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by

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Abstract

This paper analyses the wage premia associated with workers' occupational use of foreign languages in Germany. After eliminating time-invariant unobserved heterogeneity and other confounding factors, sizable returns of about 10 percent to applying fluent English skills are found. Returns to occupational use of other foreign languages are, if anything, restricted to a few specialized occupations. Compared to non-migrants, immigrants receive more than twice the return for using English. Returns depend crucially on speaking German well, thus excluding many first generation migrants and are found to occur particularly in service occupations that involve international factor flows. In such occupations it is likely that migrants can apply complementary skills such as international experience that their non-migrant counterparts lack. As immigrants do not earn significant wage premia for applying their native language on the job in addition to those for English, their trade-fostering potential seems to be unlocked by complementary fluency in the two business languages German and English.

Keywords: foreign language skills; migration; wage structure; human capital; occupational choice

JEL classification: J24, F22, J30

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Introduction

Workers with foreign language skills are thought to grease the wheels of international business relations and particularly English has become a key qualification in many occupations. Not only employers seem to benefit from workers' skills. A small and very recent literature has provided evidence that in Europe, in contrast to the United States, workers earn considerable returns to their foreign language skills. While a few channels through which such returns emerge have been suggested, these are largely untested. Whether returns originate from skill-based productivity increases or have other roots such as signaling unobserved ability to employers has important implications for migration and labor market policy, education policy with respects to these skills and the microfoundation of the immigrant-trade-effect in international economics.

This paper underlines that foreign language skills are a valuable component of human capital for workers. It extends the literature by estimating the return to foreign languages that can be reaped when foreign languages are used on the job. For this I combine a task dataset from Germany with individual-level panel data from the German Socio-Economic Panel (GSOEP). I then extend the literature on the returns to foreign languages methodologically by exploiting within-individual variation of wages and occupational requirements upon occupational change to disentangle productive application of skills and other sources of foreign language related wage premia. Returns to on-the-job use of foreign languages are found to be substantially higher for immigrant workers than for non-migrant workers, which is expected as migrants possess a higher level of potentially complementary factors such as foreign cultural knowledge that may render foreign language skills more productive. This focus on the distinction between immigrant and non-migrant workers is relevant for understanding the skills immigrants supply to the host country labor market. In addition to the wage premia associated with productive use workers reap a considerable residual return which can for example be explained by the role of language skills in signaling their speaker's favorable selection from the workforce. Excellent English skills are the main source of the return to productive use of foreign language skills, whereas other languages play a role in explaining the residual wage premium of foreign language skills. The paper furthermore highlights that returns to foreign language use depend crucially on complementary German skills in Germany and thus are particularly reaped by second-generation migrants.

The paper is organized as follows. Section 2 reviews the relevant literature before Section 3 explains the difference between the productive role of foreign language skills and other potential sources of wage premia that might be associated with them. Section 4 introduces the data. Section 5 presents the econometric approach, results and discusses robustness before Section 6 concludes.

Related Literature

While there is a large literature on the role of host country languages for immigrants' labor market performance (e.g. Chiswick and Miller, 2002; Dustmann and Soest, 2002; Bleakley and Chin, 2004), few papers study the implications of foreign language skills for individuals' labor market outcomes. At the country level, Melitz (2008) finds common languages are associated with trade in a gravity framework. He also discusses the potential impact of common languages on trade, arguing that, in addition to direct communication in the international relations of companies, service tasks such as translation are a potential field where language skills can be applied productively. Clearly foreign language skills can also be productive outside of business for example in teaching languages. Ku and Zussman (2010) demonstrate that non-native English skills can foster trade links across the globe though its role as lingua franca. As such links or productive applications benefit employers, workers who possess such skills hence can be expected to benefit personally by earning higher wages in a competitive labor market.

Only a few studies focus on the returns at the individual level so far. Fry and Lowell (2003) find no particular return to bilingualism in the US after controlling for education outcomes. They use a dummy variable for bilingualism and interact it with immigrant and native background respectively. These are included in linear regressions on log weekly wages using cross-sectional data. They conclude that returns to bilingualism exist only within small pockets of the labor market in the United States. Saiz and Zoido (2005) discuss self-selection into language learning and exploit intra-individual variation in language skill between the two waves of a short panel of college graduates collected in 1993 and 1997. They find a two to three percent return to foreign language skills for this highly skilled sub-population in the United States which is small compared to 8-14 percent for an additional year of schooling in their set-up. However, the Anglophone countries may be special, because business partners abroad can usually be expected to speak English. Isphording (2012) estimates the effect of both foreign (English) language skills and native language skills using Spanish data and finds that foreign languages are typically not rewarded in blue collar jobs, but greatly so in white collar occupations. He argues that English is an entry ticket to white collar jobs and rewarded with a premium of about 50 percent in these jobs. This wage premium is that high, he speculates, because good English skills are scarce in the Spanish work force. Ginsburgh and Prieto-Rodriguez (2011) estimate the returns to foreign languages to native workers in nine European countries. After estimating Mincer regressions where dummy variables for language skills and language use are included, they use the share of non-speakers ("disenfranchisement rate") of the most common five foreign languages to estimate returns indirectly. Their results suggest there is heterogeneity between returns to particular languages depending on the supply and demand of these foreign languages.

Whereas the existing literature has mixed the different channels through which foreign language skills provide returns, I disentangle these and provide

evidence of these channels' relative importance. I use data from Germany, which is one of the largest exporters, but other than the US trades mostly with partners who do not speak its language. At the same time, a large share of its immigrant population speak native languages that are not widely spoken outside of their home country and among non-migrant Germans (e.g. Turkish, Polish, Serbo-Croat, or Italian). This means immigrants possess a scarce skill. Acquired foreign language skills, especially English, are however far more common than in countries that have been the focus of previous studies (e.g. Spain). There exists therefore a potential substitute between the language skills of immigrants and acquired foreign languages of both non-migrant and immigrant population.

I will first establish that foreign language skills are associated with significantly higher wages in Germany by extending the approach of Fry and Lowell to a richer set of controls. I then use panel data to eliminate time-invariant individual heterogeneity while relying on a much less selected sample in a longer panel than Saiz and Zoido. While they treat foreign language skills' wage effect as a black box, I specifically look at the channel through which the premium to foreign languages emerges. I estimate the wage premium associated with productive use in workers' occupation[1], which is the main source of wage premia for migrants.

Conceptual Framework

There are two reasons why firms might pay workers with foreign languages more than otherwise comparable workers without such skills[2]. Both are likely to be present simultaneously. First, foreign language skills could increase the marginal product of labor directly. In order to formalize this, we can include foreign language skills as a factor in the production function to reflect a productive role of foreign language skills. Their relevance for productivity, which I will call language intensity fl_j (this excludes the host country language, no matter a worker's native tongue), varies by occupations j. For example, a foreign language teacher works in a more language-intensive occupation than an assembly line worker. For worker i, working in occupation j in industry k, let a_i be unobserved ability, FL_i foreign language skills, H_i other human capital, and K_{jk} all other factors affecting a worker's productivity, for example physical capital. Foreign languages are productive then if

[1] Peri and Sparber (2009) use a nested CES-production function to model the production of a (low skill) intermediate good from communicative and manual inputs. In their model, they show that the optimal share of a communicative task in relation to a manual task defines the optimal occupation choice for workers, depending on their relative effectiveness in performing each task. In this paper I use the same reasoning, but extend it to high skilled workers and use foreign language as a specific subset of communicative tasks whereas Peri and Sparber just focus on the host country language.

[2] I control for some non-causal sources of correlation between foreign languages and wages such as firm size wage effects empirically below and therefore do not discuss them in detail here.

$$Y_{ijk} = Y(a_i, H_i, FL_i, K_{jk}) \quad \text{with} \quad \left[\frac{dY_{ijk}}{dFL_i}\middle| fl_j > 0\right] > 0. \tag{1}$$

The productivity of foreign language skills in (1) depends on the specific occupation j. The higher marginal products of labor can then be expected to translate into higher wages as long as no serious market imperfections obstruct this.

Second, a positive correlation between foreign language skills and wages that persists after fully controlling for observable human capital could alternatively arise from a simple positive correlation of unobserved high ability or motivation and observable language skills due to the effort and initiative required for learning a foreign language (Saiz and Zoido, 2005). Such correlation might be even used actively by employers to derive a signal about unobservable worker characteristics during screening (e.g. in a framework such as Gibbons' and Katz', 1992). Formally, in this case worker *i's* production function does not depend on foreign language skills directly, but unobserved ability a_i is correlated positively with foreign languages, as equation 2 shows.

$$Y_{ijk} = Y(a_i, H_i, K_{jk}) \quad \text{with} \quad Cov(a_i, FL_i) > 0. \tag{2}$$

If wage premia arose because foreign languages signaled generally higher productivity, they would be positive for all occupations. However, if foreign languages were remunerated solely for their role in signaling higher unobserved ability of workers before hiring, we could not expect wage premia to exist for immigrants with other mother tongues who picked up language more or less automatically as children. In their case we might however suspect ethnicity or regional origin to be interpreted as a signal by some employers[3]. By eliminating unobserved time-invariant heterogeneity and using differences in language intensity of workers' occupation over time, we can distinguish the two explanations empirically.[4]

An occupation j can be seen as a specific combination of tasks $t_j = \left(fl_j, h_j\right)$ that have to be combined to produce an output. Autor and Handel (2013) discuss that assuming a worker chooses the wage-maximizing occupation thus means they receive the highest possible return to their bundle of skills (FL_i, H_i)

[3]Immigrants are often favorably selected on unobservables (Chiswick, 1978; Borjas, 1987), which could lead to a correlation that looks similar to a signaling effect for non-migrant workers. A role in signaling is more likely to be either general or employer-specific but not occupation-related. For example, it is more likely that employers are generally prejudiced against ethnicity A, rather than holding prejudice only again members of A who work in a specific occupation.

[4]Intermediate situations are possible in theory. Pope (2008) tests a hypothesis that would be a mix of the productivity and the ability explanation and cannot find evidence for it. According to this, learning a foreign language might increase the productivity in future learning. Then foreign languages could proxy other skills that help workers to be promoted quicker than their peers (i.e. wages increase faster with experience or tenure). Pope exploits the largely random assignment of Mormon teenagers to Anglophone and non-Anglophone destinations for their missions. Some of these pupils thus exogenously had to learn a foreign language in the latter case. He finds no effect whatsoever on GPAs at college later in life. As I, just as Pope in his paper, could not find evidence for such differences in the empirical analyses for this paper, I do not allow for this possibility in the conceptual framework.

and not necessarily the highest possible return to each individual skill component.

Within the group of workers who apply their language skills productively according to (1) it can be expected that considerable differences in returns to foreign languages exists. In a labor market without a cost to occupational mobility and without complementarity between foreign language skill FL_i and the other inputs to Y_{ijk} we would expect uniform returns to skills or tasks (Heckman and Scheinkman, 1987; Autor and Handel, 2013). If there existed some complementarity between tasks that are performed as bundles or skills that are demanded in combinations, we would expect heterogeneous returns to them. Analyzing such heterogeneity in returns to the occupational requirement of a particular skill thus can reveal complementarities that have to be satisfied in order to benefit from the productive application of the skill in question. In the case of foreign languages this paper will specifically look at two distinctions. The first is the difference between migrants and non-migrants. The reasoning is that immigrants possess not only language skills but are also more likely to possess higher levels of cultural capital from a place other than the host country, which may improve the productivity of their language skills and hence the expected returns. At the same time their command of the host country language, which may be important to apply skills or be substituted by foreign language skills, is often worse than that of non-migrants, which may result in lower returns. Both points will be followed up below.

Data & Descriptives

I use two sources of data. The first dataset are the 2000-2011 waves of the German Socio-Economic Panel, which has covered more than 35.000 individuals since 1984. The second dataset is the cross-sectional "Bundestinstitut für Berufsbildung" (Federal Institute for Vocational Education and Training, BIBB) 2005/2006 employment survey. This is a nationally representative employment and task dataset of workers aged 15 and above who worked a minimum of 10 hours per week in Germany at the time of the survey. The total sample size is 20,000 observations.

The BIBB dataset offers detailed information on workers' education, occupational requirements, and tasks. While the first part of the analysis employs the BIBB dataset at the individual level, the second part uses individual level panel data from the GSOEP combined with occupation-level information from the BIBB dataset. For each occupation in the BIBB dataset, I use individual-level information about jobs to calculate aggregate indicators of occupational characteristics at the 3- and 4-digit KldB classification, which is the German equivalent to ISCO-88. These characteristics comprise education levels, experience, the requirement of foreign languages on the job as well as other specific skills or responsibilities of workers in their respective occupation. The core variables concerning foreign language elicit occupational requirements and are thus an intermediate between pure skill and pure task variables. Respondents were

first asked whether they required any foreign language, then specifically for English, French, Russian, Spanish, Turkish, Italian, Greek, Portuguese, Polish and any other, so far unlisted, foreign languages. In addition the highest required skill level over all foreign languages and furthermore the specific level of English that is required were collected. As an example, let dummy fl_{ij} indicate whether worker i in occupation j needs foreign languages for his job. The average foreign language requirement in an occupation is thus $fl_j = \frac{1}{n} \sum_{\forall i} fl_{ij}$. These characteristics are matched to the GSOEP dataset based on the respective occupation. For the matched job characteristics to be unbiased, the respective aggregate indicator from the BIBB must be a consistent and ideally unbiased value for each occupation cell[5]. Taking occupational data from an external sources provides an exogenous assessment of occupational characteristics and improves the amount of information that is available. Matching the data however requires that both sources of data are comparable. Occupation-level averages calculated using the BIBB dataset yield consistent estimates of the true population level because this dataset is nationally representative. However, as the BIBB sample size is limited, small cell sizes within some occupation categories mean that estimates are likely to be biased (Aydemir and Borjas, 2011). If workers are on average a random draw from their occupation, this will not pose a problem for identification beyond decreasing the statistical significance of estimates, because this will be measurement error clustered at the occupation level. To provide evidence of the robustness of results I will report results for 3- and 4-digit aggregation levels whenever occupation-level values are used and run robustness checks in which small cells are excluded. The data should not systematically exaggerate low language intensity levels or under-report high intensity because the difference in language intensity will be used for identification. Underestimating the variation in language intensity would then lead to upwardly biased estimated returns to foreign language use. Data inspection shows that this is probably not an issue. Systematic over-reporting or underreporting for the whole sample would however be unproblematic, because this would simply shift the language intensity levels up- or downwards, respectively, but not affect the difference between occupations.

When using the panel data, I will rely on occupational requirements from the 2006 BIBB cross-section. These are not available on a yearly basis. Having been collected in the middle of the 2000-2011 period, they still provide a good approximation of occupational characteristics during this time. These data were collected in the middle of this period of panel data used. Therefore, change in occupational characteristics over time is unproblematic as long as this change was gradual, which is more reasonable to assume for whole occupations than sudden shifts from one year to another. Thus, the analyses of the matched dataset possess external validity and are approximately nationally representative for full-time employed workers over the whole twelve year horizon covered by

[5]A worker who is a random draw from his occupation, has a priori probability fl_j of requiring foreign languages. In the empirical part of the paper I will use individual fixed effects and several covariates to account for unobserved and observed deviations from strict representativeness.

the panel data used here.

The US-based literature typically uses a native/immigrant distinction for heterogeneous workers who differ by migration status. The use of ius sanguinis ("right of blood") in German citizenship law[6] and migration statistics as opposed to the United States' ius soli ("right of soil", where the place of birth matters) suggests a better approach in the present context. While the ius soli inspired native/immigrant distinction implicitly assumes that native born child with immigrant parents is identical to a native born non-immigrant child, I use a definition which allows children of immigrants to possess characteristics more similar to their parents' as these are at the core of this paper. A migrant is hence defined as either is a first generation immigrant or an individual with a mother tongue other than German (multiple mother tongues, including German, are possible). This reflects the official definition of the term "individual with migration background", which is the politically correct definition used most often in German media and politics. Note that migrants thus comprise some second-generation immigrants born in Germany who have not moved themselves. Migrant status in this paper does not in any way depend on internal migration experience. A migrant can thus be naturalized or be German by birth, but will in any case have had substantially different access to foreign languages during childhood, which is the distinction that matters for the context of this paper. A foreign language is defined in this paper as a language other than German, no matter the mother tongue of an individual.

Descriptives

In total about 55 percent of workers in the BIBB sample respond that they require any foreign language in their job (see Table 1). The total figure is very similar when comparing migrant and non-migrant workers. These figures comprise basic up to proficient language skills. The majority of workers who require foreign language skills however only need basic or intermediate skill levels. A total of 19.6 percent of non-migrants and 26.1 percent of migrants require *expert* knowledge of at least one foreign language. Among these are 8.1 and 11.0 percent of non-migrants and migrants, respectively, whose English skills allow fluent negotiation in English[7]. Workers who require foreign languages earn on average an additional 800 Euros per month or 5 Euros more per hour than their counterparts who do not (gross wages used throughout). The difference in average wages between non-migrant and migrant workers is about 250 Euros among workers who do not require foreign languages and narrows to about 100 Euros among those who require foreign languages.

Table 2 summarizes some of the most and least foreign-language-intensive occupations in the sample at the three digit level. In the foreign-language-

[6] Prior to 2000 German citizenship depended solely on having at least one parent with German citizenship. Since then, children born in Germany to a parent with a valid residence permit can possess German and other passports simultaneously, but have to decide between their German and other citizenships by the age of 23.

[7] More detail on English language requirements were collected than for the other languages.

intensive ones on the left between 75 and 100 percent of workers reported to require any foreign languages at any skill level, whereas zero to fifteen percent of workers in the occupations on the right did. The education levels underline that years of schooling are far from perfectly correlated with the requirement for foreign languages. For example, crews on trading vessels are so international today, that sailors and ship mechanics, who have low to medium levels of education, are among the five groups with the highest language intensity in the BIBB dataset. At the same time, only three of the 26 judges and state attorneys in the dataset require foreign language skills in their job, and none reported needing excellent skills. For an analysis of foreign language skills education and other skills should of course be controlled for. The top of Figure 1 plots the correlation between language requirement and education at the 3-digit occupation level for any language requirement and excellent language skills on the right and left, respectively. The correlation is strongly positive. Among low to medium skilled occupations language intensity varies a lot, but only few occupations require excellent skills. This leads to substantial mass at zero on the top right for most occupations requiring less than 12 years of education. Relatively few highly skilled occupations do not require any foreign language skills and the variation with respect to excellent language skill requirements is large. The bottom panels show the relationships between education and foreign languages with hourly wages, respectively. Mean hourly wages increase with education as well as foreign language skills. Note that the relationship between language intensity and hourly wages is more evenly distributed and far less clustered for low paying occupations than the relationship between years of education and wages. These plots underline that foreign language skills might explain a relevant share of the wage structure in these data.

(Tables 1 and 2 about here.)

Econometric approach & Estimation

Cross-sectional evidence

In the empirical part of the paper I will first use the cross-sectional BIBB dataset to demonstrate that the strong positive correlation between foreign language requirements and wages seen in the descriptives remains significant after controlling for important determinants of wage such as education, experience, tenure and individual characteristics not directly related to a worker's job. This establishes a robust wage premium in line with either a productive role of language skills (Equation 1) or an ability explanation (Equation 2) or a mix of both. Thereafter I will exploit the intra-individual variation over time in the GSOEP that arises from occupational change to control for time-invariant individual unobserved heterogeneity and other potential explanations for the positive correlation such as firms' productivity differences. By exploiting the difference in language intensity and wages within individuals who take up occupations with

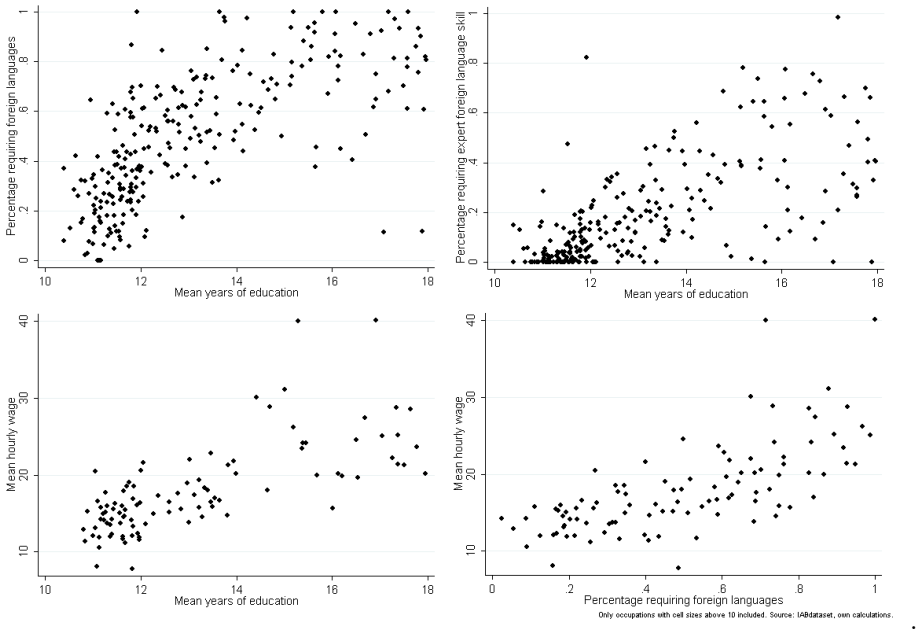

Figure 1: Mean foreign language requirements and mean education levels by 3-digit occupation category

different language intensity, I can hence estimate the wage premium that arises from foreign language skills' productive role in Equation 1.

Table 3 provides results of regressions using the logarithm of wages (column 1) and the logarithm of hourly wages (columns 2 through 7) as dependent variable and foreign language requirements fl_i and individual characteristics X_i as independent variables. The data are restricted to full-time workers working at least 35 hours per week[8]. The regression allows for non-linear effects of tenure and experience by including quadratic terms. Education is included using a number of dummy variables that capture the three-tier education system in Germany. I furthermore add state fixed effects and industry fixed effects to account for two other common sources of wage differentials. Column 1 shows that workers who require any foreign languages in their job on a regular basis earn about 8 percent higher gross monthly wages and 21.5 percent more if an expert skill level is required.[9] Migrants' hourly wages are about 9.9 and 25 per-

[8]The hours worked are taken from a variable that covers those specified in the worker's contract (rather than hours actually worked when including overtime). I exclude those 2 percent of full-time employed workers who reported to have more than 48 hours per week specified in their contracts, which is above the legal maximum limit. This hints at misunderstanding the survey question and would spuriously lower their hourly wages. Including this subgroup does not affect results considerably.

[9]From hereon I will report log gross hourly wages which reflect the compensation for workers' marginal product of labor better than log gross wages.

cent higher if their occupations require some and expert foreign language use, respectively. For non-migrants these differences are 7.6 and 21 percent. These estimated returns are not statistically significantly different between migrants and non-migrants. In columns 4 and 5 I add two extra dummy variables to demonstrate that a substantial portion of the effect refers to English. In fact, wages of workers who require below expert level skills in a language other than English do not earn significantly higher wages. The insignificance of the extra regressor in column 8 furthermore suggests that a migrant who uses his native tongue on the job does not receive significantly different wages than if using an acquired language (column 4). Just under half of migrants who require any foreign language (54 percent) report to require their or one of their (foreign) mother tongues in their occupation (24 percent). Contrary to the cross-sectional estimates by Fry and Lowell (2003) for the US who find that returns to foreign languages are a statistical fragment that is eliminated once fully controlling for education, I find robust positive correlations between occupational language requirements and wages. This result is robust to controlling for a far larger set of covariates than Fry and Lowell, comprising education, experience, tenure, basic demographic characteristics, state fixed effects, or industry fixed effects. Ginsburgh and Prieto-Rodriguez (2011, Model 1) find a similarly sized return (25.6 percent as opposed to 28.6 for expert foreign language skill use here) for non-migrant workers in Germany including two education dummies, as well as the number of years of tenure and potential experience and their squares. This is encouraging because their data come from a different source.

(Table 3 about here.)

Foreign language requirements could be correlated with other occupational requirements (Autor and Handel, 2013) that are not picked up by linear or quadratic terms for education, experience and tenure and the sets of fixed effects used in regressions above. If, for example, technology use was correlated with foreign language use but excluded from estimations, this would lead to (probably positive) omitted variable bias on the parameter estimates. The BIBB dataset includes indicators of a number of other skills specifically used in business or to operate modern technology. In Table 4 I therefore add these additional 13 job requirements[10]. The estimates suggest that, although expert-level English is associated with almost 20 percent higher hourly wages, the correlation between other foreign languages and wages is far less pronounced. Some of the occupational requirements that were added in Table 4 increase the fit of the regression slightly and affect the size of the language coefficients in the regression. Their inclusion is however partly misleading because some of them are based on complementary foreign language skills (e.g. understanding new research and technology which are primarily communicated in English). Including them thus

[10]These comprise requirements for knowledge of "modern technology", microelectronics/-systems, nano/micro technology, opto/laser technology, finance, accounting, tax/taxation, credit, controlling, sales, logistics/distribution, marketing, business administration. For every of these extra requirements I include a dummy variable for "any" and "expert level" each.

eliminates part of the effect of language use and renders the decrease in language skills' wage return too large. Still, the exercise of adding them suggests that the correlation between wages and the language requirement is robust and strongly positive.

(Table 4 about here.)

Panel data analysis

Variation in the time dimension can be used to distinguish returns to productive use of foreign languages from the wage differences arising from individual time-invariant unobserved heterogeneity, which would be in line with the ability explanation. Foreign language skill levels have little meaningful variation within individuals that can be exploited in analyses for two reasons. First, this is because working-age migrants typically do not forget their mother tongue at a high rate and non-migrant workers with foreign language skills will typically have acquired them during their education or during long stays abroad before (re-)joining the domestic labor force. Second, foreign language skills are typically measured in surveys by asking respondents to rate their language skill on an interval such as "no skill", "basic", "good" and "very good". Individuals who are unsure how to classify themselves on such scales because their skills fit into more than one category may thus report different foreign language skill levels in subsequent surveys which gives rise to spurious variation. Hence, self-reported incremental changes of language skills on an interval scale do not provide a reliable way of identifying the role of foreign language skills in the labor market. Dustmann and Soest (2002) discuss such measurement error in detail and estimate the effect of *host* country language skills on log monthly earnings with a panel approach aimed at reducing the bias from under- and over-reporting language skills. They find that about a quarter of overall variation in the language skill variable and almost all within-individual variation is due to misclassification in self-reported language skill levels. For foreign languages, I expect the extent of spurious intra-individual variation to be even larger. We should thus not base an identification strategy on this variation.

I therefore exploit the variation in foreign language use that is provided by job changes between occupations. The foreign language requirement of particular occupations is exogenous to workers because an individual has a negligible effect on population characteristics as long as these data are taken from an exogenous source. This way, both systematic over- and underreporting of language skills by particular individuals as well as the dependence on inexact self-reported language skill can be overcome. Rather than relying on subjective skill and its change over time, I can exploit that occupations have different entry requirements with regards to skill (that bind if languages are used). Observing occupational change of several thousand individuals, these intensity difference between occupations provide enough variation to identify intra-individual wage differences associated with foreign language intensity. However, the general effect of a job or occupational change has to be taken into account, because

workers who switch occupations are a selected subpopulation. A worker may enter or leave the work force, switch occupations, switch employers within one occupation, and get a new contract that is better paid within the same job.[11] Longhi and Brynin (2010) show that in the German Socio-Economic Panel occupational change is more likely for individuals who have no university degree, who are experienced, and who are overqualified for their current position. They conclude that occupational change in Germany thus is typically a form of career enhancement. According to Longhi and Brynin about 54.9 percent of workers who changed occupations in the GSOEP reported to have improved their pay, while 19.5 percent reported a decrease.

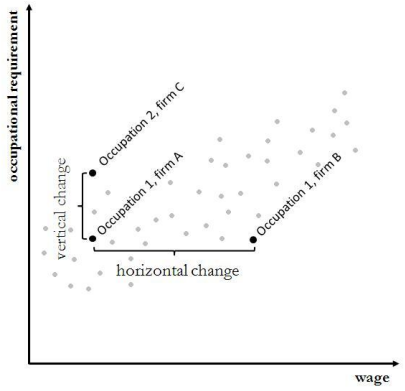

Figure 2: Two dimensional representation of occupational change

A change in a worker's position can be decomposed into within- and between-occupation change as well as a job change effect. Suppose for a moment that occupational requirements are one-dimensional. Then the job change effect is a horizontal move in Figure 2 from firm A to firm B within occupation 1, which is associated with a wage increase here[12]. The sign of the wage effect of a job change is ambiguous a priori and depends, for example, on whether a job change is the choice of the worker (e.g. higher paying offer) or not (e.g. old position closed). When the worker switches occupations, her occupational requirements may change. This results in vertical movement and possibly a horizontal change in wages as well. An occupational change means losing occupation-specific human capital but may also allow qualifications and occupations to be better matched than before.

If the employer rewards time-invariant unobserved ability signaled by the worker's foreign language skills, this component of a foreign language return would be eliminated by using individual fixed effects. In the example above,

[11] Selection into the workforce will be of minor interest here, because we can compare continually full-time employed individuals over time.

[12] The job's skill intensity is measured at the occupation level and thus remains the same.

where wages are assumed to be based on the unspecified one-dimensional requirement only, a simultaneous increase of occupational requirements and wage as a worker moves towards the top-right would suggest that workers are remunerated for their foreign languages. This is of course no causal identification, because job requirements are multidimensional in reality. If a worker switches into an occupation that requires more education or is demanding other scarce human capital components to a higher degree both theory and the empirical relationships shown earlier suggest that he is likely to earn more money in the new occupation. Thus, I will control not only for higher foreign language use but also for higher educational, experience or other requirements. Also, the general job change effect, occupation change effect or other factors such as employers' characteristics or time trends will be controlled for as they could be sources of within-individual wage increases.

Let us write individual i's wage change upon occupational change from occupation $j = j^0$ to $j = j^1$ between years $t^0 < t^1$ as $\hat{w} = w_{i,j^1,k,t^1} - w_{i,j^0,k,t^0}$, where a simultaneous change in employer k is optional. The same notation can be used accordingly for other variables. Using a fixed effects regression, the time-invariant language skill level of the worker is eliminated completely alongside all other individual characteristics that do not change over time.[13] I thus estimate

$$\widehat{w} = \alpha_1^{between} + \alpha_2^{within} + \beta \begin{bmatrix} \widehat{FL} \\ \widehat{educ} \\ \widehat{exper} \end{bmatrix} + \gamma \widehat{X} + \delta \begin{bmatrix} \widehat{industry} \\ \widehat{firm\ size} \end{bmatrix} + \zeta \widehat{year} + \epsilon, \quad (3)$$

where α_1 and α_2 stand for the general effect of switching occupation and jobs within occupation respectively[14], and $\widehat{X}$ for changes in individual characteristics.

Table 5 reports estimates from fixed effects regressions of the wage increase from occupational change at the 3-digit level[15]. I control for potential differences between occupations by including occupation-level shares of college graduates, master craftsmen, training, which are the highest formal qualification attainable in different occupational cells (e.g. "Meister" for mechanics, college degrees for engineers). Furthermore educational and experience requirements (for details see Appendix A2), a general job change effect, labor market characteristics such as experience and tenure as well as individual characteristics such as age or years of education. In the German labor market particular certificates or degrees are

[13] Also, language skill levels do not affect the estimation directly unless a worker has learned the language in the preceding period and then switches into a new occupation, which would only matter for the motives but not for the interpretation of the realized wage premium of this estimation technique, which has some analogy to an average treatment effect on the treated.

[14] Thus allowing for cases of occupational change without change of employer and change of employer without occupational change.

[15] Pooled OLS estimates can only provide lower quality surrogate for the regressions run on the BIBB sample above and will thus not be reported.

required to enter many occupations which restricts individuals mobility between occupations. At the same time, individuals with formal training[16] can switch into occupations they are overqualified for, although this might not be apparent from their years of education. As these occupational barriers to entry may command a wage premium by themselves I also add dummy variables that reflect whether workers are working in an occupation they were trained for and whether they are in training in their current occupation. Furthermore, I include year fixed effects to account for macroeconomic trends, industry fixed effects and firm size fixed effects as some industries or larger firms may generally pay higher wages.

According to these results, which are again separately estimated by migrant status, foreign language use in occupations is not significantly correlated with higher hourly wages in general. However, there are very sizable returns in occupations that require excellent English. Columns 5 through 8 show that the return to language skills that can on average be realized when workers switch from an occupation not requiring excellent English to one that does is about 20 percent for migrant workers and about 9 percent for non-migrant workers. Columns 7 and 8 suggest there is no general, robust return for low- and medium-level English language use after controlling for other wage determinants. Adding further occupation-level qualification variables does neither affect the significance nor the size of the effect of foreign languages considerably. This suggests that among the full-time employed in this sample workers are either relatively well-matched to occupations education-wise or that the mismatch is persistent. The additional layer to qualifications added by language hence provides an important, so far mostly omitted factor in wage regressions.

On the 4-digit level results are relatively similar as Table 9 shows. The main difference is that now the estimated effect of excellent language skill use in any foreign language is significant by itself at the 5 and 10 percent significance level for migrants and non-migrants, respectively. Combining both English and other foreign languages in one regression however shows that the systematic return comes from English only, even at the four digit level. The smaller, but still significant coefficients for excellent English are a consequence of smaller cell sizes and therefore higher measurement error which biases the result towards zero.

While in Table 5 unobserved time-invariant ability is eliminated, estimates in Table 3 that do not exclude it are far higher, in particular for non-migrant workers. The higher relative importance of productive use for migrants is expected. For non-migrant workers, possessing foreign language skills provides a signal about their likely positive selection on unobservables to employers. For migrant workers, foreign language skills are less helpful for signaling as they possess these anyway.

Analyzing the sources of heterogeneity can help understand why working in foreign-language-intensive occupations is associated with particularly large

[16]Training includes apprenticeship schemes in crafts, but also in many white collar occupations occupational groups. It is a highly formalized combination of schooling and on-the-job training that typically lasts 3 years and that requires at least a lower-tier high school degree.

returns for migrants. The positive wage effect of English-intensive occupations is found to have a similar size for both first and second generation migrants at the 4-digit level but to be significant only for second generation migrants at the 3-digit level (see Table 6, columns 1 to 4). Second generation migrants went through the host country's education system and are much more often fluent in German. In order to be able to enter white collar jobs outside of a few pockets of the labor market (e.g. economics research, investment banking) and many blue collar occupations, good host country language skills are essential in most countries. Dustmann and Soest (2002) as well as Bleakley and Chin (2004) demonstrate sizable returns to host-country language skills in Germany and the United States, respectively. Chiswick and Miller (2002) find that without host country language skills, returns to schooling as well as to labor market experience are very low. Constant and Massey (2003) add that language skills affect the ability to overcome labor market segmentation in Germany more significantly than they raise eventual pay. While migrants are at a disadvantage if they do not speak the host country language fluently, they might choose more foreign-language-intensive occupations to make up for this. While 80 percent of second generation migrants report very good oral German skills, this is the case for only 35 percent of first-generation migrants. The BIBB data show that in Germany so far, complementary German language skills are required in order to enter foreign-language-intensive occupations. Exceptions, namely language-intensive occupations in the data in which excellent English is more important than excellent German, are in particular found at different education levels in aviation, shipping and computer science. The most common language-intensive occupations[17] among migrants in the sample are travel agents, sales and marketing department managers and sales associates. Switching into these occupations to reap returns to English however requires fluency in German. Second-generation migrants posses this fluency more often, are therefore more mobile between occupations and show more within-individual variation in wages, language intensity and related characteristics. This is also why in Table 6 columns 5 to 8 positive returns to excellent English at the 3-digit level are found to be reaped by those who possess at least good oral German skills[18].

Table 7 shows that systematic returns are reaped in service occupations only while for other occupation groups such as technical occupations there is no evidence of systematic returns. This can explain why the wage premia are larger for migrants than for non-migrants in general. In service occupations additional factors such as cultural knowledge (hence giving rise to a different quality of foreign language skill) that migrants possess more frequently than non-migrants are far more likely to be applicable than for example for a computer scientist or engineer.

[17] Cutoff here: at least 30 percent of workers in occupational cell require excellent English or other excellent foreign language skill

[18] Written German skills (not shown), which are similarly distributed but have more variation, are a less precise indicator whether migrants can benefit from their English skills than oral language skills.

Running the regressions separately on different educational strata of the population (Table 8, columns 1-4) indicates that primarily among migrants the low and medium skilled can reap returns to using excellent English skills on the job. This again strengthens the evidence as service occupations in which returns to migrants cultural capital are likely (e.g. export merchants, sales merchants, commercial correspondence) are typically medium skilled occupations requiring formal training, but no university degree.

Hence, migrants seem to benefit more than non-migrants from their English skills not because they can substitute for lacking German skills but rather because they are able to offer more productive language skills than their non-migrant counterparts. This supports the theoretical considerations on the role of migrants in international business (Gould, 1994; Rauch, 2001). Peri and Requena-Silvente (2010) find evidence for a causal empirical effect of immigrants in Spain on the number of export transactions, which could be explained by migrants working in service occupations as those found above. This paper's results suggest that migrants can indeed reap rewards for using foreign language and migrant-specific unobserved skills can unlock productive potential once migrants work in foreign-language-intensive service occupations. Peri and Requena-Silvente (2010) as well as Mundra (2012) find that migrants' trade-creating effects vary by occupation, which is my results support. Crucially, the evidence in this paper furthermore suggests that the role of foreign language skills and English in particular is not confined to migrants. While they reap higher returns to applying their foreign language skills, imperfect substitutability with non-migrant workers exists. This provides an analogue to the immigration literatures' finding that migrant labor is substitutable with domestic labor (e.g. Borjas, 2003; Peri and Ottaviano, 2008; D'Amuri et al., 2010, for Germany) and the elasticity of substitution's dependence on the overlap of skills and experience (Peri and Sparber, 2009; Borjas et al., 2011). In the case of foreign languages the imperfect substitutability is likely to arise from unobserved migrant characteristics such as intercultural knowledge that provide them with an edge over non-migrants in the labor market when working in communication-intensive service occupations that require foreign languages. The literature on trade and migration should thus also consider domestic workers with foreign language skills, foreign country experience, et cetera as imperfect substitutes for immigrants by for example developing models with heterogeneous workers where migrants and non-migrants only differ on a continuum of skills.

(Tables 5, 6, and 7 about here.)

In Table 8 I add the extra skill requirements from Table 4 into the fixed effects regressions to assess their robustness. The estimates show that this affects results far less than in the cross-section (the decrease may still be spurious), which is partly because, for example, workers often switch from one technical occupation to another, leaving technical occupational requirement unchanged. This suggests it is reasonable to include the occupational requirement variables which proxies language intensity in an a Mincer-inspired regression that is based on individual skills and additional controls.

Excluding single regressors such as being trained for a specific occupation from the fixed effects estimates, does not affect the size and significance of the fixed effects estimates considerably. Including a variable for voluntary employment changes rather than because the employer went out of business, the worker was fired or forced to retire shows that workers improve their wage by about 3.5 (non-migrants) and 5.5 percent (migrants) on average if they change occupation voluntarily but this does not affect the estimated language premia. This suggests that this paper's estimates are robust to concerns about the motivation for occupational change for estimates (e.g. Kambourov and Manovskii, 2009; Longhi and Brynin, 2010).

At the 4-digit level the identification via occupational change (Table 9) has a higher resolution when it comes to subtle differences that make big differences for language intensity (e.g. switching from work as a wholesale trader (6712) to export merchant (6711)) At the three digit level, these differences are concealed by aggregation and the variation picked up originates only from less subtle occupational changes. Because of smaller cell sizes the potential impact of measurement error is however far higher. This biases the 4-digit results considerably towards zero.[19]. Hence excluding small cell sizes partly even increases the estimated return to switching into more foreign-language-intensive occupations (not shown). The estimated returns at the 3-digit and 4-digit levels above are thus rather conservative.

(Tables 8 and 9 about here.)

Conclusion

In this paper I extend the literature on the role of foreign languages in the labor market and the ensuing wage effects for workers. In particular, the paper evaluates the productive application of foreign language skills and the heterogeneity between migrants and non-migrants. I use occupational changes of individuals over time which induce within-individual variation in foreign language intensity at work to identify the wage premium associated with occupational foreign language use. Results suggest that excellent English skills allow workers to reap sizable benefits of about 10 percent of hourly wages on average if they choose occupations in which these are put to use. These returns exclude the effect of the mere possession of skills, which might for example signal ability to potential employers. I find no systematic return to occupational use of other foreign languages. This suggests that if wage returns to these existed, the relevant labor market segments would be too small to be picked up by the estimation strategy in the given sample. Also there is no evidence of significant returns to basic or intermediate English skills for workers beyond the potential role in signaling. In addition to returns to occupational use of fluent English, such a signal provided by language skills regarding positive selection on unobserved ability may add

[19]It is also possible, but unlikely, that language use is rewarded less in less common occupations and therefore more at risk to be excluded here because of their small cell size.

an additional language premium as I demonstrate using cross-sectional data in the first part of the paper, in particular for non-migrants.

Migrants reap on average more than twice the return of non-migrants for their occupational use of English. However, I find no additional return to immigrants' use of their native language in the German labor market, which would be expected if there was a specific demand by employers for language skills associated with a migrant's country of origin or countries sharing the language. Returns to excellent English are found to originate in service occupations, whereas in manufacturing occupations technical knowledge rather than English language skills count for returns. It is thus in services where the differential in returns to occupational English language use between migrants and non-migrants emerges. Specifically, high returns for migrants are driven by service occupations that involve international factor flows (e.g. marketing, sales, but also tourism). In such occupations it is likely that migrants can apply complementary skills such as international experience that their non-migrant counterparts lack.

The paper underlines that it is impossible to use English to substitute for a lack of German language skills in the German labor market in most occupations. Hence, immigrants do not reap higher returns than non-migrants because their English skills allow them to overcome barriers posed by a lack of host country language skills that cause them to earn a lower wage than an otherwise identically qualified non-migrant who is fluent in the host country language. Rather, immigrants seem to reap higher returns over their non-migrant counterparts in service occupations where factors in addition to the mere command of language matter. This suggests they possess unobserved characteristics that become valuable once foreign languages are used. Accordingly I find second-generation migrants, who typically speak the host country language well, to be the group driving the high returns to language use among migrants. For first generation migrants or individuals who lack host country language skills, returns are small or insignificant.

These findings have a number of important implications. In the future the labor economics literature should increasingly consider marketable skills that are useful in a globalizing world such as foreign language skills. International economists interested in the effect of migration on trade or FDI flows should consider that rather than distinguishing between migrants and non-migrants by passport or place of birth, heterogeneous workers with a continuum of skills who are not trivially separated may be a more promising way forward. The finding that the English language skills of immigrants are associated with high wage returns in international business and not other foreign mother tongues suggests that the immigrant-trade-effect may less directly depend on migrants' observable origin country characteristics than previously thought.

The paper furthermore underscores the importance of policies that foster migrants' ability to acquire host country language skills in order to make use of their full potential. Also, the paper suggests that the second generation of immigrants supplies a particularly interesting set of skills that is worth unlocking by ensuring that these workers are well educated and fully able to participate in the labor market.

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Tables

Table 1: Distribution of workers by requirement of foreign language skills and migration status

Language requirement	Variable	Non-migrant	Migrant
None	gross wage	2343.2	2089.7
	hourly wage	16.5	14.7
	years of education	12.7	12.4
	column percentage	45.4	44.8
Only low or	gross wage	2791.8	2500.9
medium skill required	hourly wage	19.4	17.5
	years of education	13.9	13.5
	column percentage	34.9	29.1
High skill in foreign language	gross wage	3294.1	3212.6
except excellent English	hourly wage	23.2	20.3
	years of education	15.3	14.7
	column percentage	11.5	15.1
Excellent English	gross wage	4332.3	4212.5
	hourly wage	28.0	26.6
	years of education	16.0	16.1
	column percentage	8.1	11.0

Source: BIBB dataset, own calculations

Table 2: Most and least foreign-language-intensive occupations

Highest (75-100%)	*Lowest (0%-0.15 %)*[a]
Translators & Interpreters	Bakers
Natural scientists (employed)	Plumber
Aircraft technician	Scaffolder
Ship mechanics & sailors	Prison officer
Geisteswissenschaftler[b] (employed)	Judges & state attorneys

[a]: Only a subset of these. [b]: Graduate of humanities, excluding arts.

Source: BIBB Dataset, own calculations

Table 3: Wage and foreign languages in the BIBB dataset

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	log(w)	log(w/h)	log(w/h)	log(w/h)	log(w/h)	log(w/h)	log(w/h)	log(w/h)
Subgroup	All	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant	Migrant
Requires expert foreign language	0.135 (0.010)***	0.151 (0.040)***	0.124 (0.011)***	0.118 (0.042)***	0.072 (0.012)***			0.118 (0.042)***
Requires any foreign language	0.080 (0.008)***	0.099 (0.029)***	0.076 (0.008)***	-0.008 (0.048)	-0.032 (0.022)			0.013 (0.054)
Requires expert English				0.116 (0.067)*	0.130 (0.017)***	0.189 (0.061)***	0.179 (0.015)***	0.119 (0.068)*
Requires any English				0.134 (0.048)***	0.116 (0.022)***	0.151 (0.028)***	0.099 (0.008)***	0.121 (0.050)**
Requires (foreign) mother tongue								-0.030 (0.038)
Experience	0.017 (0.002)***	0.007 (0.008)	0.014 (0.002)***	0.008 (0.008)	0.014 (0.002)***	0.010 (0.008)	0.014 (0.002)***	0.008 (0.008)
Experience^2	-0.000 (0.000)***	-0.000 (0.000)	-0.000 (0.000)***	-0.000 (0.000)	-0.000 (0.000)***	-0.000 (0.000)	-0.000 (0.000)***	-0.000 (0.000)
Tenure	0.014 (0.001)***	0.007 (0.005)	0.015 (0.001)***	0.008 (0.005)	0.015 (0.001)***	0.007 (0.005)	0.015 (0.001)***	0.008 (0.005)
Tenure^2	-0.000 (0.000)***	0.000 (0.000)	-0.000 (0.000)***	0.000 (0.000)	-0.000 (0.000)***	0.000 (0.000)	-0.000 (0.000)***	0.000 (0.000)
Foreign passport	-0.023 (0.018)	0.015 (0.026)	0.044 (0.045)	0.011 (0.026)	0.028 (0.044)	0.015 (0.026)	0.025 (0.045)	0.011 (0.026)
Age	0.023 (0.005)***	0.026 (0.015)*	0.025 (0.005)***	0.025 (0.015)	0.024 (0.005)***	0.023 (0.015)	0.024 (0.005)***	0.025 (0.015)
Age^2	-0.000 (0.000)***	-0.000 (0.000)*	-0.000 (0.000)***	-0.000 (0.000)	-0.000 (0.000)***	-0.000 (0.000)	-0.000 (0.000)***	-0.000 (0.000)
Female	-0.178 (0.008)***	-0.219 (0.031)***	-0.141 (0.008)***	-0.223 (0.031)***	-0.140 (0.008)***	-0.225 (0.031)***	-0.140 (0.008)***	-0.223 (0.030)***
College degree	0.447 (0.021)***	0.339 (0.051)***	0.401 (0.024)***	0.321 (0.051)***	0.394 (0.024)***	0.333 (0.052)***	0.397 (0.024)***	0.318 (0.051)***
Meister[a]	0.293 (0.021)***	0.285 (0.059)***	0.254 (0.024)***	0.268 (0.058)***	0.255 (0.024)***	0.273 (0.059)***	0.255 (0.024)***	0.265 (0.058)***
Training[b]	0.202 (0.018)***	0.190 (0.037)***	0.154 (0.021)***	0.186 (0.037)***	0.155 (0.021)***	0.181 (0.036)***	0.155 (0.021)***	0.185 (0.037)***
Abitur[c]	0.153 (0.031)***	0.210 (0.060)***	0.142 (0.038)***	0.208 (0.059)***	0.138 (0.038)***	0.213 (0.058)***	0.142 (0.038)***	0.210 (0.059)***
Realschule[d]	0.064 (0.029)**	0.050 (0.055)	0.058 (0.037)	0.060 (0.054)	0.057 (0.037)	0.063 (0.054)	0.056 (0.037)	0.060 (0.055)
Hauptschule[e]	-0.026 (0.029)	0.011 (0.056)	-0.036 (0.037)	0.017 (0.055)	-0.034 (0.037)	0.013 (0.054)	-0.036 (0.037)	0.017 (0.055)
Constant	6.885 (0.114)***	1.664 (0.347)***	1.708 (0.105)***	1.615 (0.292)***	1.724 (0.105)***	1.652 (0.291)***	1.727 (0.105)***	1.612 (0.292)***
R^2	0.45	0.47	0.46	0.48	0.47	0.47	0.47	0.48
N	10479	908	8,916	908	8,916	908	8,916	908

Industry and state fixed effects used throughout. [a]: Master craftsman. Highest professional formal qualification in crafts. Allows entrace to university, even without Abitur. [b]: Comprises all formally recognized vocational degrees, typically 2-4 years. [c]: University entrance level high school degree (12-13 years of schooling required, depending on state). [d]: 2nd tier high school degree, prerequisite for Abitur (10 years of schooling required). [e]: 3rd tier high school degree requiring 9 years of schooling, prerequisite for Realschulabschluss, typically required to start vocational training *, **, and *** denote significance at the 0.1, 0.05, and 0.01 significance level, respectively. Robust standard errors in parentheses. Only workers who earn above 400 Euros included ("geringfügige Beschäftigte" excluded). Columns 3 and 4 exclude workers who work less than 35 hours per week according to their contract.

Table 4: Wage premium in BIBB sample with other occupational requirements

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	log(w/h)	log(w/h)	log(w/h)	log(w/h)	log(w/h)	log(w/h)
Subgroup	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant
Requires expert foreign language	0.127	0.086	0.098	0.043		
	(0.039)***	(0.011)***	(0.042)***	(0.012)***		
Requires any foreign language	0.058	0.031	-0.017	-0.047		
	(0.029)**	(0.008)***	(0.049)	(0.021)**		
Requires expert-level English			0.105	0.110	0.162	0.138
			(0.064)	(0.016)***	(0.058)***	(0.014)***
Requires any English			0.094	0.082	0.096	0.045
			(0.049)*	(0.021)***	(0.029)***	(0.008)***
Additional occupational requirements	yes	yes	yes	yes	yes	yes
R^2	0.51	0.50	0.52	0.50	0.52	0.50
N	908	8,916	908	8,916	908	8,916

*, **, and *** denote significance at the 0.1, 0.05, and 0.01 significance level, respectively. Robust standard errors in parentheses. Individual characteristics as in Table 3. Industry and state fixed effects used throughout.

Table 5: Overview table: Fixed effects estimate of hourly wage returns of foreign language returns at 3-digit level

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	log(w/h)	log(w/h)	log(w/h)	log(w/h)	log(w/h)	log(w/h)	log(w/h)	log(w/h)
Subgroup	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant
Requires excellent foreign language[3]	0.010	0.025	0.037	0.015				
	(0.064)	(0.020)	(0.078)	(0.028)				
Requires any foreign language[3]			-0.027	0.012				
			(0.040)	(0.022)				
Requires excellent English[3]					0.193	0.091	0.236	0.091
					(0.107)*	(0.034)***	(0.112)**	(0.039)**
Requires any English[3]							-0.043	0.000
							(0.034)	(0.018)
College[3]	0.070	0.027	0.076	0.024	0.017	0.010	0.038	0.010
	(0.063)	(0.031)	(0.063)	(0.031)	(0.061)	(0.031)	(0.063)	(0.031)
Meister[3]	-0.069	0.082	-0.067	0.079	-0.076	0.076	-0.074	0.076
	(0.079)	(0.030)***	(0.079)	(0.030)***	(0.079)	(0.030)**	(0.079)	(0.030)**
Training[3]	0.014	0.012	0.023	0.009	0.012	0.009	0.028	0.009
	(0.052)	(0.030)	(0.052)	(0.031)	(0.052)	(0.030)	(0.052)	(0.031)
D(Occ. change)	0.000	0.010	0.000	0.010	0.001	0.010	0.001	0.010
	(0.008)	(0.004)***	(0.008)	(0.004)***	(0.008)	(0.004)***	(0.008)	(0.004)***
D(Job change)	-0.024	-0.023	-0.024	-0.023	-0.024	-0.023	-0.024	-0.023
	(0.014)*	(0.006)***	(0.014)*	(0.006)***	(0.014)*	(0.006)***	(0.014)*	(0.006)***
Trained for occupation	0.026	0.017	0.027	0.017	0.027	0.017	0.028	0.017
	(0.015)*	(0.005)***	(0.015)*	(0.005)***	(0.015)*	(0.005)***	(0.015)*	(0.005)***
In training for occupation	-0.712	-0.710	-0.712	-0.710	-0.710	-0.710	-0.708	-0.710
	(0.056)***	(0.026)***	(0.056)***	(0.026)***	(0.056)***	(0.026)***	(0.056)***	(0.026)***
Age	0.059	0.032	0.059	0.032	0.059	0.032	0.059	0.032
	(0.013)***	(0.006)***	(0.013)***	(0.006)***	(0.013)***	(0.006)***	(0.013)***	(0.006)***
Age^2	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
D(Married)	0.052	0.024	0.052	0.024	0.052	0.024	0.052	0.024
	(0.018)***	(0.007)***	(0.018)***	(0.007)***	(0.018)***	(0.007)***	(0.018)***	(0.007)***
Education	-0.061	0.008	-0.061	0.009	-0.056	0.008	-0.056	0.008
	(0.122)	(0.051)	(0.122)	(0.051)	(0.120)	(0.051)	(0.120)	(0.051)
$Education^2$	0.006	0.002	0.006	0.002	0.005	0.002	0.005	0.002
	(0.005)	(0.002)	(0.005)	(0.002)	(0.005)	(0.002)	(0.005)	(0.002)
Experience	0.002	0.027	0.002	0.027	0.002	0.026	0.002	0.026
	(0.010)	(0.005)***	(0.010)	(0.005)***	(0.010)	(0.005)***	(0.010)	(0.005)***
$Experience^2$	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)*	(0.000)***	(0.000)*	(0.000)***	(0.000)*	(0.000)***	(0.000)*	(0.000)***
Tenure	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
	(0.003)	(0.001)***	(0.003)	(0.001)***	(0.003)	(0.001)***	(0.003)	(0.001)***
$Tenure^2$	0.000	-0.000	0.000	-0.000	0.000	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.794	1.023	0.796	1.020	0.770	1.027	0.767	1.027
	(0.817)	(0.361)***	(0.818)	(0.361)***	(0.810)	(0.360)***	(0.809)	(0.360)***
R^2	0.51	0.43	0.51	0.43	0.51	0.43	0.51	0.43
N	5,584	31,766	5,584	31,766	5,584	31,766	5,584	31,766
#(occ. change)	1,329	7,082	1,329	7,082	1,329	7,082	1,329	7,082

*, **, and *** denote significance at the 0.1, 0.05, and 0.01 significance level, respectively. Robust standard errors in parentheses. Year, 2-digit Industry, and firm size fixed effects used throughout. Occupational requirement regressors are aggregates at the 3-digit level.

Table 6: Fixed effects estimate of foreign language returns to excellent English upon job change by oral German level

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Self-reported oral German skill	all	all	all	all	≤intermediate	≥good	≤intermediate	≥good
Migrant Generation	first	second	first	second	both	both	both	both
Requires excellent English[3]	0.061	0.335			-0.027	0.235		
	(0.117)	(0.175)*			(0.379)	(0.139)*		
Requires excellent English[4]			0.126	0.135			0.165	0.159
			(0.059)**	(0.080)*			(0.108)	(0.078)**
R^2	0.44	0.63	0.45	0.63	0.38	0.549	0.38	0.54
N	3,929	1,652	3,789	1,623	622	3,166	593	3,090
#(occ. change)	661	296	769	369	172	785	195	943

*, **, and *** denote significance at the 0.1, 0.05, and 0.01 significance level, respectively. Robust standard errors in parentheses. Setup as in Table 5.

Table 7: Fixed effects estimate of foreign language returns upon job change for services and other occupations separately

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Subgroup	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant
Service occupations	yes	yes	no	no	yes	yes	no	no
Requires excellent English[3]	0.330	0.088	-0.152	0.045				
	(0.129)**	(0.044)**	(0.188)	(0.071)				
Requires excellent English[4]					0.077	0.055	0.089	-0.015
					(0.059)	(0.027)**	(0.068)	(0.043)
R^2	0.53	0.47	0.53	0.39	0.53	0.47	0.54	0.39
N	2,718	20,498	2,866	11,268	2,690	20,322	2,725	10,877
#(occ. change)	614	4,370	715	2,712	766	5,534	820	3,033

*, **, and *** denote significance at the 0.1, 0.05, and 0.01 significance level, respectively. Robust standard errors in parentheses. Covariates as in Table 5.

Table 8: Fixed effects estimate of foreign language returns upon job change by educational strata and with added occupational requirements

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Subgroup	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant	Migrant
Educational Stratum	≤ 13	≤ 13	> 13	> 13	*all*	*all*	*all*	*all*
Requires excellent English[3]	0.095	0.188	0.066	0.028	0.085	0.248		
	(0.043)**	(0.148)	(0.050)	(0.113)	(0.037)**	(0.124)**		
Requires excellent English[4]							0.042	0.109
							(0.023)*	(0.075)
Additional requirements	no	no	no	no	yes	yes	yes	yes
R^2	0.37	0.52	0.38	0.44	0.43	0.52	0.43	0.52
N	21,678	4,361	10,088	1,223	31,199	5,415	31,199	5,415
#(occ. change)	1,009	4,586	320	2,496	1,288	6,914	1,586	8,567

*, **, and *** denote significance at the 0.1, 0.05, and 0.01 significance level, respectively. Robust standard errors in parentheses. Covariates as in Table 5.

Table 9: Fixed effects estimate of log hourly wage returns of foreign language returns 4-digit occupational change

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	log(w/h)	log(w/h)	log(w/h)	log(w/h)	log(w/h)	log(w/h)	log(w/h)	log(w/h)
Subgroup	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant
Requires excellent foreign language [4]	0.108 (0.044)**	0.024 (0.014)*	0.100 (0.051)**	0.029 (0.017)*				
Requires any foreign language[4]			0.012 (0.032)	-0.008 (0.014)				
Requires Excellent English[4]					0.137 (0.055)**	0.047 (0.020)**	0.127 (0.060)**	0.049 (0.022)**
Requires any English[4]							0.015 (0.030)	-0.004 (0.012)
R^2	0.51	0.43	0.51	0.43	0.51	0.43	0.51	0.43
N	5,415	31,199	5,415	31,199	5,415	31,199	5,415	31,199
#(occ. change)	1,288	6,914	1,288	6,914	1,288	6,914	1,288	6,914

*, **, and *** denote significance at the 0.1, 0.05, and 0.01 significance level, respectively. Robust standard errors in parentheses. Models specified as in Table 5. Year, 2-digit Industry, and firm size fixed effects used throughout. Occupational requirement regressors are aggregates at the 4-digit occupation level.

Appendix A1: Summary statistics for combined datasets

Variable	Obs	Mean	Std. Dev.	Min	Max
Log gross hourly wage	34,496	2.74	0.53	0.80	5.23
Log gross wage	34,496	7.80	0.52	6.00	10.31
Weekly working hours	34,496	39.4	1.60	35.2	48
Requires excellent English (3-digit)	34,496	0.09	0.11	0.00	0.54
Requires excellent English (4-digit)	33,850	0.09	0.14	0.00	1.00
Requires excellent foreign language (3-digit)	34,496	0.20	0.19	0.00	1.00
Requires excellent foreign language (4-digit)	33,850	0.20	0.22	0.00	1.00
Mean college degree requirement (3-digit)	34,496	0.25	0.30	0.00	1.00
Mean college degree requirement (4-digit)	33,850	0.26	0.32	0.00	1.00
Mean "Meister" requirement (3-digit)	34,496	0.07	0.08	0.00	0.80
Mean "Meister" requirement (4-digit)	33,850	0.07	0.11	0.00	1.00
Mean training requirement (3-digit)	34,496	0.66	0.27	0.00	1.00
Mean training requirement (4-digit)	33,850	0.66	0.30	0.00	1.00
Occupational change (3-digit)	34,496	0.23	0.42	0.00	1.00
Occupational change (3-digit)	34,496	0.28	0.45	0.00	1.00
Job change since last year	34,496	0.16	0.37	0.00	1.00
Age	34,496	41.13	10.94	17.00	78.00
Married	34,496	0.64	0.48	0.00	1.00
Education (years)	34,496	12.69	2.67	7.00	18.00
Experience (years)	34,496	17.51	11.24	0.00	50.00
Tenure (years)	34,496	10.83	10.28	0.00	54.40
Nace	34,496	56.03	23.53	1.00	100
Firm size (interval scale)	34,496	4.51	1.75	1.00	8.00
Wave (year)	34,496	2005	3.79	2000	2011

Universe used for estimations in Tables 5 and following. For description see below.

Appendix A2: Description of variables

Log gross hourly wage: GSOEP information in all regressions except for Tables 1, 3, and 4 which are based on BIBB sample. Calculated as log of gross monthly wage / hours worked per month as specified in the workers contract.
Mean language requirement (3/4-digit): Based on dummy, that is 1 if worker in respective job category answered foreign language skills required in his job in BIBB sample. Excellent skills = "Fachkenntnisse". Basic knowledge = "Grundkenntnisse".
Mean experience requirement (3/4-digit): Based on years of experience of workers in BIBB sample.
Mean college degree requirement (3/4-digit): Based on dummy for college degrees of workers in BIBB sample.
Mean "Meister" requirement (3/4-digit): Based on dummy, that is 1 if workers is a master craftsman. This is the highest professional formal qualification in crafts. It allows entering university, even without Abitur.
Mean training requirement (3/4-digit): Based on dummy, that is 1 if workers has a formally recognized vocational degree, which typically takes 2-4 years to obtain.
Job change within occupation (3/4-digit): Dummy variable, 1 if changed job but did not change occupation since previous year.
Occupational change (3/4-digit): Dummy variable, 1 if changed changed occupation since previous year.
Education: Years of education
Experience: Years of full-time experience
*Tenure:*Years with current employer
Industry: NACE industry classification
Firm size: Interval scaled variable included as dummies for each level used for fixed effects estimation