WORKING PAPER

Are there social returns to both firm-level and regional human capital? – Evidence from German social security data

by
Nils Braakmann

University of Lüneburg
Working Paper Series in Economics

No. 143

September 2009

www.leuphana.de/vwl/papers

ISSN 1860 - 5508

Are there social returns to both firm-level and regional human capital? – Evidence from German social security data

Nils Braakmann*
Leuphana University Lüneburg

This version: September 17, 2009

Abstract

This paper provides first evidence on the social returns to education from both firm-level and regional human capital. Using panel data from German social security, both at an individual and aggregated at the plant and regional level, I estimate earnings functions incorporating measures of regional and firm-level human capital while controlling for various types of unobserved heterogeneity, demand shocks, regional physical capital and other regional and firm-level confounders. The results suggest negligibly small external returns to the firm-level shares of high-skilled workers. On the regional level, the results show no support for external returns to education, except for skilled workers.

Keywords: Human capital externalities, social returns to education, error-component model
JEL Classification: D62, J24, J31, R11

*Empirical Economics, Institute of Economics, Leuphana University Lueneburg, braakmann@uni.leuphana.de, Tel.: 0049 (0) 4131 677 2303, Fax: 0049 (0) 4131 677 2026
Stata 10.1 was used in all calculations. All do-files are available from the author on request. The data used in this paper can be accessed via the research data center of the Federal Employment Agency in the Institute of Employment Research in Nuremberg. See http://fdz.iab.de for details. The author would like to thank Joachim Wagner for helpful hints and overall support. All remaining errors are my own.

1 Introduction

This paper considers for the first time the importance of both regional and firm-level human capital for the existence of external returns to education. Following the literature on this topic, e.g., Acemoglu and Angrist (2000) or Moretti (2004a), external returns to education are defined as the increase in an individual's wage caused by the increase in the share of high-skilled workers in a given region, in this case a county, or a firm. Theoretically, this relationship can arise either due to imperfect substitution between high- and low(er)-skilled workers, where an increase in the share of high-skilled workers may raise the productivity of lower-skilled workers, or because there are human capital spillovers (see Moretti, 2004a,c, for models embedding both possibilities).

Human capital spillovers may arise through a number of different factor. First, there may be "pecuniary externalities" that arise through the interaction of firms' and workers' investment decisions under imperfect information (see Acemoglu 1996 for a formal model).[1] These models effectively predict a relationship between the regional supply of high-productive or high-qualified workers and average wages of all skill groups. Second, the externalities may arise through an improved matching between workers and firms. The general idea, which can be traced back to Marshall's "Principles of Economics" (Marshall 1890/1961), is that a high share of workers with a certain level of education in a certain region implies a high number of jobs for workers with that qualification level. This in

[1]The basic idea may be sketched as follows: Firms investment decisions are positively influenced by the qualification level of the (regional) workforce as this allows firms to replace quitting workers more easily (see Acemoglu, 1997a, for a formal model) what in turns influences workers decisions to invest in human capital. The externalities arise because firms may not observe the true qualification or productivity of single workers which has two effects. First, firms use regional average human capital as an indicator when deciding on future investments. This creates a positive relationship between regional human capital and – through the fact that human and physical capital are assumed to be complements – higher wages. Second, workers and firms are matched imperfectly which means that some low productive workers are matched to workplaces with higher amounts of physical capital and higher wages than in a competitive market with perfect information.

turn raises the likelihood of "good" worker-firm-matches and consequently productivity and wages. This explanation predicts a positive relationship between the supply of workers of a certain qualification level and the wages of workers with this qualification level. Finally, another line of theoretical reasoning leads to "non-pecuniary" or technological externalities. The basic idea here is that workers may learn from each other through interactions, learning by doing or imitation.[2] A higher share of productive or high-qualified workers enhances the likelihood of such knowledge spillovers and consequently leads to higher regional productivity and growth. If one is willing to assume that learning spillovers are more likely to occur from higher (or equal) to lower qualified workers, one would expect a positive relationship between individual wages and the share of workers with a higher or equal qualification than the respective individual.

On an empirical level, the existence of a relationship between measures of regional, industry- or firm-level human capital and individual wages is far from clear. On a regional level, Rauch (1993) and Moretti (2004a,b,c) for the US and Heuermann (2008) for Germany find evidence in favor of a positive relationship, while Acemoglu and Angrist (2000), using US census data, report insignificant and economically negligible external returns to education. On the industry level, Winter-Ebmer (19994) for Austria, Sakellariou and Maysami (2004) for Venezuela and Kirby and Riley (2008) find evidence in favor of (positive) external returns, while Sakellariou (2001) finds no such evidence for Guatemala. Finally, for firm-level human capital, Battu, Belfield and Sloane (2003) for the UK, Martin and Jin (2008) for Portugal and Mas and Moretti (2009) for a single US firm find strong evidence for the existence of external returns within firms.

[2]Formal models for regional human capital have been provided by Lucas (1988), Jovanovic and Rob (1989), Murphy, Shleifer and Vishny (1991), Benabou (1996), Acemoglu (1997b), Glaeser (1999) and Acemoglu and Angrist (2000). See Martins and Jin (2008) for a model in terms of workplace interactions.

This paper builds on the previous empirical literature and considers for the first time jointly the effects of both regional and firm-level human capital.[3] Distinguishing between these effects may be worthwhile for a variety of reasons. First, as emphasized by Moretti (2004c), the question whether human capital spillovers lead to a market failure depends on whether the spillover occurs within or outside the firm. If there are spillovers within the firm, these may be internalized in the wages of the high-skilled workers (or more generally, in the wages of those workers that are the source of the spillovers), while spillovers that cross firm-boundaries are closer to pure externalities. As measures of firm-level and regional human capital are imperfectly positively correlated, studies using only one measure of human capital estimate a mixture of the true effects of both types of capital and consequently cannot distinguish between spillovers within and across firm boundaries.[4]

Second, the two types of human capital may have (theoretically) different effects: Learning and other types of technological human capital spillovers require a certain level of interaction between workers (see, e.g., the theoretical model developed in Martins and Jin (2008)). As interactions between workers in the same firm can be expected to occur more frequently than interactions between workers in the same region, firm-level human capital seems more relevant than regional human capital in this case. Acemoglu's (1996, 1997a) models are explicitly related to regional human capital. In fact, relating his models to firm-level human capital seems rather far-fetched as the models' mechanisms are driven by firms' imperfect information about the supply of high-productivity workers. This lack of information seems unlikely with respect to the firm's own workforce. For arguments relat-

[3] I ignore the industry level due to data constraints. For the firm and regional level, the available measures are calculated using data on the *population* of workers and consequently do not suffer from sampling error. Such measures are not available for the industry level.

[4] A look in the data used in this study (see section 2 for details) reveals that the correlations between the firm-level and regional shares of low- and medium-skilled labor are around 0.13 to 0.15 while the correlation for high-skilled labor is around 0.34.

ing the external returns to education to improved matching of workers and firms, one might argue that regional human capital, capturing, e.g., the number of jobs for high-qualified workers, may be more relevant than firm-level human capital. Note, however, that I do not suggest that *only* firm-level human capital matters for learning and *only* regional human capital matters for matching as, e.g., learning may also occur between firms and workers might improve job matches within firms by moving in a different department. Nevertheless, there is a clear possibility that the effects of the two types of human capital may differ.

In this paper, I use panel data from German social security records at the individual and aggregated at the firm[5] and regional level. Following, e.g., Moretti (2004a,c), I estimate standard wage functions augmented by various measures of firm-level and regional human capital. In these estimates, I address some of the major concerns for identification, specifically unobserved regional and individual heterogeneity, as well as unobserved demand shocks for various skill groups that may affect both the workforce composition in a region or firm and the wage levels. I also control for various measures of regional physical capital and allow for worker-firm-region-specific ("match-specific") unobserved heterogeneity in some specifications.

I also provide evidence for workers with various levels of education which allows me to gain some insight on the question whether the external returns are caused by imperfect substitution or by human capital spillovers. The main reasoning here is quite simple (see Moretti, 2004a,c): Imperfect substitution leads to a positive relationship between the wages of low-skilled workers and the share of high-skilled workers, while standard demand-supply considerations predict a negative relationship between the share of high-skilled workers and their own wages. Hence, the relationship between the share of high-skilled workers and

[5]"Firm" in this context refers to the local production unit, the plant, which is also the place where workers typically interact. "Firm" and "plant" are used alternatively in this paper.

the wages of low-skilled workers could be positive even in the absence of spillovers, while a positive effect, in particular one related to the regional share of high-skilled workers, on the wages of high-skilled workers would constitute evidence for the existence of spillover effects.

2 Data and descriptives

The individual level data used in this study comes from the so called employment panel of the Federal Employment Agency (*BA- Beschäftigtenpanel*) for the years 1999 to 2006. The specific time frame is chosen as some additional variables from other data sources are only available for that period. Specific information on an earlier version of the employment panel can be found in Koch and Meinken (2004), the current version is described (in German) in Schmucker and Seth (2009).

The individual data originates from social security information and is collected in the so called *employee history* by the Federal Employment Agency.[6] In Germany, employers are obliged by German law to deliver annual information on their employees, as well as additional information at the beginning and end of an employment, to social security. These notifications are used to calculate pensions, as well as contributions to and benefits from health and unemployment insurance. The data contain information on the begin and end of employment, daily wages, a person's age and sex, as well as several variables collected for statistical purposes, e.g. education or nationality. The resulting spell data cover approximately 75 - 80% of the German workforce, excluding free-lancers, the self-employed, civil servants and (unpaid) workers helping in family businesses (Koch and

[6]More information on person-level data from German social security records can be found in Bender at al. (2000).

Meinken 2004, p. 317).

The employment panel is drawn from the employee history in a two step procedure. First, all persons born on one of seven specified dates are selected. As the German social security number is tied to the date of birth and does not change over time, it is possible to track those persons over time. Additionally, entries in and exits from the labor force are automatically covered by this procedure as new entrants born on one of these dates replace persons leaving the labor force. In a second step, the panel is formed by drawing four cross-sections per year – on the last day of March, June, September and December respectively – from this data. Finally, if a person receives unemployment benefits or is in an active labor market program on one of those days, an artificial observation indicating this fact is generated from other data sources of the Federal Employment Agency. The resulting panel is unbalanced due to entries into and exits from the labor force. However, there is no missing information due to non-response. As most records in the data are based on the annual notifications to social security, which means that there is essentially no wage variation within the year for these observations, this study uses only the last observation available for each year.

The person level data is combined with firm information that is formed by aggregating social security data on the plant level. The plant data provide information on the structure of the respective workforce regarding education, age and occupational position, the plant size and the industry affiliation of the respective plant.

The data also contains information on the county (*Kreis* or *Kreisfreie Stadt*) where the worker's employer is located. A German *Kreis* is similar to the US counties in the hierarchy of public administration. It is the third highest level of administration, placed above the communal level, but below the Federal States (*Bundesländer*) and the country administration, the *Bund*. A county usually covers several towns or villages (*Kreis*) or one large city (*Kreisfreie Stadt*). In two cases, *Berlin* and *Hamburg*, it is also identical to the Federal State (*Bundesland*). The average population of a county (in 2003) is 192,502 with the smallest county being the city of *Zweibrücken* with a population of 35,677 and the largest county being *Berlin* with a population of 3,391,515. Note at this point that Berlin is not in the sample as I focus on West Germany. Given that the economic conditions in East and West Germany were still very different at least at the beginning of the Millennium (see e.g. Barrel and te Velde (2000), Franz and Steiner (2000) and Klodt (2000)), focusing on West Germany allows me to ignore the effects of the East German transformation process and allows for a cleaner identification of the human capital effects.

To capture the amount of regional human capital, I again use social security records, in this case aggregated at the county level and provided by the statistics department of the Federal Employment Agency. This data can be accessed through the website www.regionalstatistik.de which is operated by the Federal Statistical Office and the Statistical Offices of the Federal States. I also used this site to obtain other regional variables that will later be used to capture regional physical capital, experience of the regional workforce (approximated by the age distribution) as well as regional unobserved economic shocks that may influence labor demand, in particular changes in the number of firms and the local unemployment rate.

Human capital on the firm or regional level is measured by the shares of low-skilled, skilled and high-skilled workers in the total number of workers in the respective plant or region. Low-skilled workers are defined as workers without post-school training, regardless of the amount of secondary schooling, while skilled workers have completed vocational training and high-skilled workers are those with an academic degree. All values are calculated without the education of the individual under observation to address potential endogeneity concerns, for instance raised in Angrist and Pischke (2009, pp. 193-197). The measures of individual human capital are formed in an identical way. I also calculate potential experience as age - 6, which is the school-starting age in Germany, - the usual years of schooling associated with a certain degree.

To arrive at the estimation sample, I first drop persons younger than 25 and older than 60 to avoid problems with ongoing education and early retirement. I further restrict the sample to regular, full time workers, dropping trainees, home and part-time workers as well as the unemployed. Wages that are top-coded at the contribution limit to social security are imputed using a Tobit-based imputation as described in Gartner (2005).[7] Note that the wages of low-skilled and skilled workers are considerable less affected by censoring than those of high-skilled workers, which should bias the parameter estimates for high-skilled workers downward. Finally, I drop the top/bottom 1% of the wage distribution to control for outliers and keep only West-German men to avoid problems with gender-specific labor market participation and the large economic differences between East and West Germany. The resulting sample covers 1,266,905 person-year-observations from 239,036 individuals of which 42,884 individuals (179,275 observations) are low-skilled, 176,918 (930,975) are skilled and 33,812 (156,645) are high-skilled workers. There are at least 53 individuals in each county with an average of 505 individuals and a maximum of 5446. Descriptive statistics can be found in Table 1.

(Table 1 about here.)

[7] The imputation procedure essentially adds a draw from a truncated normal distribution to each censored wage. The parameters of the distribution are estimated from the data by Tobit regressions that are conducted separately for each year. The imputation typically affects (in each year) between 1,229 and 28,275 cases (between 6.6% and 14.8%) of usually around 172,00 to 194,000 cases per year. The changing number of censored cases are most likely related to the changing contribution limits over the years.

Figure 1 displays the distributions of both firm-level and regional human capital observed in the sample. Most workers are employed in firms with relatively low shares of both high- and low-skilled workers. This finding is exactly what can be expected in Germany with its generally skilled workforce. Note further that there is considerable more variation in the firm-level than in the regional shares of the skill-groups which – relatively unsurprisingly – implies that firms are more heterogeneous than regions with respect to human capital.

(FIGURE 1 ABOUT HERE.)

3 Econometric model

To fix thoughts, imagine an individual level production function

$$y_{ifjct} = f(\eta_i, \theta_c, \delta_t, \phi_f, \mu_j, HC_i, HC_{ft}, HC_{ct}, exp_{it}, exp_{ft}, exp_{ct}, K_{ft}, K_{ct}) \qquad (1)$$

that links individual productivity y_{ifjct} of worker i in firm f in industry j situated in county c at time t to individual ability η_i, fixed characteristics of the firm ϕ_f, the region θ_c and the industry μ_j, time shocks δ_t, as well as to the capital stock of the firm (K_{ft}) and the region (K_{ct}), individual, firm-level and regional education ($HC_{it}, HC_{ft}, HC_{ct}$) and experience ($exp_{it}, exp_{ft}, exp_{ct}$). Assume further that wages and productivity are sufficiently linked in the sense that factors influencing productivity also influence wages. This assumption seems not too far fetched as the wage measure used includes bonus payments that are tied to individual performance.

Against that background, I follow Moretti (2004a,c) and estimate standard earnings equations of the form

$$y_{ifjct} = \eta_i + \theta_c + \delta_t + \mu_j + \beta' X_{it} + \gamma' W_{ft} + \lambda' Z_{ct} + \tau_f * HC_{ft} + \tau_c * HC_{ct} + \epsilon_{it} \qquad (2)$$

where y_{ifjct} is the monthly log wage of worker i in firm f in industry j situated in county c at time t. η_i, θ_c, δ_t and μ_j are individual, county, time and (1-digit)-industry specific fixed effects. HC_{ft} and HC_{ct} are the shares high-skilled workers at the firm and county level respectively with τ_f and τ_c being the parameters of interest. X_{it}, W_{ft} and Z_{ct} are time-varying individual, firm-level and regional control variables. Finally, ϵ_{it} is a standard error term that is assumed to be uncorrelated with both HC_{ft} and HC_{ct} given the other variables and fixed effects. As some of the variables of interest vary only on the county level, all standard errors are adjusted for clustering on the county level (see Moulton 1990). Note that the specification in equation (2) could, for instance, be motivated by assuming a Cobb-Douglas-form for equation (1).

There are several potential threats to identification that need to be considered when taking equation (1) to the data (see also Moretti, 2004c). The first is the issue of unobserved regional heterogeneity. We can easily imagine regional unobserved factors that are both correlated with regional human capital and wages, e.g., the presence of high-tech clusters in a certain region. To address this problem, county fixed effects θ_c are added to equation (2). The presence of these fixed effects implies that the human capital effects are identified using changes in the regional human capital composition over time.

A second issue is the possibility that regions differ with respect to unobserved worker ability, which could lead to spurious correlation between regional or firm-level human capital if, e.g., high-ability workers select into firms or regions with high levels of human capital. This potential problem is addressed by exploiting the longitudinal structure of the dataset and adding individual fixed-effects. Individual education HC_i is then absorbed by the individual fixed effect η_i. This treatment of education is warranted as individual education in Germany is typically completed before entering the labor market as full-time workers, in particular for the age groups contained in my sample. As the interest in this paper lies on estimating the external returns to education, the fact that individual return cannot be identified is relatively innocuous.

A third point is the presence of potential time-varying confounders on the firm and regional level. Here, I first control for most of the elements from equation (2) by including potential individual experience as a second order polynomial, the firm-level and regional shares of workers below 30, between 40 and 49 and with 50 or more years of age as proxies for experience and, to control for changes in the regional stock of physical capital, the number and area of completed non-residential buildings and the investments (in €) by manufacturing plants. I also control for the firm-level and regional shares of low-skilled workers to capture changes in the respective amount of human capital happening below the level of high-skilled workers.

This treatment still leaves a potential problem as there might be unobserved shocks to labor demand (see Moretti, 2004c). Here, I use several proxies that hopefully attenuate these problems. The first proxy is simply the regional unemployed rate. A second set of indicators measures changes in the number of firms by using the number of plants in manufacturing, the number of newly registered firms and the number of closed firms. A final proxy is an often used index of skill-group specific demand shifts proposed Katz and Murphy (1992), which has also been applied by Moretti (2004a). The index uses the regional industry structure to predict the effect of nationwide demand shocks for a certain region. The main idea here is that regions specialize in a certain industry mix (see Bound and Holzer, 2000, for evidence for the US) and are consequently affected differently by nationwide shocks to labor demand for a certain skill group in a certain industry.[8]

A final issue is the lack of the firm identifiers in the data available to researchers that could be used to add firm fixed-effects.[9] However, the data contains a variable that identifies individuals that changed plants from one wave to the other. I use this variable to restrict the sample to individuals who remained in the same plant (and consequently in the same county) throughout the whole observation period. This strategy effectively amounts to the inclusion of individual-firm-county-specific fixed effects (see Moretti, 2004c) leading to the estimating equation

$$y_{ifjct} = \eta_i \theta_c \phi_f + \delta_t + \mu_j + \beta' X_{it} + \gamma' W_{ft} + \lambda' Z_{ct} + \tau_f * HC_{ft} + \tau_c * HC_{ct} + \epsilon_{it}. \quad (3)$$

Identification in these models arises through changes in the firm- and county-level shares of low- and high-skilled workers for individuals remaining in the same firm and county. This strategy also attenuates the potential problem that the capital stock of the firm is unobserved in the data. As far as one is willing to assume that firm-level capital has not

[8]I also experimented with county-industry-year-specific fixed effects similar to Moretti (2004b). However, this approach turned out be computationally impossible even given the (rather large) resources of the research data center of the the Federal Employment Agency in the Institute of Employment Research. In fact, estimation of these more-way error-component (or more-way fixed-effects) models is known to be computationally non trivial for datasets of the size used in this paper (see Andrews, Schank and Upward 2006). Estimation of the current model was possible using the Stata ado-file *felsdvreg* by Thomas Cornelissen (see Cornelissen 2006, 2008 for a description). Additionally, I tried an instrumental variables approach where the current shares of low- and high-skilled workers were instrumented with variables related to the regional supply of workers with various skill-levels, specifically the county-level numbers of school-dropouts, of graduates with a German *Abitur*, of students in vocational schools and of vocational schools, the *Bundesland* level shares of research and development expenditures in universities of GNP, of research and development personnel in universities of all workers and the percentage of university graduates in each age cohort (each as a second order polynomial). While the instruments were shown to be valid in a fixed-effects regression on the sample of individuals without firm change, the estimates suffered from severe weak instrument problems rendering them uninformative.

[9]The original data contains firm identifiers that are used to aggregate the social security records on the plant level. However, for reasons of data protection these are removed before the data is made available to researchers.

changed much during the observation period, this approach effectively controls for K_{ft} from equation (1). However, there is also a potential problem with this strategy as the sample of stayers is self-selected, which may lead to biased estimates. Fortunately, the vast majority of individuals in the data, specifically 35,811 out of 42,884 low-skilled workers, 150,522 out of 176,918 skilled workers and 26,901 out of 33,812 high-skilled workers, does not move which attenuates potential problems. Additionally, I report and compare estimates based on equation (2) and (3) which should give an impression of the size of the potential problem. A related problem might be that the existence of external returns to education is in fact driven by individuals who change plants and benefit from working in a new environment. However, given the relatively low number of movers and the fact that it would be impossible to control for unobserved firm characteristics in estimations restricted to movers, there is not much that could be done about this problem.

Another potential problem, which is also prevalent in much of the other literature on the external returns to education, is the fact that the data only contain monthly and not hourly wages. While there is *a priori* no clear argument for a relationship between regional human capital measures and individual working hours, which also makes any assumptions regarding a possible bias in the data largely speculative, it should be kept in mind that hourly wages would potentially be closer to productivity than my wage measure.

I estimate equations (2) and (3) separately for low-skilled, skilled and high-skilled workers. Low-skilled workers are again those without post-school training, while skilled workers have completed vocational training and high-skilled workers are those with an academic degree. As mentioned in the introduction, imperfect substitution between low- and high(er)-skilled workers may lead to a positive relationship between the wages of low-skilled or skilled workers and the regional shares of high-skilled workers even when there are no human capital spillovers, while such an effect for the wages of high-skilled workers would constitute stronger evidence for the existence of spillovers. Additionally, a comparison of the effects of the regional and firm-level shares of high-skilled workers provides some evidence on the question whether eventual spillover effects might be internalized by the firms, for instance, in the wages of high-skilled workers. If most of the effects are found on the firm level, such an internalization would be at least possible, while a positive relationship between the regional share of high-skilled workers and wages would make such an internalization appear less likely.

4 Results

Consider the econometric results displayed in Table 2. Note first that most results are practically identical in the models using both movers and stayers and the models using only stayers. As most individuals do not change employers during the observation period, this result is not particularly surprising.

Focusing on the results for the firm-level share of high-skilled workers, the results show a significant relationship with the wages of workers of all skill groups. In particular, the result for the high-skilled workers cannot be explained with imperfect substitution effects and points towards the existence of human capital spillovers. The results also suggest that the size of the spillover is relatively small: For low-skilled workers, a one percentage point increase in the firm-level share of high-skilled workers raises wages by 0.1 percent, while only slightly smaller and larger effects are found for high-skilled and skilled workers, respectively.

(Tables 2 and 3 about here.)

In Table 3, I provide simulation results for the wage increases associated with a one (overall or within) standard deviation increase in the share of high-skilled workers. For the firm level shares, the wage changes associated with overall standard deviation increases are in the magnitude of 1.0 to almost 3.0 percent, which is rather large. Taking the within standard deviation as better representation of the actual changes for individuals observed in the sample, however, leads to relatively meager wage increases between 0.3 and 0.8 percent. These results suggest much smaller wage changes in Germany than those found by Battu, Belfield and Sloane (2003) for the UK and Martin and Jin (2008) for Portugal.

Looking at the wage effects of the regional shares of high-skilled workers reveals even weaker effects: For the sample containing both movers and stayers, the results are insignificant and essentially zero for both low- and high-skilled workers. For skilled workers, they suggest wage increases in the magnitude of 0.8 percent per percentage point increase of the regional share of high-skilled workers. Qualitatively, this latter result is also found in the stayer-sample, although the wage effect shrinks to about one third of the previous effect. For low-skilled workers, the results from this model imply a negative wage effect of the regional share of high-skilled workers, while no effect can again be found for high-skilled workers.

Looking again at the simulation results in Table 3, we see negligible wage changes in the magnitude of 0.01 to -0.7 percent for both low- and high-skilled workers. For skilled workers, however, the results wage changes between 0.3 and 3.2 percent, depending on the model and the variation measure used. These results generally suggest somewhat smaller returns than those found by Moretti (2004a) for the US. They are, however, in line with the evidence by Acemoglu and Angrist (2000). A direct comparison with Heuermann (2008) who also uses German data is difficult due to the different estimation techniques used: As

Heuermann (2008) uses instrumental variables and consequently identifies an instrument-specific effect, in this case in favor of positive spillover effects, it is not exactly clear whether his effect and the one identified in this paper are identical.

Taken together, the results suggest the existence of negligibly small external returns to the firm-level shares of high-skilled workers. In other words, while there seem to be human capital spillovers from high-skilled workers within firms, it seems unlikely that these effects matter much on a practical level. On the regional level, the results show no support for external returns to education, except for skilled workers. However, even in the latter case, returns are usually small for empirically relevant changes in the regional share of high-skilled workers. Altogether, it seems safe to conclude that spillover effects on the firm and regional level do not matter much in Germany.

5 Conclusion

This paper provided evidence on the anatomy of human capital externalities arising from both firm-level and regional human capital. Using panel data from German social security records at the individual, firm and regional level, I estimated earnings functions augmented with measures of firm-level and regional human capital while controlling for various types of unobserved heterogeneity. The results show support for the existence of social returns to the firm-level share of high-skilled workers for all types of workers. However, considering the size of the effects it seems unlikely that external returns to education matter much in practice. Practically no wage effects are found for the regional share of high-skilled workers, except for the wages of skilled workers. Here, the results suggest wage changes between 0.3 and 3.2 percent for a standard deviation increase in the regional share of high-skilled workers.

6 References

1. Acemoglu, Daron, **1996**: "A Microfoundation for Social Increasing Returns in Human Capital Accumulation", *Quarterly Journal of Economics 111(3)*, pp. 779-804.

2. Acemoglu, Daron, **1997a**: "Training and Innovation in an Imperfect Labour Market", *The Review of Economic Studies 64(3)*, pp. 445-464.

3. Acemoglu, Daron, **1997b**: "Matching, Heterogeneity and the Evolution of Income Distribution", *Journal of Economic Growth 2(1)*, pp. 61-92.

4. Acemoglu, Daron and Joshua D. Angrist, **2000**: "How Large Are Human Capital Externalities? Evidence from Compulsory Schooling Laws", *NBER Macroannual 2000*, pp. 9-59.

5. Andrews, Martyn, Thorsten Schank and Richard Upward, **2006**: "Practical Fixed Effects Estimation Methods for the Three-Way Error-Components Model", *The Stata Journal 6(4)*, pp. 461-481.

6. Angrist, Joshua D. and Jörn-Steffen Pischke, **2009**: "*Mostly Harmless Econometrics – An Empiricist's Companion*", Princeton University Press: Princeton.

7. Barrel, Ray and Dirk Willem te Velde, **2000**: "Catching-up of East German Labour Productivity in the 1990s", *German Economic Review 1(3)*: 271-297.

8. Battu, Harminder, Clive R. Belfield and Peter J. Sloane, **2003**: "Human Capital Spillovers within the Workplace: Evidence for Great Britain", *Oxford Bulletin of Economics and Statistics 65(5)*, pp. 575-594.

9. Bender, Stefan, Anette Haas and Christoph Klose, **2000**: "The IAB Employment Subsample 1975-1995", *Schmollers Jahrbuch / Journal of Applied Social Science Studies 120(4)*: 649-662.

10. Benabou, Roland, **1996**: "Heterogeneity, Stratification, and Growth: Macroeconomic Implications of Community Structure and School Finance", *American Economic Review 86(3)*, pp. 584-609.

11. Bound, John and Harry J. Holzer, **2000**: "Demand Shifts, Population Adjustments, and Labor Market Outcomes during the 1980s", *Journal of Labor Economics 18(1)*, pp. 20-54.

12. Cornelissen, Thomas, **2006**: "Using Stata for a Memory Saving Fixed Effects Estimation of the Three-Way Error- Component Model", *FDZ Methodenreport 03/2006*, Nuremberg.

13. Cornelissen, Thomas, **2008**: "The Stata Command felsdvreg to Fit a Linear Model with Two High-Dimensional Fixed Effects", *The Stata Journal 8(2)*, pp. 170-189.

14. Franz, Wolfgang and Viktor Steiner, **2000**: "Wages in the East German Transition Process: Facts and Explanations", *German Economic Review 1(3)*: 241-269.

15. Gartner, Herrmann, **2005**: "The Imputation of Wages above the Contribution Limit with the German IAB Employment Sample", *FDZ Methodenreport 02/2005*, Nuremberg.

16. Glaeser, Edward L., **1999**: "Learning in Cities", *Journal of Urban Economics 46(2)*, pp. 254-277.

17. Heuermann, Daniel F., **2008**: "Human Capital Externalities in Western Germany",

mimeo, Institut für Arbeitsrecht und Arbeitsbeziehungen in der Europäischen Gemeinschaft, Trier.

18. Jovanovic, Boyan, and Rafael Rob, **1989**: "The Growth and Diffusion of Knowledge", *Review of Economic Studies 56(4)*, pp. 569-582.

19. Katz, Lawrence F and Kevin M. Murphy, **1992**: "Changes in relative wages, 1963-1987: supply and demand factors", *The Quarterly Journal of Economics 107(1)*, pp. 35-78.

20. Kirby, Simon and Rebecca Riley, **2008**: "The External Returns to Education: UK Evidence Using Repeated Cross-sections", *Labour Economics 15(4)*, pp. 619-630.

21. Klodt, Henning, **2000**: "Industrial Policy and the East German Productivity Puzzle", *German Economic Review 1(3)*: 315-333.

22. Koch, Iris and Holger Meinken, **2004**: "The Employment Panel of the German Federal Employment Agency", *Schmollers Jahrbuch / Journal of Applied Social Science Studies 124(2)*: 315-325.

23. Lucas, Robert E. Jr., **1988**: "On the Mechanics of Economic Development", *Journal of Monetary Economics 22(1)*, pp. 3-42.

24. Marshall, Alfred, **1890/1961**: "*Principles of Economics*", London: MacMillan for the Royal Economic Society.

25. Martins, Pedro S. and Jim Y. Jin, **2008**: "Firm-level Social Returns to Education", *Journal of Population Economics (forthcoming)*, DOI 10.1007/s00148-008-0204-9.

26. Mas, Alexandre and Enrico Moretti, **2009**: "Peers at Work", *American Economic Review 99(1)*, pp. 112-145.

27. Moretti, Enrico, **2004a**: "Estimating the Social Return to Higher Education: Evidence from Longitudinal and Repeated Cross-sectional Data", *Journal of Econometrics 121(1-2)*, pp. 175-212.

28. Moretti, Enrico, **2004b**: "Worker's Education, Spillovers, and Productivity: Evidence from Plant-level Production Functions", *American Eonomic Review 94(3)*, pp. 656-690.

29. Moretti, Enrico, **2004c**: "Human Capital Externalities in Cities", in: J. Vernon Henderson and Jacques-Francois Thisse (eds.), *Handbook of Regional and Urban Economics, Vol. 4*, North Holland-Elsevier.

30. Moulton, Brent R., **1990**: "An Illustration of a Pitfall in Estimating the Effects of Aggregate Variables on Micro Units", *Review of Economics and Statistics 72(2)*, pp. 334-338.

31. Murphy, Kevin, Andrei Shleifer and Robert Vishny, **1991**: "The Allocation of Talent: The Implications for Growth", *Quarterly Journal of Economics 106(2)*, pp. 503-530.

32. Rauch, James E., **1993**: "Productivity Gains from Geographic Concentration of Human Capital: Evidence from the Cities", *Journal of Urban Economics 34(3)*, pp. 380-400.

33. Romer, Paul M., **1986**: "Increasing Returns and Long-run Growth", *The Journal of Political Economy 94(5)*, pp. 1002-1037.

34. Sakellariou, Chris N., **2001**: "Identifying the External Effects of Human Capital: A Two-stage Approach", *Applied Economics Letters 8(3)*, pp. 191-194.

35. Sakellariou, Chris N. and Ramin Maysami, **2004**: "Lucas Type External Effects

of Human Capital: Strong Evidence Using Microdata", *Applied Economics Letters 11(6)*, pp. 343-346.

36. Schmucker, Alexandra and Stefan Seth, **2009**: "BA-Beschäftigtenpanel 1998-2007 Codebuch ", *FDZ Datenreport 1/2009*, Nuremberg.

37. Winter-Ebmer, Rudolf, **1994**: "Endogenous Growth, Human Capital and Industry Wages". *Bulletin of Economic Research 46(4)*, pp. 289-314.

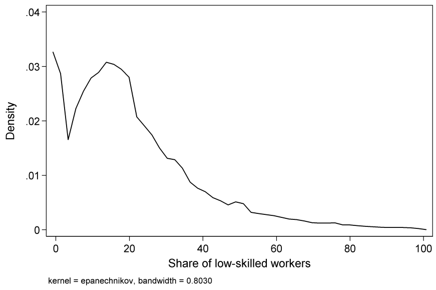
7 Tables and figures

Table 1: Descriptive statistics, all years

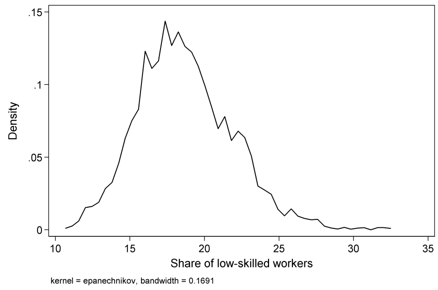
Variable	Mean	Standard deviation overall	within	Min.	Max.	Source
Monthly wage (€, 2000 prices)	3128.69	947.42	363.08	950.79	6041.92	BA employment panel
Log wage	8	.31	.11	6.86	8.71	BA employment panel
Firm-level share of low-skilled workers	20.82	17.42	6.71	0	99.88	BA employment panel
Firm-level share of skilled workers	65.13	20.19	7.91	0	99.95	BA employment panel
Firm-level share of high-skilled workers	9.73	14.87	4.44	0	99.74	BA employment panel
Regional share of low-skilled workers	18.7	3.18	1.21	10.85	32.32	Beschäftigungsstatistik der Bundesagentur für Arbeit
Regional share of skilled workers	59.88	6.46	1.86	41.85	73.37	Beschäftigungsstatistik der Bundesagentur für Arbeit
Regional share of high-skilled workers	9.21	4.25	1.19	2.7	27.24	Beschäftigungsstatistik der Bundesagentur für Arbeit
Age (years)	41.27	9.01	2.04	25	60	BA employment panel
Potential experience (years)	29.07	9.4	2.04	7	50	BA employment panel
Firm size	1486.73	5477.89	939.21	1	54162	BA employment panel
Firm-level share of workers younger than 30 years	20.15	13.3	6.39	0	100	BA employment panel
Firm-level share of workers between 30 and 39 years	29.28	11.88	6.94	0	100	BA employment panel
Firm-level share of workers betweeen 40 and 49 years	27.87	11.12	6.57	0	100	BA employment panel
Firm-level share of workers older than 50 years	22.71	12.77	5.99	0	100	BA employment panel
Regional share of workers younger than 30 years	14.01	1.55	.53	10.37	23.83	Beschäftigungsstatistik der Bundesagentur für Arbeit
Regional share of workers between 30 and 39 years	16.02	1.69	1.11	11.34	20.68	Beschäftigungsstatistik der Bundesagentur für Arbeit
Regional share of workers between 40 and 49 years	15.27	1.02	.76	12.27	18.67	Beschäftigungsstatistik der Bundesagentur für Arbeit
Regional share of workers older than 50 years	18.34	1.21	.5	14.48	22.66	Beschäftigungsstatistik der Bundesagentur für Arbeit
County population	373211.3	352492.3	86718.69	34842	1754182	Fortschreibung des Bevölkerungsstandes
No. of newly finished non-residential buildings in county	103.52	89.18	44.45	1	842	Statistik der Baufertigstellungen
Area of newly finished non-residential buildings in county	137.02	172.46	100.54	.1	2017.9	Statistik der Baufertigstellungen
No. of newly registered firms in county	4012.36	4427.7	1235.39	268	21955	Gewerbeanzeigenstatistik
No. of closed firms in county	3274.44	3394.93	898.22	188	15834	Gewerbeanzeigenstatistik
No. of manufacturing plants in county	184.41	127.14	31.94	14	673	Monatsbericht für Betriebe im Verarbeitenden Gewerbe
Manufacturing investments in county (in 1000 €)	267684.3	317186	107108.4	2276	1812544	Monatsbericht für Betriebe im Verarbeitenden Gewerbe
Katz-Murphy measure of demand shock for low-skilled labor	-1.08	2.06	1.77	-22.56	7.25	BA employment panel
Katz-Murphy measure of demand shock for skilled labor	-3.92	11.19	10.32	-128.18	55.77	BA employment panel
Katz-Murphy measure of demand shock for high-skilled labor	.38	1.21	1.15	-10.64	10.42	BA employment panel
Local unemployment rate	8.9	3.03	1.11	2.6	23.7	Arbeitsmarktstatistik der Bundesagentur für Arbeit
No. of Obs.		1,266,905				
No. of Individuals		239,036				

All variables not taken (or calculated) from the BA employment panel are available at www.regionalstatistik.de.

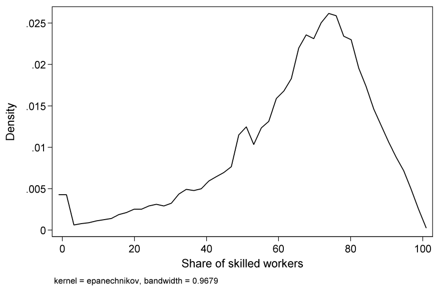
Figure 1: Observed distributions of regional and firm-level human capital variables, Kernel-density estimates



(a) Firm-level share of low-skilled workers

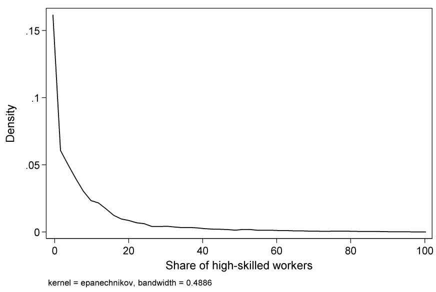


(b) Regional share of low-skilled workers



(c) Firm-level share of skilled workers

(d) Regional share of skilled workers



(e) Firm-level share of high-skilled workers

(f) Regional share of high-skilled workers

Note: Kernel density estimates using epanechikov-kernel.

Table 2: FIXED-EFFECTS-REGRESSION RESULTS, WEST-GERMAN MEN, DEPENDENT VARIABLE: LOG REAL MONTHLY WAGES (€, IN 2000 PRICES)

	All individuals			Individuals w/o firm change		
	low-skilled	skilled	high-skilled	low-skilled	skilled	high-skilled
Firm-level share of high-skilled workers	0.0013***	0.0018***	0.0007***	0.0013***	0.0017***	0.0006***
	(0.0002)	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.0001)
Regional share of high-skilled workers	0.0001	0.0076***	-0.0009	-0.0017*	0.0028***	0.0003
	(0.0026)	(0.0020)	(0.0017)	(0.0010)	(0.0004)	(0.0006)
Firm-level share of low-skilled workers	-0.0004***	-0.0002***	-0.0000	-0.0003***	-0.0002***	-0.0000
	(0.0001)	(0.0000)	(0.0001)	(0.0001)	(0.0000)	(0.0001)
Regional share of low-skilled workers	0.0035*	0.0018	0.0009	-0.0002	0.0010**	0.0013
	(0.0019)	(0.0012)	(0.0018)	(0.0011)	(0.0005)	(0.0009)
Potential experience (years)	0.0074	0.0104***	0.0198***	-0.0001	0.0088***	0.0194***
	(0.0084)	(0.0012)	(0.0040)	(0.0090)	(0.0018)	(0.0059)
Potential experience (squared)	-0.0003***	-0.0004***	-0.0006***	-0.0003***	-0.0003***	-0.0006***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Firm size/1000	0.0025**	0.0018**	0.0016***	0.0025**	0.0018***	0.0016***
	(0.0011)	(0.0008)	(0.0004)	(0.0012)	(0.0003)	(0.0004)
Firm-level share of workers younger than 30 years	-0.0004***	-0.0002***	-0.0004***	-0.0001	-0.0001**	-0.0004***
	(0.0001)	(0.0000)	(0.0001)	(0.0001)	(0.0000)	(0.0001)
Firm-level share of workers between 40 and 49 years	0.0000	0.0000	-0.0001	-0.0000	0.0000	-0.0001
	(0.0001)	(0.0000)	(0.0001)	(0.0001)	(0.0000)	(0.0001)
Firm-level share of workers older than 50 years	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000
	(0.0001)	(0.0000)	(0.0001)	(0.0001)	(0.0000)	(0.0001)
Regional share of workers younger than 30 years	0.0020	0.0030**	-0.0015	0.0002	-0.0008	-0.0000
	(0.0021)	(0.0015)	(0.0016)	(0.0015)	(0.0007)	(0.0013)
Regional share of workers between 40 and 49 years	-0.0042	-0.0026	0.0057**	-0.0023	-0.0007	0.0016
	(0.0038)	(0.0022)	(0.0027)	(0.0022)	(0.0010)	(0.0024)
Regional share of workers older than 50 years	-0.0039	-0.0064***	0.0030	-0.0048***	-0.0047***	0.0026
	(0.0027)	(0.0017)	(0.0023)	(0.0016)	(0.0007)	(0.0016)
County population/100,000	-0.0005	-0.0142	0.0124	-0.0019	-0.0012	0.0002
	(0.0221)	(0.0119)	(0.0121)	(0.0022)	(0.0010)	(0.0019)
No. of newly finished non-residential buildings/1000	0.0042	0.0112	0.0096	0.0254*	0.0113	-0.0026
	(0.0232)	(0.0138)	(0.0286)	(0.0147)	(0.0076)	(0.0176)
Area of newly finished non-residential buildings (m^2)/1000	0.0070	-0.0000	-0.0065	0.0033	0.0003	0.0015
	(0.0098)	(0.0070)	(0.0122)	(0.0057)	(0.0030)	(0.0066)
No. of newly registered firms/1000	0.0011	-0.0002	0.0015	0.0021*	0.0010*	0.0013
	(0.0019)	(0.0009)	(0.0011)	(0.0011)	(0.0005)	(0.0010)
No. of closed firms/1000	-0.0018	0.0007	0.0012	-0.0023	0.0003	0.0006
	(0.0019)	(0.0012)	(0.0021)	(0.0015)	(0.0007)	(0.0014)
No. of manufacturing plants	-0.0001	0.0000	-0.0000	0.0001*	0.0001***	-0.0000
	(0.0001)	(0.0000)	(0.0001)	(0.0000)	(0.0000)	(0.0000)
Manufacturing investments (in 1000 €)/100,000	0.0001	-0.0009	-0.0008*	-0.0002	-0.0007***	-0.0002
	(0.0008)	(0.0006)	(0.0004)	(0.0005)	(0.0002)	(0.0005)
Local unemployment rate	-0.0008	-0.0005	-0.0004	-0.0019***	-0.0006**	-0.0004
	(0.0009)	(0.0006)	(0.0008)	(0.0006)	(0.0003)	(0.0007)
Katz-Murphy measure of demand shock for low-skilled labor	0.0014*	0.0001	-0.0046***	0.0012*	0.0003	-0.0047***
	(0.0008)	(0.0007)	(0.0014)	(0.0007)	(0.0003)	(0.0014)
Katz-Murphy measure of demand shock for skilled labor	-0.0003	0.0000	0.0006	-0.0003	-0.0002	0.0009**
	(0.0003)	(0.0001)	(0.0004)	(0.0002)	(0.0001)	(0.0004)
Katz-Murphy measure of demand shock for high-skilled labor	0.0011	-0.0004	0.0011	0.0007	0.0011	-0.0023
	(0.0019)	(0.0011)	(0.0029)	(0.0017)	(0.0009)	(0.0026)
Individual fixed effects	(included)	(included)	(included)	(included)	(included)	(included)
Regional fixed effects (county-level)	(included)	(included)	(included)	(included)	(included)	(included)
Year fixed effects	(included)	(included)	(included)	(included)	(included)	(included)
Industry fixed effects (2-digit-level)	(included)	(included)	(included)	(included)	(included)	(included)
Controls for unobserved firm heterogeneity	no	no	no	yes	yes	yes
Individuals	42,884	176,918	33,812	35,811	150,522	26,901
Observations	179,275	930,975	156,645	156,301	799,516	125,705

Coefficients, standard errors adjusted for clustering at the county level in parentheses. ***/**/* denote significance on the 1%, 5% and 10% level respectively.

Table 3: SIMULATED WAGE INCREASES BY OVERALL AND WITHIN STANDARD DEVIATION INCREASES OF THE SHARE OF HIGH-SKILLED WORKERS

	All individuals			Individuals w/o firm change		
	low-skilled	skilled	high-skilled	low-skilled	skilled	high-skilled
Firm-level share of high-skilled workers						
Overall standard deviation (14.87)	0.0193	0.0268	0.0104	0.0193	0.0253	0.0089
Within standard deviation (4.44)	0.0058	0.0080	0.0031	0.0058	0.0075	0.0027
Regional share of high-skilled workers						
Overall standard deviation (4.25)	0.0004	0.0323	-0.0038	-0.0072	0.0119	0.0013
Within standard deviation (1.19)	0.0001	0.0090	-0.0011	-0.0020	0.0033	0.0004

Working Paper Series in Economics

(recent issues)

No.142: *Nils Braakmann and Alexander Vogel:* How does economic integration influence employment and wages in border regions? The case of the EU-enlargement 2004 and Germany's eastern border, September 2009

No.141: *Stefanie Glotzbach and Stefan Baumgärtner:* The relationship between intra- and intergenerational ecological justice. Determinants of goal conflicts and synergies in sustainability policy. September 2009

No.140: *Alexander Vogel:* Exportprämien unternehmensnaher Dienstleister in Niedersachsen, September 2009

No.139: *Alexander Vogel:* Die Dynamik der Export- und Importbeteiligung niedersächsischer Industrieunternehmen im interregionalen Vergleich 2001-2006, September 2009

No.138: *Stefan Baumgärtner and Martin F. Quaas:* What is sustainability economics? September 2009

No.137: *Roland Olbrich, Martin F. Quaas and Stefan Baumgärtner:* Sustainable use of ecosystem services under multiple risks – a survey of commercial cattle farmers in semi-arid rangelands in Namibia, September 2009

No.136: *Joachim Wagner:* One-third codetermination at company supervisory boards and firm performance in German manufacturing industries: First direct evidence from a new type of enterprise data, August 2009

No.135: *Joachim Wagner:* The Reasearch Potential of New Types of Enterprise Data based on Surveys from Official Statistics in Germany, August 2009

No.134: *Anne-Kathrin Last and Heike Wetzel:* The Efficiency of German Public Theaters: A Stochastic Frontier Analysis Approach, July 2009

No.133: *Markus Groth:* Das Conservation Reserve Program: Erfahrungen und Perspektiven für die europäische Agrarumweltpolitik, Juli 2009

No.132: *Stefan Baumgärtner and Sebastian Strunz:* The economic insurance value of ecosystem resilience, July 2009

No.131: *Matthias Schröter, Oliver Jakoby, Roland Olbrich, Marcus Eichhorn and Stefan Baumgärtner:* Remote sensing of bush encroachment on commercial cattle farms in semi-arid rangelands in Namibia, July 2009

No.130: *Nils Braakmann:* Other-regarding preferences, spousal disability and happiness: Evidence for German Couples, May 2009

No.129: *Alexander Vogel and Joachim Wagner:* Exports and Profitability – First Evidence for German Services Enterprises, May 2009

No.128: *Sebastian Troch:* Drittelbeteiligung im Aufsichtsrat – Gesetzliche Regelung versus Unternehmenspraxis. Ausmaß und Bestimmungsgründe der Umgehung des Drittelbeteiligungsgesetzes in Industrieunternehmen, Mai 2009

No.127: *Alexander Vogel:* The German Business Services Statistics Panel 2003 to 2007, May 2009
[forthcoming in: Schmollers Jahrbuch 129 (2009)]

No.126: *Nils Braakmann:* The role of firm-level and regional human capital fort he social returns to education – Evidence from German social security data, April 2009

No.125: *Elke Bertke und Markus Groth:* Angebot und Nachfrage nach Umweltleistungen in einem marktanalogen Agrarumweltprogramm – Ergebnisse einer Pilotstudie, April 2009

No.124: *Nils Braakmann and Alexander Vogel:* The impact of the 2004 EU-enlargement on enterprise performance and exports of service enterprises in the German eastern border region, April 2009
[revised version forthcoming in: Review of World Economics]

No.123: *Alexander Eickelpasch and Alexander Vogel:* Determinants of Export Behaviour of German Business Services Companies, March 2009

No.122: *Maik Heinemann:* Stability under Learning of Equilibria in Financial Markets with Supply Information, March 2009

No.121: *Thomas Wein*: Auf der Speisekarte der DPAG: Rechtliche oder ökonomische Marktzutrittsschranken? März 2009

No.120: *Nils Braakmann und Joachim Wagner:* Product Diversification and Stability of Employment and Sales: First Evidence from German Manufacturing Firms, February 2009

No.119: *Markus Groth:* The transferability and performance of payment-by-results biodiversity conservation procurement auctions: empirical evidence from northernmost Germany, February 2009

No.118: *Anja Klaubert:* Being religious – A Question of Incentives? February 2009

No.117: *Sourafel Girma, Holger Görg and Joachim Wagner:* Subsidies and Exports in Germany. First Evidence from Enterprise Panel Data, January 2009

No.116: *Alexander Vogel und Joachim Wagner:* Import, Export und Produktivität in niedersächsischen Unternehmen des Verarbeitenden Gewerbes, Januar 2009

No.115: *Nils Braakmann and Joachim Wagner:* Product Differentiation and Profitability in German Manufacturing Firms, January 2009

No.114: *Franziska Boneberg:* Die Drittelmitbestimmungslücke im Dienstleistungssektor: Ausmaß und Bestimmungsgründe, Januar 2009

No.113: *Institut für Volkswirtschaftslehre:* Forschungsbericht 2008, Januar 2009

No.112: *Nils Braakmann:* The role of psychological traits and the gender gap in full-time employment and wages: Evidence from Germany. January 2009

No.111: *Alexander Vogel:* Exporter Performance in the German Business Services Sector: First Evidence from the Services Statistics Panel. January 2009
[revised version forthcoming in: The Service Industries Journal]

No.110: *Joachim Wagner:* Wer wird subventioniert? Subventionen in deutschen Industrieunternehmen 1999 – 2006. Januar 2009

No.109: *Martin F. Quaas, Stefan Baumgärtner, Sandra Derissen, and Sebastian Strunz:* Institutions and preferences determine resilience of ecological-economic systems. December 2008

No.108: *Maik Heinemann:* Messung und Darstellung von Ungleichheit. November 2008

No.107: *Claus Schnabel & Joachim Wagner:* Union Membership and Age: The inverted U-shape hypothesis under test. November 2008

No.106: *Alexander Vogel & Joachim Wagner:* Higher Productivity in Importing German Manufacturing Firms: Self-selection, Learning from Importing, or Both? November 2008
[revised version forthcoming in: Review of World Economics]

No.105: *Markus Groth:* Kosteneffizienter und effektiver Biodiversitätsschutz durch Ausschreibungen und eine ergebnisorientierte Honorierung: Das Modellprojekt „Blühendes Steinburg“. November 2008

No.104: *Alexander Vogel & Joachim Wagner:* Export, Import und Produktivität wissensintensiver KMUs in Deutschland. Oktober 2008

No.103: *Christiane Clemens & Maik Heinemann:* On Entrepreneurial Risk – Taking and the Macroeconomic Effects Of Financial Constraints, October 2008

No.102: *Helmut Fryges & Joachim Wagner*: Exports and Profitability – First Evidence for German Manufacturing Firms. October 2008

No.101: *Heike Wetzel*: Productivity Growth in European Railways: Technological Progress, Efficiency Change and Scale Effects. October 2008

No.100: *Henry Sabrowsk*i: Inflation Expectation Formation of German Consumers: Rational or Adaptive? October 2008

No.99: *Joachim Wagner*: Produktdifferenzierung in deutschen Industrieunternehmen 1995 – 2004: Ausmaß und Bestimmungsgründe, Oktober 2008

No.98: *Jan Kranich:* Agglomeration, vertical specialization, and the strength of industrial linkages, September 2008

No.97: *Joachim Wagner:* Exports and firm characteristics - First evidence from Fractional Probit Panel Estimates, August 2008

No.96: *Nils Braakmann:* The smoking wage penalty in the United Kingdom: Regression and matching evidence from the British Household Panel Survey, August 2008

No.95: *Joachim Wagner:* Exportaktivitäten und Rendite in niedersächsischen Industrieunternehmen, August 2008
[publiziert in: Statistische Monatshefte Niedersachsen 62 (2008), 10,552-560]

No.94: *Joachim Wagner:* Wirken sich Exportaktivitäten positiv auf die Rendite von deutschen Industrieunternehmen aus?, August 2008
[publiziert in: Wirtschaftsdienst, 88 (2008) 10, 690-696]

No.93: *Claus Schnabel & Joachim Wagner:* The aging of the unions in West Germany, 1980-2006, August 2008
[forthcoming in: Jahrbücher für Nationalökonomie und Statistik]

No.92: *Alexander Vogel and Stefan Dittrich:* The German turnover tax statistics panels, August 2008
[published in: Schmollers Jahrbuch 128 (2008), 4, 661-670]

No.91: *Nils Braakmann:* Crime does pay (at least when it's violent!) – On the compensating wage differentials of high regional crime levels, July 2008
[revised version forthcoming in: Journal of Urban Economics]

No.90: *Nils Braakmann:* Fields of training, plant characteristics and the gender wage gap in entry wages among skilled workers – Evidence from German administrative data, July 2008

No.89: *Alexander Vogel:* Exports productivity in the German business services sector: First evidence from the Turnover Tax Statistics panel, July 2008

No.88: *Joachim Wagner:* Improvements and future challenges for the research infrastructure in the field *Firm Level Data*, June 2008

(see www.leuphana.de/vwl/papers for a complete list)

Leuphana Universität Lüneburg
Institut für Volkswirtschaftslehre
Postfach 2440
D-21314 Lüneburg
Tel.: ++49 4131 677 2321
email: brodt@leuphana.de
www.leuphana.de/vwl/papers