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DIFFERENCES IN HETEROGENEOUS RETURNS TO FOREIGN LANGUAGE USE AT WORK AMONG NATIVES AND MIGRANTS IN EUROPE

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Abstract
The cultural-demographic profile of Europe has been heavily influenced by migration dynamics over the past decades. The question is whether language diversity in a host country – in particular, language proficiency and foreign language use at work – has implications for the workers' wages. Our study examines the heterogeneous impacts of foreign language use at work on earnings of both native-born workers and foreign-born workers. To that end, a Mincer earnings equation is specified. The model is tested by means of an extensive data set that captures all relevant variables. Despite the dated nature of the data used, several interesting outcomes on wage differentials in Europe – as a result of foreign language use at work – are found. First, for native-born workers with a tertiary diploma, using a foreign language at work is found to have an unambiguously positive impact on their earnings (2%). Second, for foreign-born workers, returns to foreign language use at work is highly complementary to education. Foreign language users below the upper secondary educational level earn significantly less (−8%) than those who use the local language at work. Third, a linguistically distant foreign language gives native-born workers the highest wage premium, while the use of EU official languages pays off the most for foreign-born workers. Fourth, our results do not show evidence that the lack of local language knowledge of low-educated migrants causes these results, as immigrants for whom the mother tongue is similar to the local language show similar outcome.

Keywords: foreign language at work, earnings, native-born
JEL Classification: J24, J31, J61

1. Introduction

Europe is a multi-cultural and multi-language region. Use of multiple languages – in particular, at work – may be facilitating both socio-cultural cohesion and economic productivity. In recent decades, European countries have experienced an increasing pace of internationalisation caused inter alia by foreign migration, leading to a rising demand—and therefore an increasing value—of foreign language skills. Indeed, it is estimated that 11% of the exporting small-to-medium enterprises within the European Union may be losing business due to a shortage of foreign language skills (European Commission, 2008). Moreover, speaking a common language amongst business partners is found to be an essential element in spurring international trade (Kim et al., 2015; Melitz, 2008). And with the increase of internationalisation, Europe also witnesses an increasing influx of migrants, bringing in valuable foreign language skills. However, for most jobs further migrant integration on the labor market requires a good understanding of the local language (Florax et al., 2005), but less so of a foreign language. So, these two opposite forces might lead to different returns on foreign language use between natives and immigrants, and may need perhaps specific policies to make the best use of migrants' foreign language skills. Therefore, it is remarkable that, although much attention has been given to the labor market consequences for migrants of acquiring the local language (see for some seminal contributions, e.g., Carliner, 1981; Chiswick, 1998) and to a lesser extent to the labor market returns for natives of using a

foreign language (other than the local language) at work, there is only scant evidence for the labor market returns of speaking a foreign language for immigrants.

From a labor market supply side perspective, language skills are considered to be major economic assets for individuals. A sizable literature addressed the labor market effects for native workers of speaking a foreign language in general, pointing to a modest but significant 2 to 3% earnings increase of the use of a foreign language at work.[1] Nevertheless, evidence is mixed on the reward patterns for migrant workers. To start with, Stohr (2015) found high returns to the occupational use of foreign languages for immigrants in Germany, but the results are restricted to a few specialized occupations, Lang and Siniver (2009) analysed how native Israelis benefit from a knowledge of English while immigrants with a low level of education do not. Next, Toomet (2011) indicated a significant wage premium for ethnic Russians who speak English at work in Estonia and Latvia, but no wage premium for the local language. And finally, Isphording (2013) finds that language proficiency in English, German and French has high returns for migrants in Spain.

The considerable heterogeneity between native-born and foreign-born workers deserves further exploration, in terms of different (educational) backgrounds, linguistic skills, and motives for migration. Workers may benefit from using a foreign language at work, but that benefit may depend heavily on the factors mentioned above. The present paper aims to tackle this heterogeneity. Therefore, this study seeks to examine the heterogeneous returns to foreign language use at work, and how they vary according to country of residence, country of origin, workers' skill portfolio, and types of foreign language used at work.

In this paper, we first analyse the average returns to foreign language use at work among natives and migrants in Europe. The acquisition and skill maintenance of a foreign language comes at some cost, if it is not the mother tongue of the worker. It might take too much time from the acquisition of other skills (e.g., learning the local language) that yield higher returns on the labor market, and therefore, the acquisition of a foreign language would not be an efficient investment in human capital (Williams, 2011).

Second, the heterogeneity of returns is associated with the type of foreign language at work as well. So, the next issue we deal with is which foreign language used at work yields the highest returns. In general, the assessment of returns to foreign languages in Europe is complex, due to its multilingual

[1] See for some references, inter alia, Chiswick and Miller (2016), Christofides and Swidinsky (2010), Di Paolo and Tansel (2015), Fry and Lowell (2003), Ginsburgh and Prieto-Rodriguez (2011), Grin (2001), Henley and Jones (2005), Isphording (2013), Saiz and Zoido (2005), and Williams (2011).

environment (Ginsburgh and Weber, 2011; Hagen et al., 2006). Moreover, the demand for specific types of languages might substantially affect the economic payoffs. Ginsburgh and Prieto-Rodriguez (2011) found that for native workers, English skills are well rewarded in Northern Europe, but much less rewarded in Southern Europe (for example, less than French and German in Italy, etc.). Still, the rewards to foreign-born workers in Europe remain somewhat unknown. At first sight, multilingual talents are always appreciated in the labor market, especially those who master several foreign languages distinctively different from each other. However, the question remains whether it is still worthwhile for a foreign-born worker to use a foreign language at work if the effort required to master that foreign language is huge.

We explore these questions using a longitudinal survey, the European Community House- hold Panel (ECHP), running from 1994 to 2001. This is a slightly dated information system, but has the advantage of containing exactly all data needed for an econometric estimation of the related Mincer equation. The main conclusions are as follows. First, for native-born workers with a tertiary diploma, using a foreign language at work is found to have an unambiguously positive impact on their earnings (2% on average). Second, for foreign-born workers, however, returns to foreign language use at work is highly complementary to education. Foreign language users below the upper secondary educational level earned significantly less (−8%) than those who use the local language at work. Third, with regard to language types, a linguistically distant foreign language gives native-born workers the highest wage premium, and EU official languages pays off the most for foreign-born workers. Fourth, our results do not show that lack of local language knowledge of low-educated migrants causes these results, as immigrants for whom the mother tongue is similar to the local language show similar results.

Our main contributions are threefold. Firstly, we extend the analysis of Williams (2011) by looking specifically at migrants as well for most countries in Europe. Secondly, we look into the heterogeneity of the impact of foreign language use on earnings and show that especially for migrants heterogeneity is a crucial element. Thirdly, our results indicate that specific policies might be devised for low-educated migrants, as productivity losses are sizeable for this group alone with annual wage losses which could amount to 0.03% of a country's annual GDP.

Though with a dataset preceding 2001, this study is still highly relevant to current debates on immigration policies in the increasingly complex linguistic environment in Europe (Ginsburgh and Moreno-Ternero, 2018). Our study focus on the heterogeneous population of migrants. First, for the high-skilled group, it speaks to an ongoing discussion of language policies in higher education institutes (Wang et al., 2021). For example, The Netherlands and Denmark both started considering cancelling English-taught programmes during the bachelor period to preserve the local cultural

identify, which potentially might lower attractiveness of host countries and prevent local companies from gaining additional productivity from high-skilled migrants. Second, for the low-skilled group, we emphasize the importance of local language acquisition at the host country, as our results imply substantial gains in using the local language at work. It also sheds lights on implications on low-skilled refugees in the recent refugee crisis experienced by Europe (Fasani and Frattini, 2022). To sum up, our study compares the wage premium between using the local language and a foreign language at work, and hints on optimal decision making in allocating time and efforts in human capital investment (learn new languages in this context). This is consistent with what was mentioned by Ginsburgh and Weber (2020) that the micro-economic foundations for making decisions on whether to learn the local language of the host country or to use another foreign language is a potential direction for future research.

The remainder of the paper is organised as follows. The next section describes the data and methodology. Section 3 presents the empirical analysis, results and robustness checks. The final section provides concluding remarks, and discusses avenues for future research.

2. Data and Methodology

2.1.Description of the data

We employ the European Community Household Panel (ECHP) running from 1994 to 2001 (8 waves). The ECHP is a harmonised cross-national longitudinal survey conducted in 15 European countries (Belgium, Denmark, Germany, Ireland, Greece, Spain, France, Italy, Luxembourg, the Netherlands, Austria, Portugal, Sweden, Finland and the United Kingdom) and is coordinated by Eurostat. It includes information on individual socio- economic characteristics, employment characteristics, wage earnings, and information on foreign language use at work.

The survey has been conducted in different ways in different countries of the ECHP. First, for Germany, Luxembourg and the United Kingdom, the data set includes not only the ECHP respondents, but also the respondents from the German Socio-Economic Panel (SOEP), the national household survey in Luxembourg (PSELL), and the British Household Panel Survey (BHPS). Second, Austria entered the ECHP in 1995; Finland entered in 1996; and Sweden entered in 1997. We removed Sweden from the empirical analysis due to substantial shares of missing values in most

of the variables.[2] Third, and perhaps most important, the variable of primary interest, 'foreign language use at work' was formulated differently after 1999. In Waves 1 to 6, the question was asked: 'does your work involve the use of a language other than [the official language of the country]' and 'what is the first foreign language used in the current job'. We directly coded the question as a dichotomous variable FL being equal to 1 if a foreign language is used at work, and 0 otherwise. In Waves 7 and 8, however, the question was changed to: 'main language used in main work' and 'second language used in main work'. If the respondent reported a language other than the official language of the country, then the variable FL is coded as 1, and 0 otherwise.[3] Table A3 in the Appendix presents a full list of the definitions and coding of the variables.

In total, the ECHP contains 262,526 native-born and 17,012 foreign-born workers, who are adults (aged between 20 to 64) with positive earnings from labor market activities and non-missing information on foreign language use at work. Table 1 presents the descriptive statistics of the individual characteristics by country of birth. The native-born group and foreign-born group do not differ much in terms of socio-demographic characteristics or distribution of occupation. The mean average age is around 39. Almost 60% of the sample are male workers and almost 70% reported being married. Around one-quarter of the sample reported having completed a recognised third level education. The biggest difference occurs in yearly earnings (16,075 for the foreign-born and 14,068 for the native-born) and the percentage of foreign language users (44% for the foreign-born and 23% for the native-born). The wage distribution for the foreign-born workers appears flatter than that for the native-born workers. When we check the average earnings difference on a country by country base, the case that the foreign-born workers earn more than the native-born workers do only exist in four countries, namely Belgium, the United Kingdom, Portugal and Finland. In the United Kingdom and Portugal, the foreign-born workers are on average more educated than the native-born workers.

[2] See Table A1 and Table A2 in the Appendix for the structure of the unbalanced panel by year and country.

[3] Both Belgium and Luxembourg have more than one official language, and we have taken this into account.

Table 1. Descriptive Statistics for Individual Characteristics, by Country of Birth

Characteristics	Native-Born	Foreign-Born
Earnings (in PPP terms)	14068.48	16075.31
Foreign language use at work	0.23	0.44
Age	38.78	38.76
Male	0.59	0.57
Married	0.66	0.70
Household size	3.42	3.43
Children under 12 in the household	0.35	0.41
Education Levels		
1. Less than second stage of secondary education	0.38	0.37
2. Second stage of secondary level education	0.38	0.36
3. Recognised third level education	0.24	0.27
Working hours per week	39.99	39.44
Occupations		
1. Legislators, senior officials and managers	0.05	0.06
2. Professionals	0.13	0.13
3. Technicians and associate professionals	0.14	0.12
4. Clerks	0.15	0.11
5. Service workers and shop and market sales workers	0.12	0.12
6. Skilled agricultural and fishery workers	0.02	0.01
7. Craft and related trades workers	0.16	0.17
8. Plant and machine operators and assemblers	0.09	0.11
9. Elementary occupations	0.10	0.14
10. Missing, armed forces, miscellaneous	0.03	0.03
Sectors		
1. Agriculture	0.04	0.01
2. Industry	0.31	0.34
3. Services	0.66	0.65
Work in private sector	0.67	0.77
Full-time	0.92	0.91

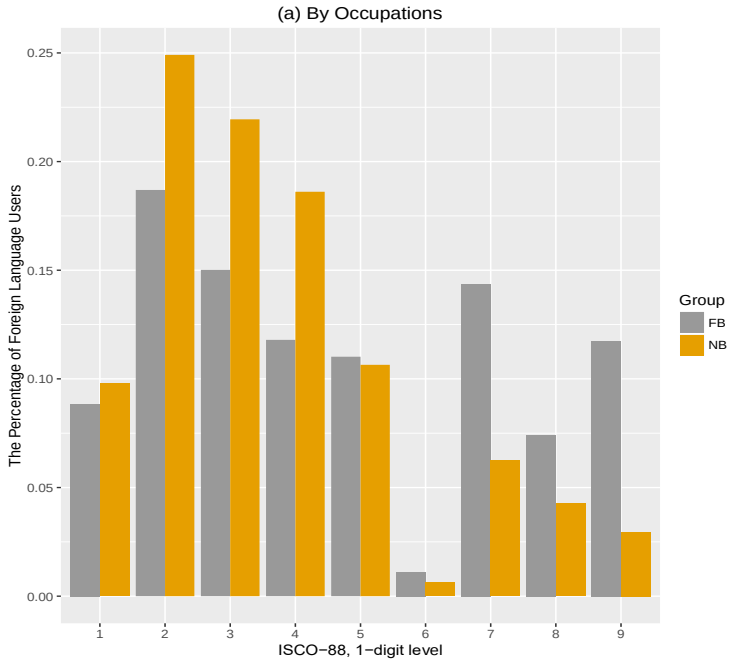
Source: ECHP, 1994–2001. Sample size: 262,526 for the native-born and 17,012 for the foreign-born.

Notes: The table presents the mean values of each variable. Earnings are adjusted for Purchasing Power Parity (PPP).

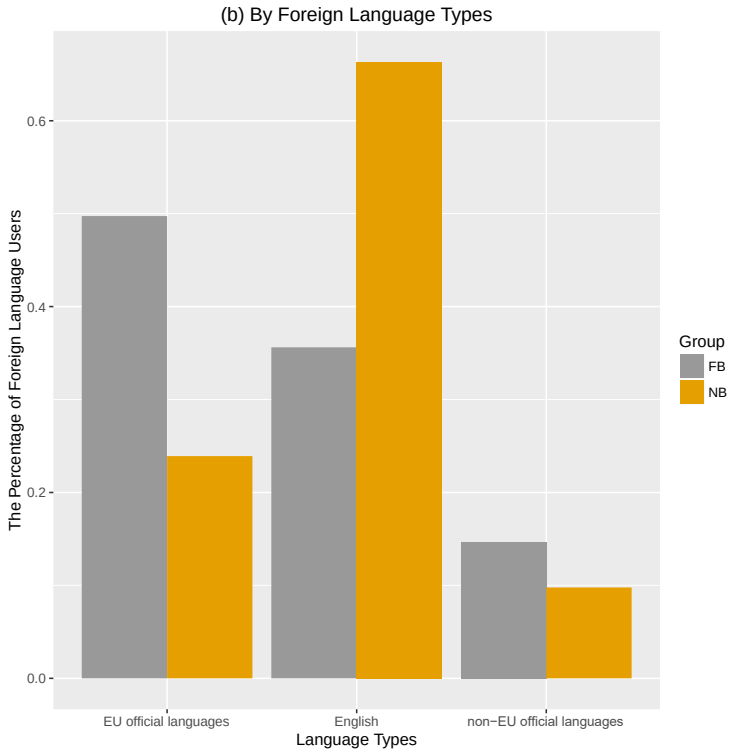
Figure 1 shows the distribution of foreign language users at work across occupations and language types. We make use of the International Standard Classification of Occupation, ISCO-88 at the 1-digit level: namely, (1) legislators, senior officials and managers, (2) professionals, (3) technicians and associate professionals, (4) clerks, (5) service workers and shop and market sales workers, (6) skilled agricultural and fishery workers, (7) craft and related trades workers, (8) plant and machine operators and assemblers, and (9) elementary occupations. Codes 1 to 5 are defined as white-collar occupations,

while codes 6 to 9 are defined as blue-collar occupations. In panel (a) of Figure 1, The foreign language users who are foreign-born are more or less equally distributed across all occupations, except for an extremely low percentage in the occupation type (6) being skilled agricultural and fishery workers. Foreign language users who are native-born are, however, heavily concentrated in the white-collar occupations. Panel (b) of Figure 1 summarises the distribution of foreign language users across the types of language used at work. We categorize the reported languages into three groups: English, EU official languages (Danish, Dutch, Finnish, French, German, Greek, Italian, Portuguese, Spanish and Swedish), and non-EU official languages (Arabic, Chinese, Japanese, Russian, and other languages not specified).[4] Among the foreign-born workers, about 50% of foreign language users reported the use of an EU official language (excluding English), while the most frequently reported foreign language among the native-born workers is English.

Figure 1. The Distribution of Foreign Language Users at Work



[4] Needless to say, English, as a lingua franca, is a key language for gaining access to export markets (Crystal, 2003; Ku and Zussman, 2010). Although English is an EU official language, it is singled out to be its own category because of its role as a lingua franca in inter-cultural communication.



Source: ECHP, 1994–2001.

Notes: 'FB' means foreign-born workers. 'NB' means native-born workers. Panel (a): Codes 1 to 9 are from the International Standard Classification of Occupation, ISCO-88, 1-digit level. 1 means legislators, senior officials and managers, 2 means professionals, 3 means technicians and associate professionals, 4 means clerks, 5 means service workers and shop and market sales workers, 6 means skilled agricultural and fishery workers, 7 means craft and related trades workers, 8 means plant and machine operators and assemblers, 9 means elementary occupations. Panel (b): EU official languages include Danish, Dutch, Finnish, French, German, Greek, Italian, Portuguese, Spanish and Swedish. Non-EU official languages include Arabic, Chinese, Japanese, Russian and other languages not specified.

2.2.External data sources

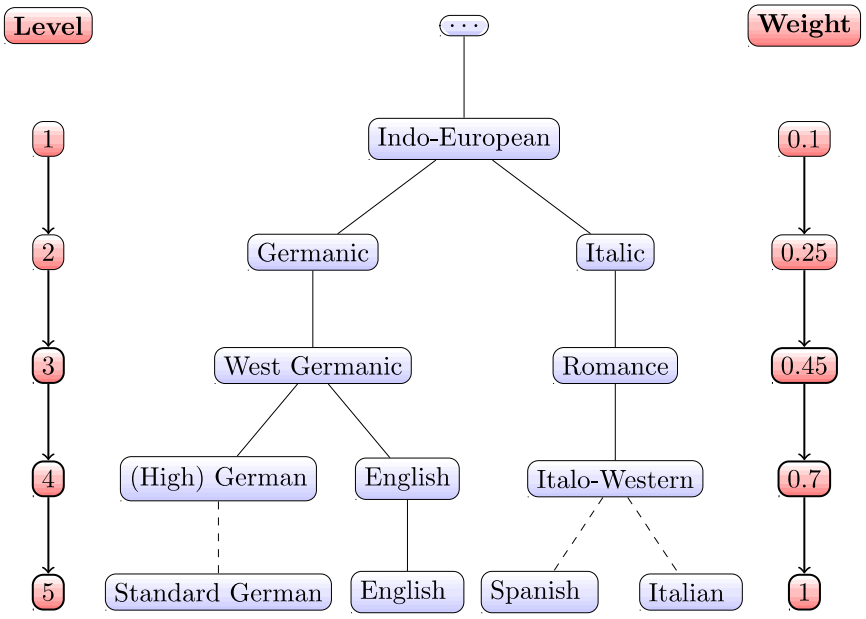
Apart from analyzing the average effect of foreign language use at work, the type of language also matters for earnings. To investigate the type of foreign language that pays off the most, we additionally merge external data sets.

The first hypothesis is about the role of linguistic similarity.[5] Are labor market returns larger if the foreign language used at work is linguistically distant from the local language? And will the reward pattern be different between native workers and foreign workers? Following Adserà and Pytliková (2015), we constructed a linguistic similarity index by counting the shared number of linguistic family

[5] Linguistic similarity has already been applied as a determinant for various socio-economic phenomena, e.g. for the probability of immigrants learning the host country's language and for the probability of international bilateral trade (Isphording and Otten, 2013).

trees from Ethnologue (Lewis, 2009). The index ranges from 0 to 1. It is equal to 0 if the two languages do not belong to any common language family (i.e., an Indo-European language versus a Sino-Tibetan language). It is equal to 0.1 if the two languages only share the most aggregated level of the language family (e.g., a Germanic versus an Italic language). It is equal to 0.25 if the two languages share the first and second linguistic tree level (e.g., two Germanic languages such as English and Norwegian). It is equal to 0.45 if the two languages share three levels of linguistic trees (e.g., English and German). It is equal to 0.7 if the two languages share the four top levels of the linguistic trees (Spanish and Italian). Finally, it is equal to 1 if the two languages are exactly the same. Figure 2 is an application of the linguistic tree with levels and weights for a specific part of the Indo-European language group. So, the linguistic similarity index between English and German is 0.45, and the linguistic similarity between English and Spanish is 0.1. The index increases at an increasing weight (0.1, 0.15, 0.20, 0.25, 0.3), in order to distinguish between within-level and between-level similarity.

Figure 2. An example of the linguistic tree for the Indo-European language group from ethnologue



Source: Adapted from Lewis, 2009

The second hypothesis is about the potential application of a specific foreign language in the labor market. In other words, the value of the foreign language becomes higher if it can be used as an instrument for international collaboration with other firms. This situation is particularly common in multinational companies. We speculate that the potential economic value of a foreign language at work is positively associated with the economic status of the countries where the foreign language can be understood. So, either for future trade opportunities or collaboration programs, such language use should be more appreciated in the labor market. To give a quantitative measure of the value of language in a specific year, we first summarise a list of countries where a specific language is used as one of the official languages. Then for each language, we calculate the Gross Domestic Product (*GDP*) per capita per year for all of the countries weighted by the countries' population (*POP*). For example, Dutch is spoken as an official language in the Netherlands, Belgium and Suriname. So, the value of Dutch language is measured as as weighted GDP per capita of the three countries, i.e.,

$$VALUE_{lt} = \frac{\sum_c GDPGDP_{ct} \times POP_{ct}}{\sum_c POP_{ct}} \quad (1)$$

where l denotes the language type, t the specific year, and c the country where l is spoken. The GDP and population data from year 1994 to 2001 are publicly available from the World Bank.

2.3. Empirical methodology

We aim to estimate the effect on earnings of using a foreign language at work. Our main assumption is that being able to speak a foreign language *besides* the local language is a human capital asset and should therefore resort in higher productivity. Therefore, our baseline specification is a Mincer earnings function, which estimates the natural logarithm of annual earnings E (in purchasing power parity terms) based on individual characteristics. Apart from the use of a foreign language, we add to the baseline specification some additional job-specific characteristics (i.e., sector dummies) as well (*cf.*, Ginsburgh and Prieto-Rodriguez, 2011):

$$\ln(\mathrm{E})_{\mathrm{ijt}} = \beta_1 \mathrm{X}_{\mathrm{it}} + \beta_2 \mathrm{Z}_{\mathrm{jt}} + \beta_3 \mathrm{FL}_{\mathrm{jt}} + \beta_4 \mathrm{FL}_{\mathrm{jt}} \times \mathrm{H}_{\mathrm{it}} + \eta_{\mathrm{i}} + \delta_{\mathrm{j}} + \varepsilon_{\mathrm{ijt}}, \qquad (2)$$

where X_{it} denotes individual i's socio-demographic characteristics, such as age and education (the 'years since migration' variable is only applicable to the foreign-born sample but not to the native-born sample), Z_{jt} denotes job j-specific characteristics, and FL_{jt} is a dichotomous variable equal to 1 if a foreign language is used for job j at time t. H_{it} denote certain characteristics (either coming from X_{it} or types of language used), that might lead to heterogeneous returns to foreign language use. Therefore an interaction term $FL_{jt} \times H_{it}$ is added, and the marginal effect on earnings of foreign language use at work is $\partial \ln(E) / \partial FL = \beta_3 + \beta_4 H_{it}$. η_i denotes an individual specific effect to capture unobserved heterogeneity, and δ_j denotes a fixed effect at occupational level. ε_{ijt} denotes an *i.i.d.* idiosyncratic error term.

To be precise, FL_{jt} measures the *use* of a foreign language at work, not so much the proficiency of speaking the foreign language. It therefore should be regarded as a job- characteristic. We are, however, more interested in the interaction term $FL_{jt} \times H_{it}$ measuring heterogeneous returns to foreign language use, which is a combination of an individual and a job characteristic. Therefore, β_4 reflects relative productivity differences for various levels of H_{it} of individual i when having job j.

Foreign language use and earnings may both depend on unobserved individual aptitudes or other skills. Those with a great talent for learning languages might be fluent in various languages and then sort themselves into jobs with intensive requirements for foreign language skills. Due to the selection of job entry, their higher earnings reflect not only the effect of using a foreign language, but also the reward to their fluency level. Hence, there will be a positive ability bias in the estimate β_3. Using the panel structure of our data set, the fixed effects estimation eliminates η_i and thus eliminates this bias by de-meaning the variables over time t.

A common concern in the literature concerning the impact of language on earnings is the occurrence of measurement error on the language variable, when the proficiency of speaking a (foreign) language is researched (Dustmann and van Soest, 2002; Isphording, 2013). In our case, as we simply ask for whether somebody uses a foreign language at work instead of proficiency, this most probably is less of an issue. But if so, then our results should be regarded as lower bounds of the true effects.

The literature itself is much less concerned about reverse causality, although this obviously would bias the estimates as well. If foreign language use is spurred by past earnings[6], then the reverse relationship exists as well. This yields a positive covariance between FL and the error term ε. So, β_3 and β_4 in Equation (2) would then be overestimated. Because our dataset does not provide a suitable instrument able to explain foreign language use but exogenous to earnings, we resort to a Granger (non-)causality approach.[7] That is, we test whether past earnings ($\ln E_{ij,t-1}$) does not impact current foreign language use (FL_{ijt}) and whether past foreign language use ($FL_{ij,t-1}$) does not impact current earnings ($\ln E_{ijt}$). If there is no reverse causality then the former test should at least not be rejected. Note, however, that this is not a sufficient condition for a true causal relation (see, e.g., Davidson and MacKinnon, 1993, for more details).

3. Empirical Results

3.1. Baseline result

Table 2 presents the average effect on earnings of foreign language use at work. Column (1) is the OLS estimation for the whole native-born sample. Column (2) is the OLS estimation for the whole foreign-born sample. Column (3) is the Fixed Effects (FE) estimation for the whole native-born sample.

[6] The exact mechanism that might occur here is not entirely clear; one may think of higher satisfaction levels because of higher wages that might induce a person to better herself to learn and use a new language. Note that *the promise* to learn and eventually use a foreign language for an on-the-job promotion is actually what we are looking for. Some specific jobs require specific human capital assets and therefore pay higher wages; regardless of the timing of the wage increase.

[7] Dustmann and van Soest (2002) employ an instrumental variable, namely parental education, to control for time persistent measurement error (apart from using lags and leads for time-varying measurement error and unobserved heterogeneity), but note that this is that this is only suitable for migrants. For natives we know that parental education affects individual wages of their offspring via multiple channels. Isphording (2013) uses an instrumental variable approach as well and adopts the similarity between the mother tongue and the foreign language as an instrument. We have two reasons for not using it. Firstly, it might not be exogenous to wages because of, e.g., discrimination on the labor market. Secondly, the variation in foreign language use is then reduced to time in-varying combinations of two languages, reducing all temporal and most individual variation.

Column (4) is the FE estimation for the whole foreign-born sample.

Table 2. The Average Effect of Foreign Language Use at Work on Earnings

Variable	(1) OLS,NB	(2) OLS,FB	(3) FE,NB	(4) FE,FB
Age	0.077***	0.071***	0.159***	0.159***
	(0.004)	(0.009)	(0.003)	(0.026)
Age squared/100	-0.080***	-0.074***	-0.121***	-0.093***
	(0.005)	(0.010)	(0.003)	(0.019)
Married	0.081***	0.048***	-0.001	0.011
	(0.009)	(0.024)	(0.009)	(0.031)
Male	0.249***	0.224***		
	(0.015)	(0.024)		
Edu2	0.118***	0.068***	0.026***	0.077***
	(0.015)	(0.023)	(0.006)	(0.028)
Edu3	0.226***	0.157***	0.070***	0.203***
	(0.026)	(0.038)	(0.010)	(0.057)
Club member	0.017***	0.026	0.002	-0.007
	(0.012)	(0.021)	(0.003)	(0.016)
Working hours	0.000	0.003***	0.002***	0.001
	(0.001)	(0.002)	(0.000)	(0.001)
Full time job	0.595***	0.565***	0.159***	0.188***
	(0.038)	(0.044)	(0.009)	(0.036)
FL use at work	0.132***	0.090***	0.017***	0.011
	(0.015)	(0.028)	(0.005)	(0.022)
YSM		0.005**		0.016
		(0.003)		(0.021)
YSM squared/100		-0.001		-0.058***
		(0.005)		(0.013)
R^2	0.352	0.307	0.116	0.125
Adj. R^2	0.352	0.305	0.082	0.083
Num. obs.	224731	10971	224731	10971

***p < 0.01, **p < 0.05, *p < 0.

In column (1) of Table 2, the native-born workers who use a foreign language at work earn 13% more than those who do not, and the estimate is 9% for the foreign-born sample in column (2). However, when we control for individual fixed effects, the returns to foreign language use at work turn out to be much smaller. In column (3), native- born workers who use a foreign language at work earn only 2% higher than those who use the local language. For the foreign-born workers in column (4), the estimate is not statistically significantly different from zero. With regard to the other variables, earnings increase at a decreasing rate with age (also potential working experience), and are positively associated with the status of marriage, being male, higher education, and full-time contract. These

conform with the previous literature on migrants' earnings. Note that the estimates for 'years since migration' (YSM) and its quadratic form conform with the observation in Chiswick (1978) that foreign-born workers catch up with the natives' earnings at a decreasing rate. Moreover, note that in columns (1) and (2) of Table 2, we control for country of residence, industry, occupation and sector as well. The estimates for the country dummies are statistically significant, implying a substantial variation in earnings (in PPP terms) between countries. The Netherlands and Luxembourg rank the highest, while Greece and Portugal rank the lowest.

The estimates for the FL variable in the FE model are much smaller. So, individual unobserved heterogeneity indeed plays a significant role, as stated in Williams (2011). The OLS model explains the variation in the levels of earnings between individuals. If there is a sizable share in the sample of both high wage earners and low wage earners, the slope of the fitted line is highly biased upwards. The FE model, however, explains the variation of earnings within each individual. When the unobserved heterogeneity is controlled for, the estimate becomes much smaller than before. It turns out that the unobserved productivity differentials explain substantially the returns to foreign language use at work in the cross-section regression analysis.

In the following subsection, we will mainly employ the FE model, and focus particularly on a set of interaction terms to study the heterogeneous effect of foreign language use at work.

3.2. Heterogeneous returns

Table 3 presents the fixed effects estimation of the heterogeneous returns to foreign language use at work. Foreign language use at work is now interacted with educational levels. Column (1) is the FE estimation for the whole native-born sample. Column (2) is the FE estimation for the whole foreign-born sample. Column (3) is the FE estimation for a subsample of foreign-born workers, who are able to speak the local language. For example, if a person from Brazil with the mother tongue Portuguese is working in Portugal, then she is included in the sample of column (3).

Table 3. Fixed Effects Estimation: The Heterogeneous Returns to Foreign Language Use at Work on Earnings

Variable	(1) NB	(2) FB	(3) FB know LL	(4) FB don't know LL	(5) FB know LL	(6) FB don't know LL
Edu (ref: < upper secondary edu.)						
Edu2	0.025***	0.054*	0.054	0.073	0.062	0.083*
	(0.006)	(0.029)	(0.038)	(0.051)	(0.037)	(0.054)

Edu3	0.064***	0.164***	0.195***	0.070	0.206***	0.080
	(0.010)	(0.060)	(0.083)	(0.117)	(0.083)	(0.118)
FL-related Terms						
FL use at work	0.003	-0.077**	-0.044	-0.108	-0.970***	-0.094
	(0.011)	(0.035)	(0.174)	(0.143)	(0.591)	(0.172)
FL*Edu2	0.011	0.119***	0.097	0.107*	1.040***	0.126
	(0.012)	(0.043)	(0.093)	(0.058)	(0.615)	(0.221)
FL*Edu3	0.025**	0.145***	0.154**	0.138**	1.216***	0.036
	(0.013)	(0.047)	(0.099)	(0.067)	(0.632)	(0.247)
Migrant-specific Terms						
FL*YSM		0.017	0.039	0.012	0.039	0.014
		(0.022)	(0.038)	(0.013)	(0.039)	(0.014)
FL*YSM squared/100		-0.058***	-0.054***	-0.065***	-0.057***	-0.062***
		(0.013)	(0.021)	(0.026)	(0.022)	(0.026)
FL*Edu2*YSM			-0.007	0.002	0.049**	-0.002
			(0.010)	(0.011)	(0.037)	(0.012)
FL*Edu3*YSM			0.015	0.004	-0.054	0.015
			(0.018)	(0.021)	(0.053)	(0.022)
FL*Edu2*YSM squared/100					-0.052*	0.004
					(0.040)	(0.016)
FL*Edu3*YSM squared/100					-0.063**	0.016
					(0.041)	(0.021)
YSM					0.056	-0.015
					(0.060)	(0.027)
YSM squared/100					0.075	-0.041
					(0.060)	(0.040)
R^2	0.116	0.127	0.157	0.168	0.162	0.169
Adj. R^2	0.082	0.084	0.121	0.128	0.124	0.128
Num. obs.	224731	10971	3722	2278	3722	2278

$***p < 0.01$, $**p < 0.05$, $*p < 0.$

Edu2 denotes upper secondary educational level, and Edu3 denotes tertiary educational level. Other variables not shown in the table include age and its quadratic term, marital status, working hours, occupation dummies, sector dummies, private sector dummy, and job contract type.

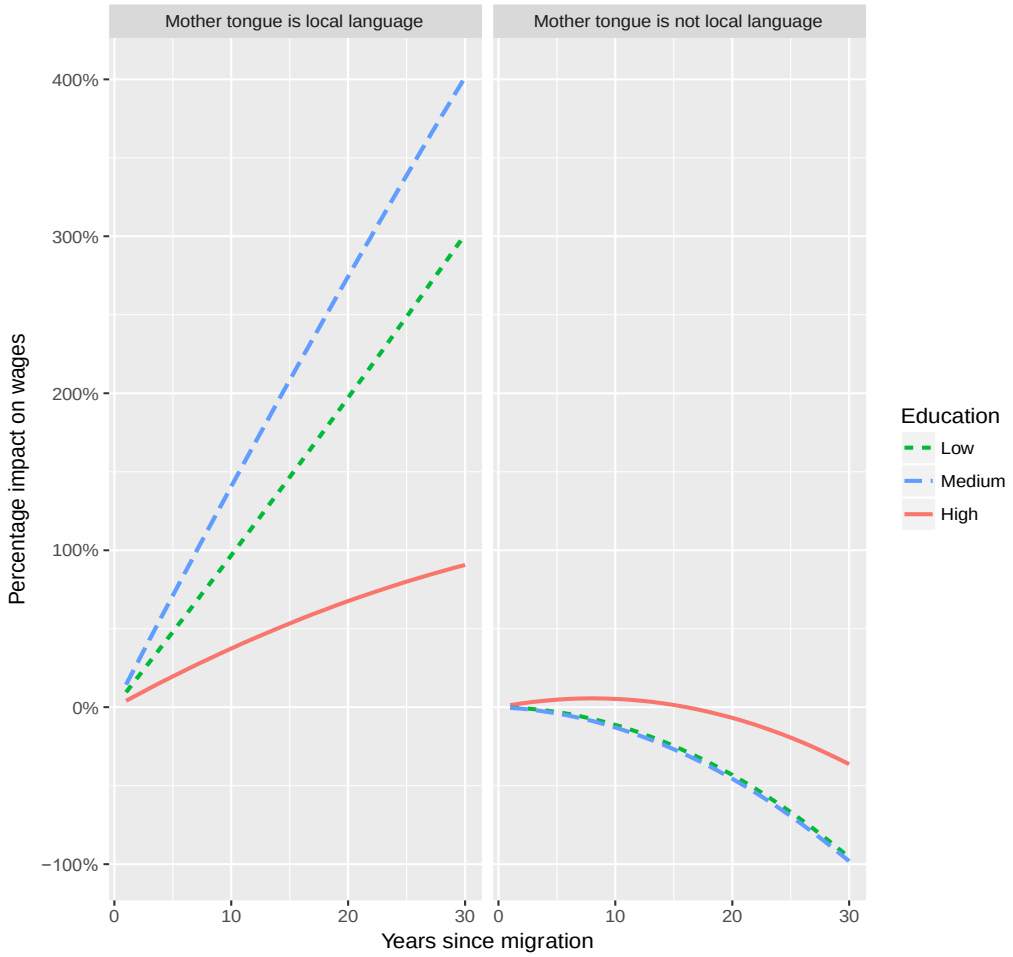
We start by analysing the complementarity between foreign language use and educational level. In column (1) of Table 3, the economic returns to foreign language use at work for native-born workers are only pronounced amongst the high-educated group. In other words, the native-born workers with a tertiary diploma earn 2% more if a foreign language is used at work than those local language users with the equivalent diploma, ceteris paribus. For native-born workers below the upper secondary educational level, the estimates for FL use at work are not statistically significantly different from zero. However, column (2) of Table 3 shows distinctly different reward patterns for

foreign- born workers. The return varies greatly across educational levels both in the sign and the magnitude. Those foreign language users below the upper secondary educational level earn 8% less than those who use the local language at work, ceteris paribus. The foreign language use seems to pay off only for foreign-born workers above the upper secondary educational level.[8] Foreign-born workers with an upper secondary educational diploma earn 4% (= −8% + 12%) more than those who use the local language at work, ceteris paribus. Additionally, foreign-born workers with a tertiary educational diploma earn 7% (= −8% + 15%) more than those local language users at work, ceteris paribus.

The results show that low-educated migrant workers bear a substantial economic loss when using a foreign language at work instead of using the local language. For around half of the low-educated migrants' work in service, market sales and other blue-collar elementary occupations, clearly speaking the local language will pay off more. It sheds light on the human capital accumulation for low-educated migrant workers that speaking the local language pays off more compared to speaking a foreign language. The result could as well be explained by the limited possibilities of learning the local language on the job (cf. Beckhusen et al., 2013). Due to job requirements or other reasons, the migrant workers have to use a foreign language at work, and are left with no time to invest in the local language. To further test whether local language ability matters for the reward pattern of using a foreign language at work, we additionally split the foreign-born sample in those migrant workers who can speak the local language and those migrants who cannot. The former group comprises foreign-born workers whose mother tongue is similar to the local language of the country of residence. This sample covers Austrians working in Germany, Mexicans working in Spain, etc. Both columns (3) and (4) of Table 3 shows a similar reward pattern with column (2) for foreign-born workers—although some of the coefficients are not statistically significant anymore due to a lower sample size. Workers with a tertiary diploma have significantly higher returns, but the substitution effect between a foreign language and the local language remains similar for foreign-born workers with or without the ability to speak the local language. So, there seems little support for the hypothesis that low-skilled foreign workers face opportunity costs of not learning the local language when having to speak a foreign language on the job.

8 We calculate the marginal effect of using a foreign language at work with the following formula (take the Edu2 group for example): $\partial \ln(E)/\partial FL = \beta_{FL} + \beta_{FL\times Eud2}$, where β_{FL} is the estimated coefficient for FL, and $\beta_{FL\times Edu2}$ is the estimated coefficient for FL × Edu2.

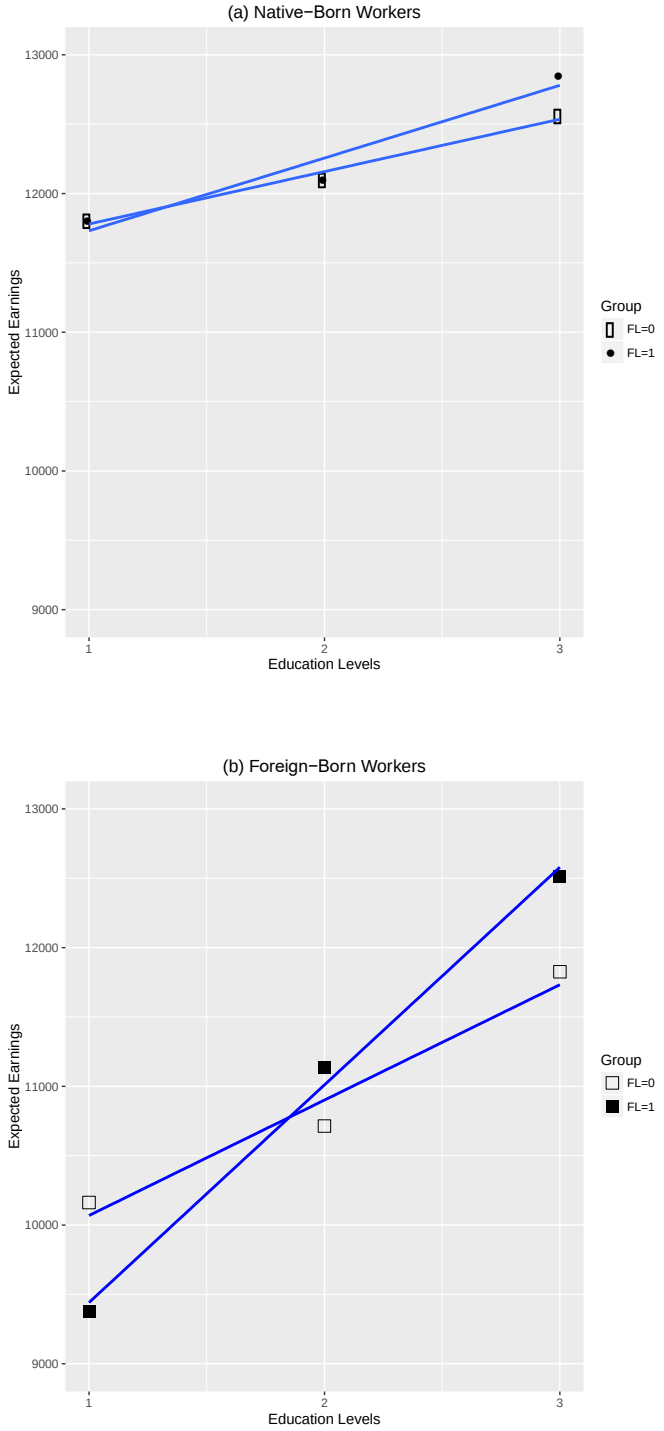
Figure 3. Catching up for migrants for whom the mother is equal and unequal to the local language.



Source: Authors' calculation using the coefficients in columns (5) and (6) of Table 3.

An alternative mechanism might be that low-skilled migrants—whether or not they do speak the local language—end up in the same type of jobs in the lower tier of the labor market in which they do not have to speak the local language due to a lack of knowledge of the local labor market and its culture. If so, theory would predict that low-skilled migrants who are able to speak the local language catch up much faster than migrants who do not speak the local language. Indeed, columns (5) and (6) in Table 3 and the marginal effects as displayed in Figure 3 show that this fast catching up exists for only those low-skilled migrants who speak the local language. Low-skilled migrants who are not able to speak the local language are much less likely to catch up in earnings—if at all—when staying in those jobs where they do not use the local language.

Figure 4. Hypothetical Workers Described in Columns (1) and (2) of Table 3



Source: Authors' calculation using the coefficients in columns (1) and (2) of Table 3.

Figure 4 summarizes six hypothetical workers described in columns (1) and (2) of Table 3. We use the sample mean of earnings (in PPP terms) of workers who are in the lowest educated group and who use the local language at work as the base earnings, respectively for the foreign-born and the native-born group. Panel (a) shows the earnings growth curve for native-born workers. For educational level 1 (below the upper secondary diploma) and 2 (between the upper secondary diploma and the tertiary diploma), the black dots (*FL* = 1) and the white dots (*FL* = 0) coincide because the estimates are not statistically different from zero. For educational level 3 (with a tertiary diploma), there is a significant 2% increase in earnings. The fitted line for foreign language users is quite flat. In contrast, panel (b) shows that the complementarity between foreign language use and educational level is much stronger among the foreign-born workers. Respectively, the estimates are −8 %, 4 % and 7 %. Foreign language use at work complements the educational level. The lowest educated group earns significantly less if they reported using a foreign language at work.

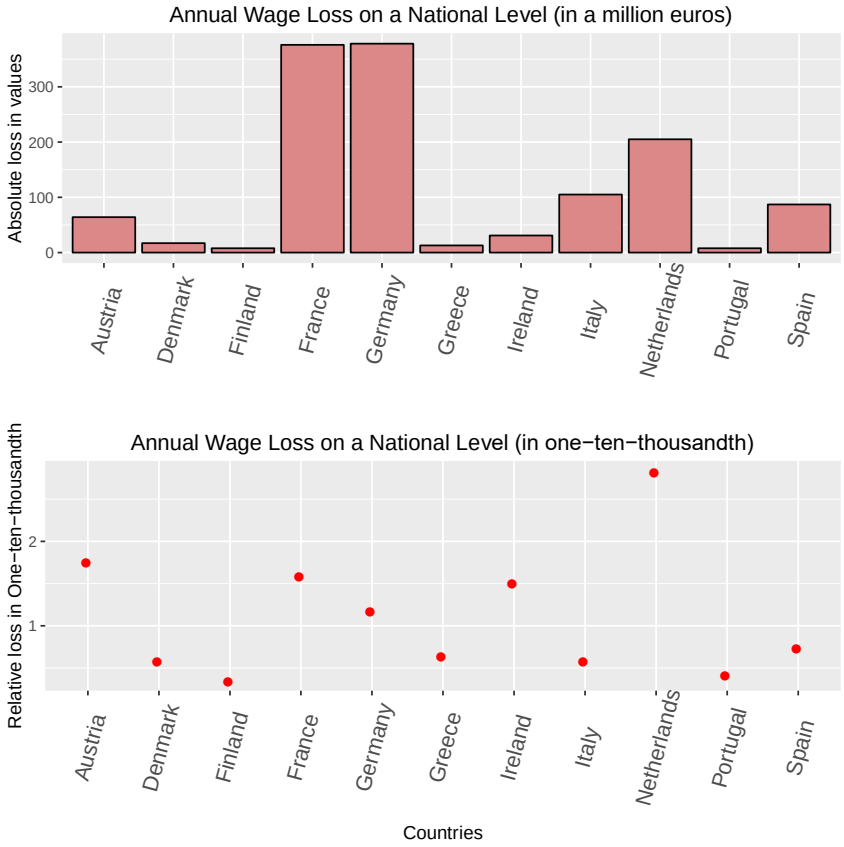
Whether low-skilled migrants' wage losses are due to lack of knowledge of the local language or of the local labor market itself, is difficult to distinguish with our dataset. However, upon arrival all low-skilled migrants earn lower wages in jobs that require a foreign language other than the local language. If we convert these wage losses for low-educated migrant workers to a loss of productivity as the Mincer model would predict, the result would be interpreted as a GDP loss at a national level. To see which country suffers the most from this loss of productivity, we calculate for each country the following loss function:

$$LOSS_c = \overline{E_{c,edu=1}} * \beta_3 * FBPOP_{c,edu=1} \qquad (3)$$

where c is a subscript for country, $\overline{E_{c,edu=1}}$ denotes the weighted average earnings of low- educated migrant workers in country *c* in the data, β_3 denotes the estimated coefficient for *FL* in column (2) of Table 3, and $FBPOP_{c,edu=1}$ denotes the population of low-educated foreign-born workers in country *c*. Figure 5 shows an estimation for the annual wage losses for several European countries in the ECHP data. The total productivity loss due to using a foreign language at work for the low-skilled migrant workers is presented both in an absolute term (the upper panel) and a relative term (the lower panel). France and Germany suffer the largest loss (as high as 400 million euros) due to high wage levels and large pools of low-skilled migrant workers. The lower panel of Figure 5 shows the relative loss in a country's annual GDP in one-ten-thousandth point. In terms of the relative loss in GDP account, Austria, France, Germany, Ireland and the Netherlands rank higher than the southern and

the Nordic European countries.[9]

Figure 5. Annual Wage Loss due to Foreign Language Use for the Low-skilled Migrant Work



Source: Authors' calculation using the coefficients in columns (1) and (2) of Table 3, and the share of low-skilled migrant workers in each country.

3.3. Which types of language pay off the most

We now proceed to analyse which type of foreign language pays off the most and how the return varies by the type of foreign languages used at work. Different language types could yield unequal returns. Here we consider mainly three factors: namely, (*i*) the types of languages, which are categorised into English, EU official languages (Danish, Dutch, Finnish, French, German, Greek, Italian, Portuguese, Spanish and Swedish), and non-EU official languages (Arabic, Chinese, Japanese, Russian and other languages not specified),

(*ii*) the similarity between the foreign language used at work and the local language, which is measured by counting the shared number of linguistic family trees from the Ethnologue website (see

[9] Note that the productivity loss is based on 2014's GDP for each country. The average wage has been multiplied by an inflation factor.

Lewis, 2009), and (*iii*) the potential economic value of the language, which is measured by an average of GDP per capita of the countries that use the language as one of the official languages. Table 4 presents the fixed effects estimation of the heterogeneous language types. Foreign language use at work is now interacted not only with educational levels, but also the language types dummy, the linguistic similarity index, and the potential economic value of the language.

Table 4. Fixed Effects Estimation: The Heterogeneous Returns to Foreign Language Use at Work on Earnings

Characteristic	(1) NB	(2) NB	(3) NB	(4) FB	(5) FB using MT	(6) FB	(7) FB
Edu (ref: < upper secondary edu.)							
Edu2	0.025***	0.025***	0.024***	0.050*	0.068**	0.049*	0.066**
	(0.006)	(0.006)	(0.006)	(0.029)	(0.030)	(0.029)	(0.029)
Edu3	0.064***	0.065***	0.063***	0.157***	0.110**	0.157***	0.141***
	(0.010)	(0.010)	(0.010)	(0.059)	(0.069)	(0.060)	(0.057)
FL-related Terms							
FL use at work	0.002	0.012	0.002	-0.100**	-0.110**	-0.123***	-0.120***
	(0.022)	(0.012)	(0.013)	(0.044)	(0.049)	(0.043)	(0.047)
FL*Edu2	0.010	0.013	0.006	0.135***	0.133**	0.137***	0.094**
	(0.012)	(0.012)	(0.012)	(0.046)	(0.073)	(0.044)	(0.046)
FL*Edu3	0.023**	0.025**	0.026**	0.168***	0.125	0.164***	0.097**
	(0.013)	(0.013)	(0.014)	(0.053)	(0.092)	(0.050)	(0.051)
FL*EUlang	-0.008			0.084*	0.123*		
	(0.021)			(0.056)	(0.072)		
FL*ENGlang	0.004			-0.033	0.103		
	(0.020)			(0.055)	(0.133)		
FL*LS (FL and LL)		-0.054***				0.154**	
		(0.022)				(0.068)	
FL*GDPPC_FL			0.000				0.009***
			(0.001)				(0.003)
R^2	0.116	0.116	0.117	0.129	0.138	0.128	0.130
Adj. R^2	0.082	0.082	0.083	0.085	0.091	0.085	0.086
Num. obs.	224731	224436	221911	10971	7424	10935	10548

$***p < 0.01$, $**p < 0.05$, $*p < 0.$

In the last row of the variables, LS denotes linguistic similarity, MT denotes mother tongue, and FL denotes foreign language. Columns (1), (2) and (3) are the fixed effects estimation for the whole native-born sample. Columns (4), (6) and (7) are the fixed effects estimation for the whole foreign-born sample. Column (5) considers a subsample of

foreign-born workers who use mother tongue as the foreign language at work. The dependent variable for all columns is the natural logarithm of earnings. Edu2 denotes upper secondary educational level, and Edu3 denotes tertiary educational level. Other variables not shown in the table include age and its quadratic term, marital status, working hours, occupation dummies, sector dummies, private sector dummy, job contract type, years since migration (YSM) and its quadratic term.

Columns (1) – (3) of Table 4 are for the native-born sample. In column (1), the estimates for the interaction terms with educational level are consistent with those in column (1) of Table 3. Only workers with a tertiary diploma earn more by using a foreign language other than using the local language at work. When it comes to the types of foreign language used, there is no significant difference between English, EU official languages and non-EU official languages. But when we use a linguistic similarity index with a larger variation, the estimate in column (2) shows a more sizable effect. The foreign language used at work will be better paid off if it is linguistically distant from the local language (−0.05). In column (3), we add an interaction term between the average *FL* and an average GDP per capita of countries that uses the *FL* as one of the official languages, and we do not find any significant effect.

To sum up, the reward pattern for the native-born sample is quite straightforward. There is a wage premium of about 2% for highly educated native-born workers. In addition, using a linguistically distant foreign language from the local language yields more returns. The result could be well explained by the labor supply side of foreign language skills. Due to the geographical proximity of European countries and language education at a very early age, a European native-born worker on average has the capability of speaking two to three European languages. But for linguistically distant languages, native-born workers are not required to learn them in the schooling system. So, the low supply of talents in these languages makes these skills highly rewarded.

Columns (4) – (7) of Table 4 are for the foreign-born sample. The complementarity between foreign language use and the educational level is very robust across columns (4) – (7), compared to column (2) of Table 3. With regard to types of language, the reward pattern is very different from what we have found for native-born workers. Column (4) shows that for foreign-born workers, using a EU official language as a foreign language at work pays significantly higher than other types of language. It increases earnings by 8%, ceteris paribus. Note that one limitation of the ECHP is that it does not include any question on language proficiency level, and hence we restrict *FL* users in the foreign-born sample to those reporting a mother tongue use as a foreign language at work in column (5). This guarantees each *FL* user is proficient at work regarding the foreign language. The estimate for $FL * EUlang$ remains positively significant (12 %). When we use a linguistic similarity index with a larger variation, column (6) shows that the more similar the foreign language is to the local language, the higher

returns to a foreign language use at work. In column (7), the control for GDP per capita interacted with *FL* is added. For foreign-born workers, the languages that are the official language of countries with higher GDP per capita pay off more. Quantitatively, for one specific foreign language, a unit increase in 1,000 euros in the average GDP per capita of its countries raises the economic returns to the language by 0.9%.

In contrast to native-born workers, the degree of heterogeneity within the returns for foreign language use at work for foreign-born workers is much larger. Not only the educational level matters, but also the type of foreign language used at work seems to matter much more for foreign-born workers. EU official languages are well rewarded in the European local market. Note that the positive estimate for $FL * GDPPCF\ L$ also hints on a high reward for EU official languages. Their corresponding countries' GDP per capita is relatively high.

3.4. Reverse causality

As mentioned earlier in section 2.3, reverse causality would bias our estimates. If a promotion on the job causes a worker to develop new skills by acquiring a new foreign language, our results on returns to foreign language use at work will be overestimated. Although perhaps unlikely to learn a language at short notice, we test the existence of this possible channel by checking whether a lagged variable of *lnE* predicts foreign language use in the next period.

Table 5. Granger Causality: The Heterogeneous Returns to Foreign Language Use at Work on Earnings

Characteristic	(1) NB, \ln{E_t}	(2) NB, FL_t	(3) FB, \ln{E_t}	(4) FB, FL_t
Age	0.096***	0.017***	0.139***	-0.002
	(0.003)	(0.002)	(0.038)	(0.022)
Age squared/100	-0.058***	-0.013***	-0.075***	-0.012
	(0.003)	(0.003)	(0.016)	(0.019)
Married	-0.012*	0.020***	-0.008	-0.010
	(0.008)	(0.007)	(0.026)	(0.028)
Edu2	0.015***	0.009***	0.053***	0.042**
	(0.005)	(0.004)	(0.021)	(0.023)
Edu3	0.021***	0.021***	0.125***	0.107***
	(0.008)	(0.007)	(0.041)	(0.041)
Club member	0.003	0.008***	0.005	0.026**
	(0.003)	(0.002)	(0.014)	(0.016)
Working hours	0.002***	0.001***	0.002*	0.002**
	(0.000)	(0.000)	(0.001)	(0.001)
Private sector	0.004	0.008*	0.016	0.017

	(0.007)	(0.006)	(0.036)	(0.040)
Full time job	0.131***	0.000	0.193***	-0.025
	(0.009)	(0.005)	(0.041)	(0.036)
FL_t-1	0.009**		-0.022	
	(0.005)		(0.021)	
\ln{E_{t-1}}		0.001		0.015
		(0.002)		(0.011)
YSM			-0.003	0.001
			(0.035)	(0.019)
YSM squared/100			-0.038***	0.035***
			(0.012)	(0.014)
R^2	0.103	0.005	0.143	0.013
Adj. R^2	0.072	0.003	0.091	0.008
Num. obs.	161630	160872	7363	7344

***p < 0.01, **p < 0.05, *p < 0.

In the last row of the variables, LS denotes linguistic similarity, MT denotes mother tongue, and FL denotes foreign language. Columns (1) and (2) are the fixed effects estimation for the whole native-born sample. Columns (3) and (4) are the fixed effects estimation for the whole foreign-born sample. Edu2 denotes upper secondary educational level, and Edu3 denotes tertiary educational level. Other variables not shown in the table include occupation dummies.

Table 5 presents the fixed effects estimation using lagged variables. The main result here is that our findings are consistent with those in Table 2. Foreign language use in the previous period still has a positive significant effect on the earnings of native workers, while the effect on foreign born workers' earnings is absent. Moreover, earnings in the previous period are unrelated with foreign language use. Note again that this only points at the absence of reverse causality, as the possibility of non-causality of earnings on foreign language use is not rejected. Because of the limited number of years in our dataset, taking more lags increases our standard errors - although the results, qualitative, do not change our conclusions -, and, therefore, we only present results with one time lag.

3.5. Robustness checks

Lastly, we do two robustness checks to validate our main findings. Firstly, up until now, we have not considered individuals' own capability of speaking both the local language and any foreign language. The estimates become preciser if we run the regression for a subsample of respondents who have ever changed foreign language use status at work. In other words, FL can change both from 0 to 1 and from 1 to 0, if we remove those who do not change their FL status. It indicates that the remaining group is more homogeneous, as they have demonstrated the ability to use both the local and a foreign language. Thus, the estimates we find are not taking up the effect that some native-born workers are not able to speak any foreign language, or that some foreign-born workers are not able to speak the local language in the country of residence. Secondly, we remove the occupation controls δ_j in equation (2) to

test whether the returns are underestimated due to the pre-requisite of foreign language skills in a specific occupation. As mentioned both in Ginsburgh and Prieto-Rodriguez (2011) and Isphording (2013), knowing a foreign language skill might lead workers to a specific occupation associated with higher wages, and workers with the same other qualifications but without the foreign language skills will sort into other occupations with relatively lower wages. In this way, foreign language skills have both a direct and indirect effect on earnings via occupation choice.

Table 6 presents the fixed effects estimation under these two scenarios, both for the native-born workers and foreign-born workers. Column (1) shows that native-born workers with a tertiary diploma earn 3% more if they are using a foreign language at work, ceteris paribus. Column (3) shows a strong complementarity relationship between foreign language use at work and the educational levels. The low-educated migrant Workers earn 9% less, and the loss is even greater compared to our main results in Table 3. Columns (2) and (4) replicates the FE estimation without occupation controls. If the returns to foreign language use are mediated through the channel of occupation choice, our main estimates in Table 3 would be underestimated. The estimates in columns (2) and (4) if Table 6 are very consistent with the main results. The mediating channel does not seem to play a substantial role here as our results are quite robust.

Table 6. Robustness Checks: FL change and without occupation controls

Characteristic	(1) NB, FL change	(2) NB, no occ	(3) FB, FL change	(4) FB, no occ
Edu (ref: < upper secondary edu.)				
Edu2	0.038***	0.025***	0.108**	0.054*
	(0.014)	(0.006)	(0.059)	(0.029)
Edu3	0.089***	0.064***	0.351***	0.164***
	(0.021)	(0.010)	(0.129)	(0.060)
FL-related Terms				
FL use at work	-0.004	0.003	-0.091***	-0.077**
	(0.012)	(0.011)	(0.038)	(0.035)
FL*Edu2	0.017	0.011	0.166***	0.119***
	(0.014)	(0.012)	(0.050)	(0.043)
FL*Edu3	0.028**	0.025**	0.135***	0.145***
	(0.015)	(0.013)	(0.052)	(0.047)
R^2	0.144	0.116	0.172	0.127
Adj. R^2	0.113	0.082	0.133	0.084
Num. obs.	41824	224731	2368	10971

***p < 0.01, **p < 0.05, *p < 0.

Columns (1) is the fixed effects estimation for the native-born workers who have ever switched their FL status during all waves. Columns (2) is the fixed effects estimation for the whole native-born workers without occupation controls. Columns (3) is the fixed effects estimation for the foreign-born workers who have ever switched their FL status during all waves. Column (4) is the fixed effects estimation for the whole foreign-born workers without occupation controls. The dependent variable for all columns is the natural logarithm of earnings. Edu2 denotes upper secondary educational level, and Edu3 denotes tertiary educational level. Other variables not shown in the table include age and its quadratic term, marital status, working hours, occupation dummies (not applicable in columns (2) and (4)), sector dummies, private sector dummy, job contract type, years since migration (YSM) and its quadratic term.

4. Conclusion

Europe has turned into a complex multi-cultural and multi-lingual region. The use of multiple languages by workers may have productivity and wage effects on natives and foreign migrants. There are clearly different patterns of the payoff of foreign language use at work for natives and migrants in Europe. In this paper, we employed ECHP data running from 1994 to 2001, and focused on the heterogeneity amongst native-born and foreign-born worker in the effect of foreign language use on earnings. Please see Table 7 for a summary of these heterogeneous estimates.

Table 7. A Summary of the Heterogeneous Estimates

Groups Compared	Table Estimates
N1 vs. N2	Table 3 (1), Table 4 (1)–(3)
F3, F5 vs. F4, F6, F7	Table 3 (2), Table 4 (4),(6),(7)
F3 vs. F4	Table 3 (3),(5)
F5 vs. F6, F7	Table 3 (4),(6)
F3, F5 vs. F6	Table 4 (5)

We use LL to denote the local language, MT to denote the mother tongue and FL to denote the foreign language use at work. All respondents can be categorised into the following groups:

- Native-born sample:
  - N1={LL=MT, FL=0},
  - N2={LL=MT, FL/=MT}.
- Foreign-born sample:
  - F3={LL=MT, FL=0},
  - F4={LL=MT, FL/= MT}
  - F5={LL/=MT, FL=0},
  - F6={LL/=MT, FL=MT},
  - F7={LL/=MT, FL/=MT}.

There is a substantial difference in the reward patterns between native-born workers and foreign-born workers. For native-born workers, using a foreign language at work has an unambiguously positive effect 2% on earnings within the tertiary diploma educational group. For

other educational levels, using a foreign language or the local language at work do not show statistically different economic outcomes. However, for foreign-born workers, the return is very heterogeneous across different educational groups. The lowest educated group suffers a wage loss of 8% by using a foreign language instead using the local language at work. Consider a waitress in a Dutch restaurant, who is only capable of serving in English. She would be likely to be paid more if she learns Dutch, having then many more job choices. Foreign-born workers with an upper secondary educational level gain a wage premium of 4% and those with a tertiary diploma gain a wage premium of 7%. Clearly, high-educated migrant workers do not need to acquire the local language to integrate into the local labor market to earn more. But it seems a necessity for low-educated migrant workers to do so.

In addition, it matters much for foreign-born workers to speak a rewardable foreign language at work. Our evidence-based finding is that a EU official language, a close language to the local language, or a language that is one of the official languages in one or several countries with a high GDP per capita, pays off the most. Many of the overlapping languages that fit the characteristics of these three types are European languages. On the contrary, using a EU official language does not make native-born workers earn more. But using a linguistic distant language does, which is particularly common in trading firms if the company wishes to expand their business with faraway countries or increase the exporting/importing shares of their products.

These conclusions are highly relevant to the EU's language policy. Although the data used is not the most recent, its longitudinal feature and abundant information on language use at work provide insightful implications for the heterogeneity in returns to a foreign language among different groups. Acquiring a foreign language skill is not always a worthwhile investment for foreign-born workers, especially for the low-educated group. This is of great relevance for framing immigrant economic assimilation policies. In addition, Europe is still in great need of international migrants to fill the shortage of linguistic skills in EU official languages, which are still highly rewarded.[10]

On a final note, due to complications involving the mother tongue, the local language, and the foreign language at work, a promising extension of this research can be human capital investment theory, both regarding the local language and foreign language skills for migrants. Given the limited time for human capital accumulation, a comparison between the economic payoffs from the local language and another foreign language needs to be incorporated into conventional language acquisition theory

[10] The returns to the use of a foreign language at work vary across regions to a great extent (Beblavý et al., 2016; Ginsburgh and Prieto-Rodriguez, 2011).

(Chiswick and Miller,1995; Lazear,1999).[11] The cost function of acquiring a specific language then should be associated with the linguistic distance from one's mother tongue (Isphording and Otten, 2014). This has, so far, not yet received due attention in the migration economic literature. Second, given that the prevalence of English is quite common in some Nordic countries, it remains interesting to investigate the deterring effect on migrant workers of foreign language proficiency at work on local language proficiency. This might well fit the pattern of a substantial share of high-skilled workers in Europe who use English only, and in the meantime are well integrated into the host society. A third strand of future research could be focused on the social benefits of acquiring the local language and the foreign language skills. Speaking a common language for the majority reduces the cost of communication on the meso-level, and implicitly works as a channel to increase transactions and to promote regional economic growth. A fourth, and final, extension is further merging current individual data with firm data, in order to provide a more thorough analysis on the heterogeneous labor market returns to different languages. The firm data record the specific tasks of workers, and details on the requirements (communication, technical skills, etc). The increasing accessibility to international databases nowadays will foreseeably prompt a new and promising direction in the literature on migration and culture.

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[11] Ginsburgh et al. (2005) is one example. It looks at the optimal sets of official languages that depend on society's sensitivity against disenfranchisement and comprehensiveness of the chosen language regime.

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Appendix

Table A1. The Structure of the Unbalanced Panel for the Native-Born Adult Workers

Country	1994	1995	1996	1997	1998	1999	2000	2001
Austria	0	2699	2585	2543	2387	2284	2137	2074
Belgium	2761	2561	2409	0	0	0	1973	1826
Denmark	2964	2866	2619	2460	2268	2197	2186	2145
Finland	0	0	3804	3656	3487	3394	2897	2839
France	4939	4936	4935	4546	4135	3925	3789	3788
Germany	0	0	0	0	0	0	4553	3875
Greece	2902	2620	2405	2380	2230	2052	2087	2214
Ireland	3075	2680	2393	2304	2180	1920	1595	1532
Italy	5432	5191	5041	4855	4542	4365	4183	4126
Luxembourg	539	516	504	0	0	0	1431	1385
Netherlands	0	100	264	429	608	878	274	0
Portugal	3857	3881	3821	3992	3999	4041	3594	4037
Spain	4688	4156	4000	3986	3910	3920	3934	4046
United Kingdom	2327	1978	1685	0	0	0	0	0

Source: ECHP, 1994–2001.
Sample size: 262,526.
Notes: Austria entered the survey in year 1995. Finland entered the survey in year 1996. For Belgium (1997–1999), Germany (1994–1999), Luxembourg (1997–1999), the Netherlands (2001), and the United Kingdom (1997–2001), the questions on foreign language use are not included.

Table A2. The Structure of the Unbalanced Panel for the Foreign-Born Adult Workers

Country	1994	1995	1996	1997	1998	1999	2000	2001
Austria	0	247	218	198	183	159	141	135
Belgium	269	239	217	0	0	0	154	127
Denmark	84	82	82	81	66	60	60	62
Finland	0	0	123	131	113	115	88	97
France	526	495	446	377	328	300	271	260
Germany	0	0	0	0	0	0	1049	872
Greece	165	138	124	115	123	98	105	111
Ireland	168	151	124	123	107	86	78	68
Italy	123	127	122	120	104	96	96	92
Luxembourg	406	373	352	0	0	0	935	1096
Netherlands	41	50	45	52	51	58	18	0
Portugal	122	126	119	136	129	140	134	151
Spain	87	78	70	61	64	56	65	74
United Kingdom	315	222	167	0	0	0	0	0

Source: ECHP, 1994–2001.
Sample size: 17,012.
Notes: Austria entered the survey in year 1995. Finland entered the survey in year 1996. For Belgium (1997–1999), Germany (1994–1999), Luxembourg (1997–1999), the Netherlands (2001), and the United Kingdom (1997–2001), the questions on foreign language use are not included

Table A3. The Definitions and Coding of the Variables in the European Community Household Panel (ECHP)

Variables	Questions asked in the survey and coding
Foreign-born	'Migration trajectory'. 0-Born in the country of present residence; 1-Born abroad. The information on this question was not available for Germany, part of Luxembourg and part of the Netherlands, so we have used other questions (year of arrival and citizenship) to supplement this variable.
Earnings in purchasing power parity terms	'Regular wage and salary earnings (amount in national currency)'. The amount reported is divided by the Purchasing Power Parity (PPP). For France and Finland, the earnings are in gross terms.
Foreign language use at work	'Does your work involve the use of a language other than [the official language of the country]?' (Wave 1–6) 'Main language used in main work' and 'second language used in main work'. (Wave 7–8) 0-No; 1-Yes. In Wave 7 and 8, if the respondent reported a language other than the official language of the country, the variable is coded as 1 and 0 otherwise. For Spain, 'main foreign language' and 'second foreign language' was asked instead.
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Table A3. continued from previous page

Variables	Questions asked in the survey and coding
Reported foreign language	'First foreign language used in current job'. (Wave 1–6) 'Main language used in main work'. (Wave 7–8) 1-English; 2-EU official languages (Danish, Dutch, Finnish, French, German, Greek, Italian, Portuguese, Russian, Spanish and Swedish); 3-non-EU official languages (Arabic, Chinese, Japanese, and other languages not specified). In Wave 7 and 8, only those reported languages that are not the official language of the country are included. For Spain, 'main foreign language' was asked instead.
Years since migration	'Year of arrival in the country of present residence'. (only applicable to foreign-born respondents) We calculate years since migration using the formula $YearSurveyed - YearArrival + 1$.
Foreign country of birth	'Code of foreign country of birth'. (only applicable to foreign-born respondents) 1-Community; 2-Other foreign country. Community includes the 12 original member states in the European Community (Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, the United Kingdom).
Mother tongue	'Mother tongue'.(only applicable to foreign-born respondents) 1-English; 2-French; 3-German; 4-Spanish; 5-Italian; 6-Dutch; 7-Portuguese; 8-Danish; 9-Greek; 10-Finnish; 11-Swedish; 12-Russian; 13-Japanese; 14-Chinese; 15-Arabic;
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Table A3. continued from previous page

Variables	Questions asked in the survey and coding
	16-Other modern languages. The question was only asked in Wave 7 and 8. The time-invariant feature of this information makes it possible to supplement the previous 6 waves for traceable respondent.
Age	'Age of the individual'. (in years)
Male	'Sex of the individual'. 0-Female; 1-Male.
Married	'Present marital status'. 0-Divorced, widowed and never married; 1-Married, separated.
Household size	'Total number of household members at present'.
Education	'Highest level of general or higher education completed'. 1-Less than second stage of secondary education (ISCED 0-2); 2-Second stage of secondary level education (ISCED 3); 3-Recognised third level education (ISCED 5-7).
Club member	Are you a member of any club, such as a sport or entertainment club, a local or neighbourhood group, a party etc.? 0-No; 1-Yes.
Working hours	'Total number of hours working per week (in main and additional jobs)'.
Occupation	'Occupation in current job, i.e. principal activity performed'. 1-legislators, senior officials and managers; 2-professionals; 3-technicians and associate professionals; 4-clerks; 5-service workers and shop and market sales workers; 6-skilled agricultural
Continued on next page	

Table A3. continued from previous page

Variables	Questions asked in the survey and coding
	and fishery workers; 7-craft and related trades workers; 8-plant and machine operators and assemblers; 9-elementary occupations; 10-Missing, armed forces, miscellaneous.
Sector	'Main activity of the local unit of the business or organisation in current job'. 1-Agriculture; 2-Industry; 3-Services.
Job type	'Current job in private or public sector?' 0-Public sector; 1-Private sector.
Contract type	'Main job: full-time/part time'. 0-Part time; 1-Full-time.