the random assignment assumption. First, the share of foreigners is much lower in East Germany than in West Germany. Second, the share of foreigners is also higher in cities than in rural areas. These two findings may be problematic for the analysis if differences in the agglomeration or East-West differences affect a firm's decision to recruit from abroad. The share of foreigners may be higher in cities because cities have better networks and infrastructure. Furthermore, West German regions are more developed, and therefore, firms in West Germany may also be more likely to recruit from abroad. To address these worrisome findings in the iv approach, I include both agglomeration and region as control variables. I address the East-West differences by using an East-Germany dummy variable and the differences in agglomeration by using the BIK variable. The BIK variable is an agglomeration index of 10 categories, which I use as dummy variables. This index, which is available for all municipal areas, combines the two dimensions population density and distance to the next city centre in one categorical measure for agglomeration. Another important geographic

[17] The F-statistic for a single variable is equivalent to the squared t-statistic. As conventionally required, the test should yield a t-statistic above $\sqrt{10} \approx 3.2$.

covariate is a variable that indicates border regions (Niebuhr/Stiller (2006)). Firms that are located in border regions may more easily recruit abroad because the short distance allows them to hire abroad more easily, and thus, the region has a direct impact on the outcome variable. Conditional on all these controls, there should be no doubt that the assignment of the share of foreigners to districts is exogenous. Hence, the required conditional independence assumption of the instrument holds.

6 Estimation strategy

I estimate the structural model as defined in equation 1 using a linear and nonlinear specification with and without special treatment of the endogenous explanatory variable, namely, the share of foreigners (*for_share*). The simplest strategy that accounts for neither the endogeneity of *for_share* nor the nonlinearity of the dependent variable *for_rec* is an OLS estimation of equation (1). The linear probability model provides a first approximation to the effect of interest and serves as a baseline result for further analyses. We can interpret the results as conditional correlations of the dependent and independent variables of interest. The second estimation strategy estimates the structural model using a nonlinear binary response probit model. This does not account for the endogeneity of *for_share* but addresses the binary characteristic of the dependent variable.

To achieve an exogenous identification, I estimate the structural model using an iv approach where I apply a simple 2SLS specification as well as a nonlinear iv probit approach. The latter estimates the structural model using a binary specification and interpretation. The iv probit, like 2SLS, consistently estimates the exogenous effect of interest in a second-stage regression.

In the linear 2SLS specification, I estimate the structural equation from the following two stages:

$$for\_rec_i = \beta_0 + for\_share_i * \beta_1 + z_i' * \beta + u_i \tag{2}$$

where all exogenous explanatory variables other than the instrument are in vector z_i, and the reduced form (first stage) of the endogenous variable *for_share* is: *for_share*:

$$for\_share_i = \delta_0 + for\_municipality_{-i,t-1} * \delta_1 + z_i' * \delta + v_i \tag{3}$$

The index $(-i, t-1)$ of the instrument indicates that I use all firms located in Germany other than firm i to calculate the share of foreigners in the respective neighbourhood and, second, that I include the iv *for_municipality* lagged by one period. Note that the reduced form of *for_share* also includes all the exogenous explanatory variables.

The 2SLS procedure takes the fitted values of *for_share* from the first-stage regression (equation 3) and uses them as the regressor in the so-called second stage, which is the structural equation (equation 2). Under weak exogeneity, i.e., $E(for\_municipality' u) = 0$, 2SLS consistently estimates the exogenous average partial effects.

To account for both the nonlinearity of *for_rec* and the endogeneity of *for_share*, I estimate an iv probit that uses a binary response model for the structural equation, while the

first-stage regression relies on the linearity of the endogenous explanatory variable. The procedure that I apply here is estimated by joint maximum likelihood.

I formulate the full specification in the following two equations:

$$for\_rec_i = 1[for\_share_i * \beta_1 + z_i' * \beta + u_i > 0] \tag{4}$$

$$for\_share_i = for\_municipality_{-i,t-1} * \delta_1 + z_i' * \delta + v_i \tag{5}$$

Equation 4 is the structural model of interest written as an indicator function, and equation 5 is the first stage or reduced form of *for_share*. The indicator function of *for_rec* creates the binary characteristic and contains all exogenous explanatory variables other than the instrument, which I only include in the right-hand side of equation 5. Note that equation 5, the reduced form regression of *for_share* on the instrument *for_municipality* and covariates z, is still the same linear model as already presented in equation 3.

For consistency, the iv probit requires independence of the instrument from the structural equation and bivariate normality of u_i and v_i. Thus, the iv probit approach comes at the cost of requiring more restrictive assumptions but has the advantage of allowing estimation of the conditional expectation function of recruiting abroad using a binary model.

7 Results

In table 3, I present the main empirical results addressing the hypotheses. I use linear and nonlinear specifications both with and without the iv, where all the specifications aim to estimate the effects of the structural model as specified in equation 1.

We interpret the OLS results in column (1) as conditional correlations of the indicator for recruiting abroad and the explanatory variables of interest. The estimates all yield the expected sign. The shares of foreign employees and foreign ownership have positive conditional correlations with the use of foreign labour markets. As expected in the scarcity hypothesis, the demand for high-skilled workers also has a positive correlation, and the regional unemployment rate has a negative correlation with the use of foreign labour markets. Thus, the OLS results provide the first evidence supporting both of the main hypotheses. Note that the effect of the share of foreign employees suffers from severe endogeneity problems.

The marginal effects of the probit estimation in column (2) do not differ much from the OLS results, but neither account for endogeneity.

[Table 3]

The first IV estimation uses a 2SLS estimation strategy and thus relies on a linear probability model. Therefore, we interpret the results in column (3) as linear approximations for

the nonlinear specification of interest. The results allow for causal interpretations, as I instrument the endogenous explanatory variable *for_share* using the exogenous instrument $for\_municipality$. The coefficient for the variable *for_share* is slightly higher in the 2SLS estimates than in the OLS estimates, but all other coefficients are of similar size.

Column (4) presents the effects of the iv probit, which accounts for both the nonlinearity of *for_rec* and the endogeneity of *for_share*. We interpret the coefficients as probability effects of the respective variables. For the variable *for_share*, the observed probability effect corresponds to an increase of one in the fraction of foreigners. The estimated effect thus shows an increase in the probability for recruiting abroad by 33.8 percentage points. Because, in fact, only 15 % of all establishments with at least 5 employees recruit abroad, this represents an increase of 225 %. This increase seems large, but because an increase in the *for_share* variable of one implies an increase in the share of employed foreigners from 0 to 100 %, such a scenario is unrealistic. More realistic is a 10 % increase in the share of foreigners (i.e., *for_share* increases by 0.1), which would indicate an increase in the probability of recruiting abroad by 3.38 percentage points, corresponding to an increase of 22.5 %. The effect is still remarkably large, supporting the hypothesis that the share of foreigners employed in a firm reduces the barrier to recruiting immigrant workers. The effect of foreign ownership is 0.047, which implies that foreign ownership increases the probability of recruiting immigrant workers by 4.7 percentage points, corresponding to a remarkably large increase of 31 %.

The coefficient for the exogenous effect of the demand for skilled workers is also positive and indicates that the demand for skilled workers increases the probability of recruiting abroad by 7.1 percentage points, corresponding to an increase of 47 %. This is a causal effect arising from the demand of establishments for skilled personnel due to the retirement of elderly workers, which I assume is an exogenous reason for the demand for skilled personnel. The effect of the unemployment rate is negative, which is consistent with the notion that firms do not need to recruit immigrant workers once the unemployment rate increases. Thus, the probability of recruiting immigrant workers increases as the unemployment rate decreases, i.e., if skilled labour becomes scarce.

[Table 4]

To shed light on the question regarding through which channel the share of foreign employees affects firms' use of foreign labour markets, I estimate the iv probit with samples of small and large establishments separately. Furthermore, I calculate the share of foreigners among highly paid employees to determine whether the effect is particularly strong for employees in leading positions.

Table 4 presents the results of the effect heterogeneities by establishment size and different shares of foreigners as measures of foreign affinity. Column (1) presents the baseline results from the iv probit for establishments with less than 50 employees.[18] We do not

[18] Different categorisations by establishment size have been tested. The cut-off point of 50 employees is

observe a significant effect for the share of foreign employees in this sub-group. We also observe that the effect of the demand for skilled personnel is smaller in size, whereas the effect of the unemployment rate is particularly strong. Column (2) presents the estimates for a sub-sample of establishments with at least 50 employees. Using only large establishments, the effect of foreign employees is 0.62, and thus, the likelihood of recruiting immigrant workers increases by 6.2 percentage points if the share of foreign employees increases by 10 %. This partial effect is larger than the estimate using the entire sample of establishments. Because the average use of foreign labour markets among large firms is 25.7 %, this corresponds to an increase of 24.1 % if the share of foreign employees increases by 10 %. Foreign ownership increases the likelihood of foreign recruitment by 6.3 percentage points, such that both variables capturing foreign affinity still have a positive impact when using a sample of large firms only. The exogenous effect of the demand for skilled personnel is large and positive, but the coefficient for the district unemployment rate becomes insignificant for large establishments, indicating that the regional unemployment rate is irrelevant for large firms' decision to recruit immigrant workers.

Turning to columns (3) and (4), the share of foreign employees is calculated from employees in the top decile of earners, e.g., employees in leading positions. Using the same iv and the same iv probit approach as before, the estimated effect is much larger. Examining small establishments only (column 3), we do not observe a significant effect of the share of foreigners in leading positions. All other coefficients for the estimates in columns (3) and (1) are similar in size. Again, among establishments with more than 50 employees (column 4), the effect in percentage points for the share of foreign employees in leading positions is quite large compared with that for small establishments. We can conclude that among large establishments, foreigners in leading positions are a crucial factor driving the recruitment of immigrant workers abroad. Furthermore, the results in column (4) show that foreign ownership and demand for high-skilled personnel enhance the recruitment of immigrants, but the regional unemployment rate is again irrelevant.

To test the robustness of the results, I use additional lags of the instrument to determine the endogenous explanatory variable in the first stage. Using additional lags is necessary if the current composition of employees has been exogenously determined by the regional composition of the work force, but if such an effect was influential longer ago. Thus, I use the share of foreign employees at neighbouring establishments (other establishments in the same municipality) for the years 2008, 2009 and 2010 jointly in an overidentified specification. Table 5 shows the overidentified results using the iv probit to estimate all specifications, such as in table 4. The results are fully robust to this alternative overidentified iv specification.

Fig. 2 shows a significant difference in the share of foreign employees between regions in East and West Germany. To show that the results are not entirely driven by this variation in the iv, I estimate the model using a sample of West German establishments only. Examining the results in table 6, the precision slightly decreases, but the point estimates have the

used because it splits the sample in two roughly equal groups of establishments. The cut-off point of 50 employees seems sufficient to demonstrate that some of the results, such as the effect of foreign employees, are driven by establishment size.

same signs and are of similar size compared with the full sample of establishments.

8 Conclusion

Analysing why firms recruit immigrant workers, I propose two main hypotheses: first, that labour market scarcity leads firms to use foreign labour markets for recruiting and, second, that foreign affinity positively affects the use of foreign labour markets for recruiting skilled personnel. We can confirm both hypotheses using an iv probit. I measure the foreign affinity of a firm using the share of foreigners and foreign ownership as explanatory variables. Both effects yield the expected positive sign, indicating that foreign affinity indeed enhances the recruitment of immigrant workers. Calculating the share of foreigners among high wage employees only shows that the results are largely driven by immigrants in leading positions. Thus, I conclude that foreign affinity among the leading personnel in a firm in particular increases immigrant recruitment.

To test whether labour market scarcity influences the use of foreign labour markets for recruiting, I use the self-reported demand for skilled personnel and the district unemployment rate as explanatory variables. The demand for skilled personnel is calculated solely from the retirement of elderly workers. Thus, the reported effect yields the exogenous interpretation of interest. The effect is positive through all specifications and is particularly strong for large establishments. For large firms, the demand for skilled personnel increases the probability of recruiting immigrant workers by 47 %. I assume that the regional rate of unemployment is exogenous, i.e., it cannot be influenced by a firm. Its effect, which is statistically significant, is negative throughout all specifications and large for small establishments.

The implications of the primary results are twofold. The first finding, that labour market scarcity enhances the recruitment of immigrant workers, shows that market mechanisms are functioning in the recruitment of immigrant workers. Firms that report having a demand for skilled personnel are already more likely to recruit immigrant workers. Thus, the probability of recruiting abroad further increases as the labour market becomes more demand oriented.

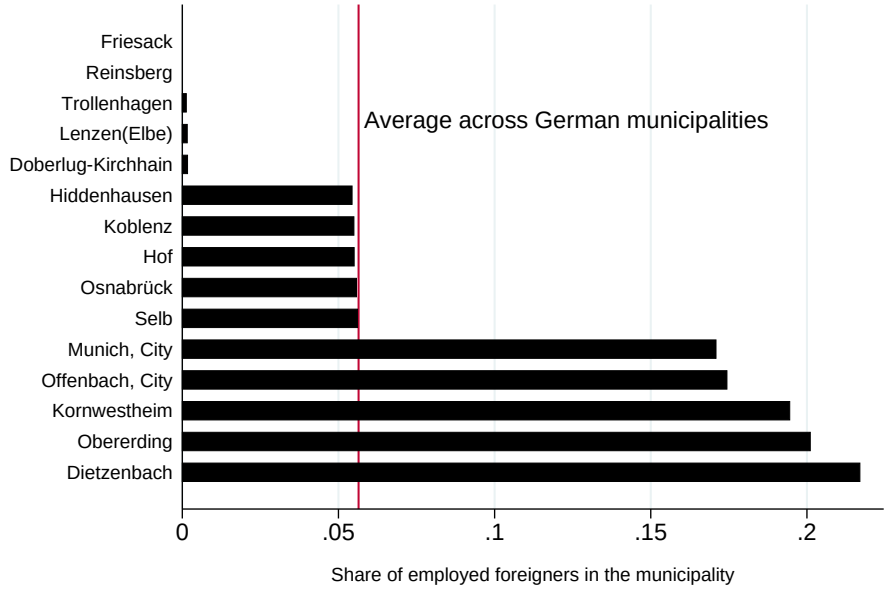
In contrast, the results obtained for foreign affinity, captured by foreigners in leading positions and foreign ownership, show that the potential of immigrant workers is selectively used. This implies that the recruitment of immigrant workers does not purely follow economic mechanisms.

Because all labour force projections predict an increasing shortage of skilled labour, i.e., an increasing demand for immigrant workers, future research should identify potential selection criteria, barriers to recruiting immigrant workers and strategies to overcome such barriers.

9 Figures and Tables

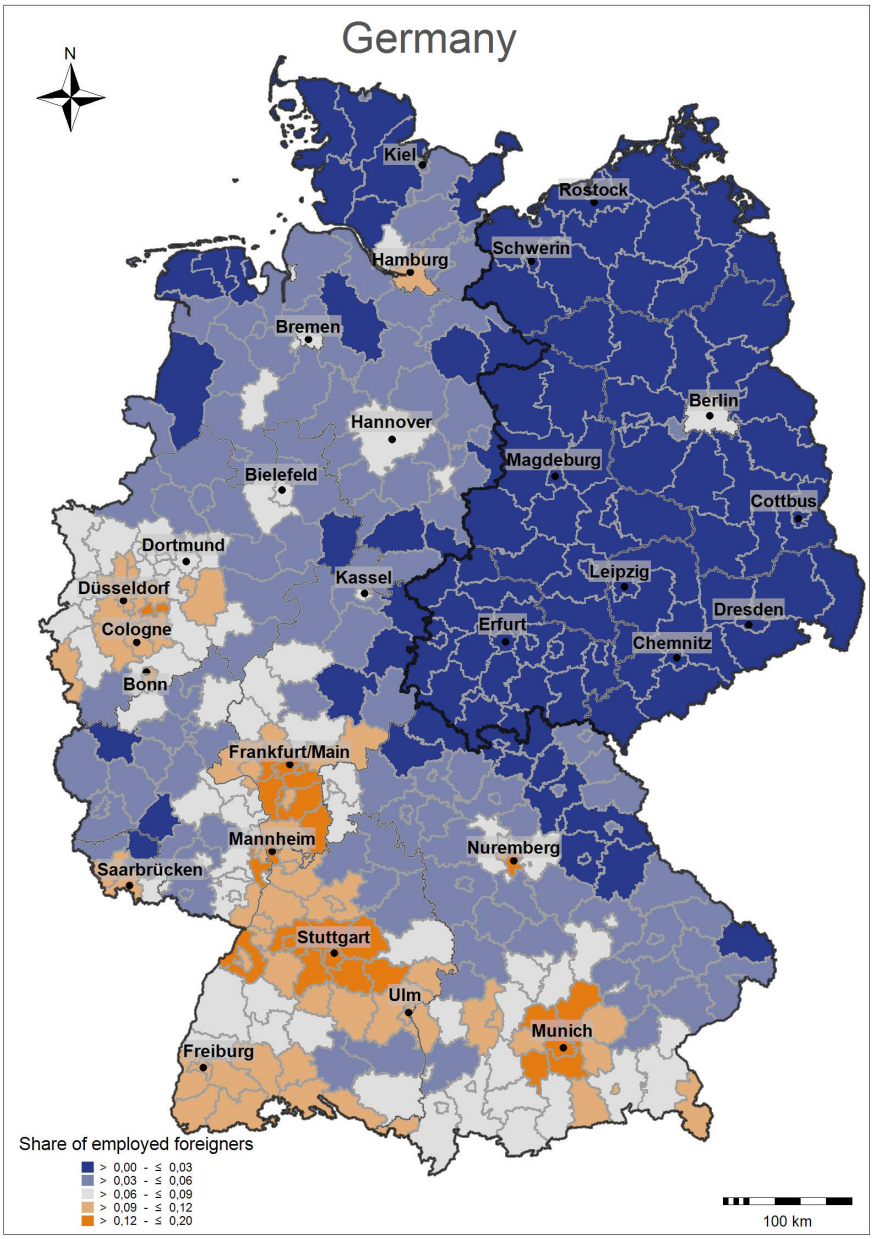
9.1 Appendix: Figures

Figure 1: Share of employed foreigners in a selection of municipalities: The minimum, maximum and median



Data source: Employment History of the German Employment Agency and the IAB, June 30th 2010.

Figure 2: The variation of the share of employed foreigners in regions across Germany 2010



9.2 Appendix: Tables

Table 1: Descriptive statistics on the usage of foreign labor markets

by establishment size	all (1)	<50 employees (2)	>=50 employees (3)
Num. of establishments	8,937	5,561	3,376
Frac. of establishments	1	0.622	0.378
Recruiting abroad:			
Num. of establ.	1,339	470	869
Frac. of establ.	0.150	0.085	0.257
Skilled labor shortage (hq_shortage):			
Num. of establ.	4,711	2,184	2,527
Frac. of establ.	0.527	0.393	0.749
Foreign ownership (for_owner):			
Num. of establ.	588	194	394
Frac. of establ.	0.066	0.035	0.117
Share of foreign employees (for_share):			
Mean across establ.	0.055	0.053	0.059
Pairwise correlations with recruiting abroad:			
hq_shortage	0.229***	0.158***	0.182***
for_owner	0.138***	0.111***	0.100***
for_share	0.087***	0.048***	0.100***

Source: 2011 IAB establishments, own calculations. The analysis sample includes establishments with at least 5 employees. Asterisks indicate significance levels for all pairwise correlations (*10 %, **5 %, and ***1 %).

Table 2: First stage OLS regression

Endogenous variable	for_share (1)	for_share (2)	for_manager (3)	for_manager (4)
for_municipality	0.861	0.777	0.447	0.374
	(0.034)	(0.047)	(0.041)	(0.059)
Controls:				
Plant level chars.	no	yes	no	yes
Industry fe	no	yes	no	yes
Regional controls	no	yes	no	yes
Clusters	2,603	2,603	2,603	2,603
Observations	8,108	8,108	8,108	8,108

Cluster robust standard errors in parentheses (cluster=municipality). The presented estimates are marginal effects from OLS specifications. Dep. vars: *for_share* and *for_manager* are the shares of foreigners and share of foreigners in the top decile of wages within establishments. Plant level chars. include dummies indicating whether the firm is a subsidiary of a larger corporation, has a R&D department, the legal form, and 8 firm size categories, as well as 4 dummies for export activity. Industry fe comprises of 43 industry level fixed effects. Regional controls include dummies for East Germany, border regions, and 10 categories for agglomeration.

Table 3: Regression results in which recruiting abroad is the dependent variable

Method	OLS (1)	probit (2)	2SLS (3)	iv probit (4)
for_share	0.238	0.227	0.373	0.338
	(0.049)	(0.035)	(0.153)	(0.136)
for_owner	0.082	0.048	0.080	0.047
	(0.022)	(0.013)	(0.022)	(0.013)
uer	-0.346	-0.368	-0.316	-0.341
	(0.128)	(0.142)	(0.134)	(0.148)
hq_demand	0.062	0.070	0.064	0.071
	(0.009)	(0.009)	(0.009)	(0.009)
Controls:				
Plant level chars.	yes	yes	yes	yes
Industry fe	yes	yes	yes	yes
Regional controls	yes	yes	yes	yes
Clusters	2,603	2,603	2,603	2,603
Observations	8,109	8,099	8,108	8,099

Cluster robust standard errors in parentheses (cluster=municipality). The presented estimates are marginal effects from OLS, probit, 2SLS and iv probit specifications. Dep. var: *for_rec*, indicates establishments if recruiting abroad is a firm strategy to recruit skilled workers. Plant level chars. include dummies indicating whether the firm is a subsidiary of a larger corporation, has a R&D department, the legal form, and 8 firm size categories, as well as 4 dummies for export activity. Industry fe comprises of 43 industry level fixed effects. Regional controls include dummies for East Germany, border regions, and 10 categories for agglomeration.

Table 4: Effect heterogeneities: Share of foreigners in management and large firms

Method	iv probit			
Sample by establ. size	<50 employees	>50 employees	<50 employees	>50 employees
	(1)	(2)	(3)	(4)
for_share	0.097	0.615		
	(0.174)	(0.215)		
for_manager			0.190	1.530
			(0.294)	(0.478)
for_owner	0.053	0.063	0.047	0.041
	(0.018)	(0.022)	(0.022)	(0.023)
uer	-0.476	-0.065	-0.496	-0.013
	(0.152)	(0.258)	(0.156)	(0.241)
hq_demand	0.043	0.119	0.044	0.120
	(0.010)	(0.020)	(0.010)	(0.018)
Controls:				
Plant level chars.	yes	yes	yes	yes
Industry fe	yes	yes	yes	yes
Regional controls	yes	yes	yes	yes
Clusters	1,983	1,377	1,983	1,377
Observations	4,730	3,178	4,730	3,178

Cluster robust standard errors in parentheses (cluster=municipality). The presented estimates are marginal effects from iv probit specifications. Dep. var: *for_rec*, indicates establishments if recruiting abroad is a firm strategy to recruit skilled workers. Plant level chars. include dummies indicating whether the firm is a subsidiary of a larger corporation, has a R&D department, the legal form, and 8 firm size categories, as well as 4 dummies for export activity. Industry fe comprises of 43 industry level fixed effects. Regional controls include dummies for East Germany, border regions, and 10 categories for agglomeration.

Table 5: Estimation results with additional lags of the instrument

Method	iv probit			
Sample by establ. size	<50 employees	>50 employees	<50 employees	>50 employees
	(1)	(2)	(3)	(4)
for_share	0.040	0.575		
	(0.181)	(0.213)		
for_manager			-0.137	1.430
			(0.351)	(0.492)
for_owner	0.056	0.063	0.066	0.039
	(0.018)	(0.022)	(0.030)	(0.022)
uer	-0.497	-0.079	-0.535	-0.036
	(0.152)	(0.257)	(0.164)	(0.242)
hq_demand	0.043	0.119	0.043	0.120
	(0.010)	(0.020)	(0.010)	(0.019)
Controls:				
Plant level chars.	yes	yes	yes	yes
Industry fe	yes	yes	yes	yes
Regional controls	yes	yes	yes	yes
Clusters	1,978	1,377	1,978	1,377
Observations	4,718	3,178	4,718	3,178

Cluster robust standard errors in parentheses (cluster=municipality). The presented estimates are marginal effects from iv probit specifications. Dep. var: *for_rec*, indicates establishments if recruiting abroad is a firm strategy to recruit skilled workers. Plant level chars. include dummies indicating whether the firm is a subsidiary of a larger corporation, has a R&D department, the legal form, and 8 firm size categories, as well as 4 dummies for export activity. Industry fe comprises of 43 industry level fixed effects. Regional controls include dummies for East Germany, border regions, and 10 categories for agglomeration.

Table 6: Estimation results using West German establishments

Method	iv probit			
Sample by establ. size	<50 employees	>50 employees	<50 employees	>50 employees
	(1)	(2)	(3)	(4)
for_share	0.140	0.653		
	(0.203)	(0.244)		
for_manager			0.287	1.638
			(0.340)	(0.525)
for_owner	0.035	0.091	0.025	0.060
	(0.021)	(0.028)	(0.028)	(0.029)
uer	-0.338	0.091	-0.366	0.147
	(0.241)	(0.334)	(0.247)	(0.310)
hq_demand	0.051	0.125	0.055	0.125
	(0.013)	(0.025)	(0.013)	(0.024)
Controls:				
Plant level chars.	yes	yes	yes	yes
Industry fe	yes	yes	yes	yes
Regional controls	yes	yes	yes	yes
Clusters	1,209	919	1,209	919
Observations	2,701	2,090	2,701	2,090

Cluster robust standard errors in parentheses (cluster=municipality). The presented estimates are marginal effects from iv probit specifications. Dep. var: *for_rec*, indicates establishments if recruiting abroad is a firm strategy to recruit skilled workers. Plant level chars. include dummies indicating whether the firm is a subsidiary of a larger corporation, has a R&D department, the legal form, and 8 firm size categories, as well as 4 dummies for export activity. Industry fe comprises of 43 industry level fixed effects. Regional controls include dummies for East Germany, border regions, and 10 categories for agglomeration.

References

Altonji, Joseph G.; Pierret, Charles R. (2001): Employer Learning And Statistical Discrimination. In: The Quarterly Journal of Economics, Vol. 116, No. 1, p. 313–350.

Angrist, Joshua; Pischke, Jörn-Steffen (2009): Mostly Harmless Econometrics: An Empiricist's Companion. Massachusetts: MIT Press 2009.

Bauer, Thomas K; Kunze, Astrid (2004): The demand for high-skilled workers and immigration policy. In: Brussels Economic Review, Vol. 47, No. 1, p. 77–88.

Burkert, Carola; Niebuhr, Annekatrin; Wapler, Rüdiger (2008): Regional disparities in employment of high-skilled foreigners–Determinants and options for labour migration policy in Germany. In: Journal of International Migration and Integration/Revue de l'integration et de la migration internationale, Vol. 9, No. 4, p. 383–400.

Dustmann, Christian; Glitz, Albrecht; Schönberg, Uta (2011): Referral-based Job Search Networks. In: IZA Discussion Papers No. 5777.

Epstein, Gil S.; Kunze, Astrid; Ward, Melanie E. (2009): High-Skilled Migration and the Exertion of Effort by the Local Population. In: Scottish Journal of Political Economy, Vol. 56, No. 3, p. 332–352.

European Union (1968): Regulation (EEC) No 1612/68 of the Council of 15 October 1968 on freedom of movement for workers within the Community.

Federal Employment Agency (2012): Arbeitsmarktanalyse für Deutschland, West- und Ostdeutschland. Amtliche nachrichten der bundesagentur fuer arbeit, Bundesagentur fuer Arbeit, Nuremberg.

Federal Employment Agency (2006): Arbeitsmarktanalyse für Deutschland, West- und Ostdeutschland. Amtliche nachrichten der bundesagentur fuer arbeit, Bundesagentur fuer Arbeit, Nuremberg.

Fellini, Ivana; Ferro, Anna; Fullin, Giovanna (2007): Recruitment processes and labour mobility: the construction industry in Europe. In: Work, Employment & Society, Vol. 21, No. 2, p. 277–298.

Fischer, Gabriele; Janik, Florian; Müller, Dana; Schmucker, Alexandra (2009): The IAB Establishment Panel * things users should know. In: Schmollers Jahrbuch: Zeitschrift für Wirtschafts- und Sozialwissenschaften / Journal of Applied Social Science Studies, Vol. 129, No. 1, p. 133–148.

Fuchs, Johann; Söhnlein, Doris; Weber, Brigitte (2011): Projektion des Arbeitskräfteangebots bis 2050: Rückgang und Alterung sind nicht mehr aufzuhalten. In: IAB-Kurzbericht 16, 2011.

Giuliano, Laura; Levine, David I.; Leonard, Jonathan (2009): Manager Race and the Race of New Hires. In: Journal of Labor Economics, Vol. 27, No. 4, p. 589–631.

Hiller, Sanne (2013): Does immigrant employment matter for export sales? Evidence from Denmark. In: Review of World Economics/ Weltwirtschaftliches Archiv, Vol. 149, p. 369–394.

Hussein, Shereen; Stevens, Martin; Manthorpe, Jill (2011): What Drives the Recruitment of Migrant Workers to Work in Social Care in England? In: Social Policy and Society, Vol. 10, No. 3, p. 285–298.

Niebuhr, Annekatrin; Stiller, Silvia (2006): Integration and labour markets in European border regions. In: Zeitschrift für ArbeitsmarktForschung - Journal for Labour Market Research, Vol. 39, No. 1, p. 57–76.

Rivers, Douglas; Vuong, Quang H. (1988): Limited information estimators and exogeneity tests for simultaneous probit models. In: Journal of Econometrics, Vol. 39, No. 3, p. 347–366.

Rodriguez, Nestor (2004): "Workers Wanted": Employer Recruitment of Immigrant Labor. In: Work and Occupations, Vol. 31, p. 453–473.

Russo, Giovanni; Gorter, Cees; Nijkamp, Peter; Rietveld, Piet (1997): Employers' Recruitment Behaviour: An Empirical Analysis of the Role of Personnel Management Attitudes. In: LABOUR, Vol. 11, No. 3, p. 599–623.

Salt, John (1992): Migration Process among the Highly Skilled in Europe. In: International Migration Review, Vol. 26, No. 2, p. 484–505.

Spengler, Anja (2008): The Establishment History Panel. In: Schmollers Jahrbuch: Zeitschrift für Wirtschafts- und Sozialwissenschaften / Journal of Applied Social Science Studies, Vol. 128, No. 3, p. 501–509.

Winkelmann, Rainer (2002): Why Do Firms Recruit Internationally? Results from the IZA International Employer Survey 2000. In: Schmollers Jahrbuch: Zeitschrift für Wirtschafts- und Sozialwissenschaften / Journal of Applied Social Science Studies, Vol. 122, No. 2, p. 155–178.

Wooldridge, Jeffrey (forthcoming): Quasi-Maximum Likelihood Estimation and Testing for Nonlinear Models with Endogenous Explanatory Variables. In: Journal of Econometrics.

ZEIT Online (2012): Merkel plädiet für europäischen Arbeitsmarkt, newspaper article.

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