Disadvantages of Linguistic Origin – Evidence from Immigrant Literacy Scores*

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Abstract

This study quantifies the disadvantage in the formation of literacy skills of immigrants that arises from the linguistic distance between mother tongue and host country language. Combining cross-country data on literacy scores from the International Adult Literacy Survey with unique information on the linguistic distance between languages, gaps in literacy test scores are estimated. Linguistically distant immigrants with a large degree of dissimilarity between mother tongue and destination language face significant initial disadvantages in the literacy acquisition that can be attributed to their linguistic origin. The importance of the linguistic origin increases with the age at migration. Linguistically distant immigrants face a steeper assimilation profile in literacy scores, but convergence by time of residence is moderate and does not offset the initial disadvantage.

Keywords: Linguistic Distance, Literacy, Human Capital, Immigrants

JEL classifications: F22, J15, J24, J31

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1 Introduction

The information age and the accompanying rapid transformation of labor market demands drastically increases the need for skills including literacy and numeracy (OECD 2000). By the rise of information and communication technology usage, almost every occupation demands a minimum level on literacy and language ability. The OECD defines literacy as "the ability to understand and employ written information in daily activities, at home, at work and in the community – to achieve one's goals, and to develop one's knowledge and potential" (OECD 2000). As such, literacy comprises the productive functions of language that are rewarded in the labor market, e.g. the usage of language to store information, communicate with co-workers and to order one's thoughts (Crystal 2010). The importance of language-related human capital represented by individual literacy for individual labor market success has gained considerable attention in the literature (Vignoles et al. 2011, Finnie and Meng 2005, Dougherty 2003, Gonzalez 2000, Charette and Meng 1994).

A group especially prone to insufficient levels of literacy are immigrants from distant linguistic backgrounds. For immigrants, low levels of literacy are a crucial risk factor in the the social and economic integration of immigrants (Ferrer et al. 2006, Kahn 2004). Non-native speaking immigrants face an economic decision to acquire a host-country language (Selten and Pool 1991, Chiswick and Miller 1995). One important cost factor in this human capital investment is the linguistic distance between mother tongue and host country language, the degree of dissimilarities between languages in terms of pronunciation, grammar, script, vocabularies etc. In linguistics, the linguistic distance between languages is believed to decrease the potential language transfer in language acquisition, i.e. the application of knowledge in the mother tongue L1 in the acquired language L2 (Llach 2010). In an economic sense, the linguistic distance displays the degree of transferability of home country language capital into the destination country, analogue to the discussion of imperfect portability of human capital by Friedberg (2000). Chiswick and Miller (1999) argue that linguistic differences towards the destination language decrease the efficiency of language acquisition, rise the costs of skill investment, and finally have subsequent consequences on labor market success and integration.

The multidimensionality of linguistic differences makes it difficult to analyze its effect on the language acquisition empirically in large scale micro data studies. The linguistic literature on linguistic barriers in the language acquisition of immigrants mainly comprises of qualitative or small scale quantitative studies in the linguistic literature. Van der Slik (2010) offers an overview and notable exception. Beenstock et al. (2001) use non-collinear sets of indicators for country of birth and mother tongue to identify the importance of the linguistic origin on language skills of immigrants in Israel. A noteworthy and innovative approach has been undertaken by Chiswick and Miller (1999) using average test scores

of language classes to proxy linguistic differences. Unfortunately, due to data limitations this approach is restricted to the analysis of English-speaking destination countries.

Against this background, this study aims at quantifying the linguistic barriers in the literacy skill formation. Data on literacy scores from the International Adult Literacy Survey (IALS) are combined with a unique measure of the linguistic distance based on differences in pronunciation between mother tongue and the host country language. This measure, drawn from linguistic research by the German Max Planck Institute of Evolutionary Anthropology, offers a continous and cardinally interpretable measurement of linguistic differences for any of the world's languages. The resulting dataset covers 9 host countries receiving immigrants from 70 sending countries and includes 1,559 individual observations. Regressing literacy scores on the linguistic distance yields estimates of score differentials with respect to the linguistic origin of an immigrant.

The study contributes to the existing literature in four ways. First, the cross-sectional design of the IALS data allows to control for destination and origin country specific characteristics simultaneously, which were omitted in previous studies using national datasets. Second, the application of the innovative measure of linguistic distance allows the broadening of national results to an international comparison. Third, the usage of objective literacy scores allows to confirm previous results for subjective measures of language skills and avoids issues of measurement error in these self-reported indicators. Finally, the study specifically addresses the influence of linguistic origin over time of residence and offers additional evidence for the so-called Critical Period hypothesis which states that the necessary effort for acquiring a language is increasing with the age at arrival of an immigrant.

The results indicate a strong negative effect of the linguistic distance on the achieved literacy score. To give a rough quantification: Linguistically distant immigrants (e.g. a Turk in the Netherlands) face significant initial disadvantages of linguistic origin that are comparable to the disadvantage of having formal education of ISCED 1 (primary education) compared to ISCED 5 (short-cycle tertiary education). In line with the Critical Period hypothesis, this negative effect is mainly observable for late arrivals who immigrated at an age of 12 or older. The effect of linguistic origin decreases over time of residence, although the convergence does not offset the initial disadvantage.

This study is organized as follows. Section 3 describes the data sources, specifically the measurement of linguistic differences between languages, Section 4 outlines the empirical strategy. Section 5 discusses the regression results against the significance of literacy skills in the labor market. Section 7 concludes.

2 Language Skill Acquisition and Linguistic Distance

3 Data

This study utilizes data from the public use file of the International Adult Literacy Study (IALS). The IALS represents a unique data source on adult's literacy skills and socio-economic characteristics over the period of 1994 to 1998 (OECD 2000). Regarding the migration background, not all participating countries offer the necessary information on the origin of immigrants. The sample is therefore restricted to immigrants to Switzerland, the Netherlands, Sweden, Great Britain, Italy, Slovenia, Czech Republic, Finland and Hungary.

The key advantage of the IALS data is the direct measurement of individual literacy scores. Immigrants are defined as those individuals who were not born in the country of assessment. The usage of these objective test scores circumvents measurement error issues of self-reported measures of language ability. Subjective measures of language skills are prone to substantial degrees of misreporting (Charette and Meng 1994, Dustmann and van Soest 2001, de Coulon and Wolff 2007). Akresh and Frank (2011) show that the misclassification is not merely white noise but related to individual labor market outcomes. The objective test scores from the IALS data offer a convenient way to analyze determinants of language or literacy acquisition without having to deal with these measurement error issues. Three different dimensions of literacy are assessed independently in the IALS: prose literacy (the knowledge to understand and use information in texts), document literacy (the skills to use information stored in documents like forms, schedules, tables etc.) and quantitative literacy (the skill to locate numbers found in printed materials and to apply simple arithmetic operations). A score between 0 and 500 is assigned to task booklets in the respective official language of a region. The reported scores of the immigrant subpopulations differ in means. Highest average scores are found in the Czech Republic, the lowest average in Slovenia (see Table 1). [1]

To identify linguistic barriers in the formation of literacy skills, the literacy test scores are regressed on a measure of linguistic distance between mother tongue and host country language. The measurement of linguistic distance stems from the Automatic Similarity

[1] Specific answers to the test booklet do not indicate a literacy level with certainty. Due to the restricted number of questions, individuals with different levels of literacy might still produce the same set of answers. To take this uncertainty into account, the IALS data provides 5 different plausible values of literacy scores for every individual. To take into account this sampling procedure of the IALS (see Murray (1997) for further details), I follow the established method to use the simple average of the 5 plausible values of test scores as the outcome variable. Standard errors are then computed taking into account the replicate weights offered by IALS. This method takes into account unspecified intra-cluster correlation, but ignores the stratification of the sampling. Brown and Micklewright (2004) show that this method might produce slightly overstated standard errors in some cases.

Judgment Program, which has been developed by the German Max Planck Institute of Evolutionary Anthropology to explain geographical distribution and historical development of languages Bakker et al. (2009). This method has been applied to the explanation of linguistic barriers in international trade flows by Isphording and Otten (2013). The idea behind this approach is that languages share common ancestors. After a language population splits up, languages begin to differ over time by the development of new speech patters, changes in pronunciation and vocabulary. These differences are then represented in the the number of so-called *cognates*, words in different languages sharing a common ancestor. The number of cognates can be approximated by comparing the pronunciation of words between different languages (Serva 2011).

The measurement of similarities in pronunciations relies on a direct comparison of word pairs having the same meaning across different languages. These words are taken from a 40-item sublist of the so-called Swadesh list (Swadesh 1952). This deductively derived list includes words that are believed to be culturally independent and which are represented in any of the world's languages. These words comprise basic words of human communication (e.g. *I, You, One*), body parts (e.g. *Eye, Nose, Tooth*) or environmental concepts (e.g. *Water, Stone, Night*). For each word, the respective representation in a language is expressed in a phonetic script, e.g. the English word *mountain* is transcribed as *maunt3n*, while its Spanish counterpart is transcribed as *monta5a*. Each character in these transcriptions represents a common sound of human communication. To assess the dissimilarity of two words, the Levenshtein distance, i.e. the minimum number of sounds that have to be changed, to be removed or added to transfer the word of one language into the same word in a different language is calculated. In the above example, this minimum distance consists of 5 sounds. Table 2 summarizes some computational examples. The average minimum distance between all 40 word pairs is normalized to take into account potential similarities by chance due to shared phonetic inventories, resulting in the final measure of linguistic dissimilarities (Bakker et al. 2009).

The approach yields a continuous descriptive measure of the differences in pronunciation between two languages as the proxy for the number of cognates, and thus, on the approximative linguistic difference between the languages. Wichmann et al. (2010) show that the linguistic distance measured by differences in pronunciation is a strong predictor for family relations of languages. Table 3 lists the closest and furthest languages in the used sample with regard to some destination languages. Closest distances emerge within the same language family (Germanic languages for English and German, Romance languages for French and Slavic languages for Czech). The closest linguistic distance different from zero in the present sample is faced by Serbian-speaking immigrants in Slovenia, the largest distance by Turkish immigrants in the Netherlands. The complete matrix of lin-

guistic distances can be found in Table 9 in the appendix. The linguistic distance is merged with the IALS data using information on the first language of an immigrant.

4 Empirical Strategy

To identify systematic disadvantages of linguistic origin in the literacy scores, the following equation is estimated separately for each of the three literacy scores using multivariate linear regressions:

$$\begin{aligned} Y &= \beta_0 + \beta_1 LD + \beta_2 YSM + \beta_3 Age_{Entry} \\ &+ \beta_4 LD \times Age_{Entry12} + \beta_5 LD \times YSM \\ &+ X'\gamma + O'\delta + D'\lambda + \varepsilon \end{aligned}$$

Y indicates the literacy score in one of the three dimensions. LD is the calculated linguistic distance towards the host country language. Acquisition of the destination language is crucially affected by the time exposed to the language, proxied by the time of residence (YSM) in the destination country. The interaction term between years since migration (YSM) and the linguistic distance accounts for a convergence over time of residence between native and non-native speakers in literacy scores. The linguistic distance is also interacted with a binary indicator for arrival in the host country at the age of 12 or older ($Age_{Entry12}$). Previous psychobiological literature indicates that early childhood language acquisition is not hindered by linguistic differences until a certain age threshold in adolescence, which is referred to in linguistics as the Critical Period hypothesis (Newport 2002). Following this hypothesis, the interaction effect is expected to be negative, indicating a higher impact of linguistic origin for late arrivals. The main effects of years since migration and arrival at age 12 or older, β_4 and β_5, indicate the effects for the subpopulation of native-speaking immigrants with $LD = 0$.

The control variables X consist of a gender indicator, the individual and parental education (in ISCED groups)[2], birth cohort indicators and the geographic distance between capitals of destination and origin. Country-wise descriptive statistics on these explanatory variables are reported in Table 1. The inclusion of own and parental education is of specific importance for my specification, as it is a first way to deal with potential selection into source countries according to expected linguistic differences, as analyzed for

[2]The underlying question for the educational information is: *What is the highest level of schooling you have completed?* Information is coded into ISCED codes, omitting ISCED category 4, *Post-secondary non-tertiary education* including vocational training. In the estimations ISCED 0 and ISCED 1 are used as comparison group.

aggregated migration flows by Adsera and Pytlikova (2012).

The cross-national design of the IALS allows to control simultaneously for origin- and destination-fixed effects by including indicators for 9 receiving (D) and 70 sending countries (O). These fixed effects capture potentially omitted receiving country characteristics, e.g. differences in language acquisition support, or selective migration policies favoring skilled immigrants. Potentially omitted sending country characteristics can be differences in media exposure to foreign languages or differences in the quality of the education system. As linguistic and geographic distance both vary on the level of origin- and destination-country permutations, they are not collinear with either the set of origin- or destination-country indicators.

5 Results

The main results of the estimation of equation 1 are summarized in Table 4. The specifications are estimated separately for each dimension of literacy, prose, document and quantitative. Linguistic distance enters the specification both as a main effect and as an interaction with the age at arrival and the years since migration. Such, the main effect of linguistic distance displays the initial disadvantage (at $YSM = 0$) for young arrivals immigrating at the age of 11 or younger. This initial relationship of linguistic distance and the literacy scores turns out to be significant in the prose and the quantitative literacy, but remains insignificant for document literacy.

The negative effect of the linguistic distance strongly increases with the age at arrival, indicated by the significant coefficients of the interaction terms between age of entry at the age of 12 or older and the linguistic distance, where now also the document literacy is negatively affected. This interaction supports the idea of the linguistic Critical Period Hypothesis. Young children are able to learn new languages irrespectively from their own linguistic origin or are only marginally affected by the linguistic distance. With increasing age at arrival, the linguistic barriers in the language acquisition start to rise.[3] Based on these parameters, this is also depicted in illustrations of depicted means in Figure 2. A similar pattern arises for all three dimensions of literacy in the upper panels (a), (b) and (c). Though the linguistic distance has only a small effect for childhood immigrants (the dark grey line), it distinctively decreases the test scores for late arrivals, indicated by much steeper slope of the light grey line.

The results indicate a certain convergence over time of residence for immigrants with

[3]The Critical Period is believed to end with adolescence, although some scholars (e.g. Chiswick and Miller 2008) claim a continuous decrease in learning efficiency rather than a specific threshold. Estimations with indicators defined at different age thresholds indicate that the results are not sensitive to the choice of the actual threshold, see Table 8 in the appendix.

different linguistic background. The positive interaction of linguistic distance and years since migration shows that immigrants with a distant linguistic background face a steeper assimilation profile and are able to catch up over time. This is consistent with larger incentives for immigrants with larger initial disadvantages as discussed by Chiswick (1978). Still, looking again at the illustrations in Figure 2, the convergence is only moderate. The time of exposure to the host county language, indicated by the years since migration, does not significantly affect the literacy scores of native speakers. A more distant linguistic background increases the assimilation rate, although only marginally (Figure 2, panels (d), (e), (f)). The convergence does not compensate the large initial disadvantage of linguistic origin.

Due to the interaction with the linguistic distance, the pure main effects of age at arrival and years since migration indicate the influence on literacy scores for native speakers (with $LD = 0$). The coefficients of these main effects remain small in levels and mostly insignificant. Native speakers do not face a disadvantage by immigrating at an older age, as they acquired the destination language skills already as their mother tongue prior migration. Neither do they face an assimilation process by time of residence.[4]

The effect of linguistic distance can be quantified using differences in predicted means and fixing covariates at their sample means: the initial disadvantage of linguistic origin of a linguistically distant immigrant (e.g. a Turk in the Netherlands, $LD = 102.33$) compared to a native-speaking immigrant accounts for 33.5 (*13.1*, 25.3) points in the prose (*quantitative*, document) scale. It increases to 79.2 (*66.1*, 67.5) points for immigrants who arrived at the age of 12 or later. This is a very large initial effect of the linguistic origin. The strong disadvantage is roughly comparable to the disadvantage of having no formal schooling or schooling of ISCED 1 (only primary schooling) compared to ISCED 5 (short-cycle tertiary education). Due to the only moderate convergence, the disadvantage prevails over a long period of time. After 15 years of residence, the average disadvantage still accounts for 59.8 (*53.9*, 50.6) points.

Concerning the control variables, women experience disadvantages in the quantitative and document literacy, but not in the prose literacy. Younger birth cohorts show higher levels of literacy. Strongest determinant for the literacy scores is the level of formal schooling. The ISCED level indicators show a highly significant positive partial correlation

[4]One concern might be that the results are solely driven by the difference between native-speaking immigrants and non-native speakers. Therefore, I repeat the estimations on a subsample excluding native speakers with a linguistic distance of zero. This leads to a reduced sample of 878 observations, while the fit of the regressions decreases slightly. The results for this subsample are summarized in Table 7. Compared to the estimations in Table 4 the general pattern remains the same, although the coefficients of interest become larger. The now missing natural control group of native speakers (with $LD = 0$) renders the quantitative interpretation of the results less intuitive, but I conclude from this additional results that the results of the main regressions are not solely driven by the comparison of native speakers and non-native speakers.

to the literacy scores that increases with the accomplished degree. Parental education shows a similar but less distinct pattern.

Gender differences in estimates are reported in Table 5. The general pattern seems to be independent of gender. Differences arise in the increase of the effect of the linguistic distance by age at entry. Here, the female results are more distinct than the male counterparts. Insignificant main effects of linguistic distance in the document and quantitative literacy and strong negative interaction terms with age at entry at age 12 or older strongly confirm the Critical Period hypothesis of effortless language acquisition for young arrivals, while the picture remains fuzzy for the male subsample.

The general pattern that can be concluded from the results is a moderate effect of linguistic distance on the average literacy scores for young arriving immigrants, which is distinctively larger for late arrivals who immigrated at the age of 12 or later. Time of residence leads to an increase in exposure to the destination country language and has a moderate positive effect on the literacy scores. The convergence in literacy scores does not make up for the initial disadvantage, which prevails even a long time after immigration. Disadvantage of age at arrival and the assimilation profile cannot be observed for immigrating native speakers with zero linguistic distance.

Although the small number of observations does not allow for a direct estimation of labor market disadvantages of linguistic origin, the magnitude of the results indicates the importance of linguistic barriers on the labor market. Figure 1 displays descriptively the distributions of literacy scores along the wage distribution and for the employed and unemployed subsample. The initial disadvantage of linguistically distant immigrants distinctively exceeds the differences we can observe along labor market outcomes. Therefore, it is likely, that the effect of linguistic distance I observe has an economically significant effect on the labor market integration of immigrants, above and beyond merely statistical significance.

6 Additional Robustness Tests

So far, I interpreted the coefficient of the linguistic distance as the pure linguistic influence of the mother tongue on the destination language acquisition, while controlling for unobservable fixed effects on the origin- destination-country level. However, unobserved heterogeneity might also arise on the level of combinations of origin and destination. Unfortunately, I cannot include combined destination-origin fixed effects, as this would eliminate almost any variation in the variable of interest, the linguistic distance. Still, some potential sources of such a community effect can be directly addressed by enriching the data by additional external sources.

Table 6 reports results of robustness checks that aim at ruling out potential omitted variables on the origin/destination level that could bias my main results. Due to incomplete data availability of some of these variables, the number of observations differs from the main specifications in Table 4. Column (1) reports changes in estimation results when the bilateral migrant stock on the origin/destination level is included. The numbers are provided by the UN Population Division (United Nations, Department of Economic and Social Affairs 2012). Migrant stocks are related to the language acquisition by ambigous enclave effects (Dustmann and Fabbri 2003, Chiswick and Miller 2002, Cutler et al. 2008). Living in a neighbourhood dominated by speakers of the same language family might decrease incentives to acquire skills in the destination language or might provide a supportive environment easing hurdles for integration. As I only observe migrant stocks on the national level, it additionally represents selection patterns by linguistic hurdles as analyzed by Adsera and Pytlikova (2012), which are not captured by the already included measures for individual and parental education. Although the migrant stock is positively related to the literacy scores, the results for the linguistic distance measure and the interactions with age at migration and time of residence remain robust.

Language is a major dimension of the culture of a country. Therefore, it is important to note that the concept of linguistic distance is difficult to separate from further cultural dissimilarities between countries. A number of studies has attempted to operationalize the idea of cultural distances between countries, using innovative approaches as the average genetic distance between populations (Spolaore and Wacziarg 2009), expert-based opinions on cultural values (Hofstede et al. 2010), or even voting behavior in international song contests (Kokko and Gustavsson Tingvall 2012). While each of these measures possesses its own advantages and flaws, the major disadvantage is the restriction to small subsets of origin and destination countries. A very generally applicable approach is offered by Inglehart and Welzel (2005, 2010), who use differences in answers to the World Value Survey to generate a cultural map of the world's populations using average differences between countries on two cultural dimensions, traditional vs. secular-rational values and survival vs. self-expression. Column (2) summarizes the results of including this measure for cultural difference. The cultural differences are negatively related to the literacy scores. Despite the fact that cultural distance and linguistic distance are negatively correlated by a correlation coefficient of $r = 0.38$, the results for the linguistic distance measure remain robust to the inclusion of this proxy of cultural differences. This makes me confident that the estimated effect of linguistic distance does not capture further cultural dissimilarities and indeed shows the effect of linguistic differences.

Finally, immigrants sharing the same origin country might face different degrees of discrimination and/or institutional hurdles when accessing the destination country labor

market. Chiswick and Miller (2012) even use a measure of linguistic distance as a proxy for transferability of human capital. As labor market opportunities act as important incentives in the acquisition of language-related human capital, such correlations between linguistic distance and transferability or discriminational hurdles could bias the results. To control for this potential source of unobserved heterogeneity, column (3) includes controls for labor force particiation and, conditional on being employed, the individual wage. The results confirm a positive relationship between labor market success and literacy scores. The results concerning the linguistic distance remain robust.

In the last column (4), the additional regressors enter the specification jointly, again not signifantly affecting the main results on the linguistic distance. Taken together, the robustness checks indicate that omitted variables on the origin/destination level do not bias the main results reported in Table 4.

7 Conclusion

Insufficient language proficiency is a significant hurdle for the integration and assimilation of immigrants into the labor market of the destination countries. The literacy acquisition in the host country language is crucially influenced by the linguistic origin of an immigrant. Immigrants with a linguistically distant background face distinctively higher costs to reach a sufficient level of command of a language. Against this background, I aim at quantifying the disadvantage of linguistic origin in literacy test scores.

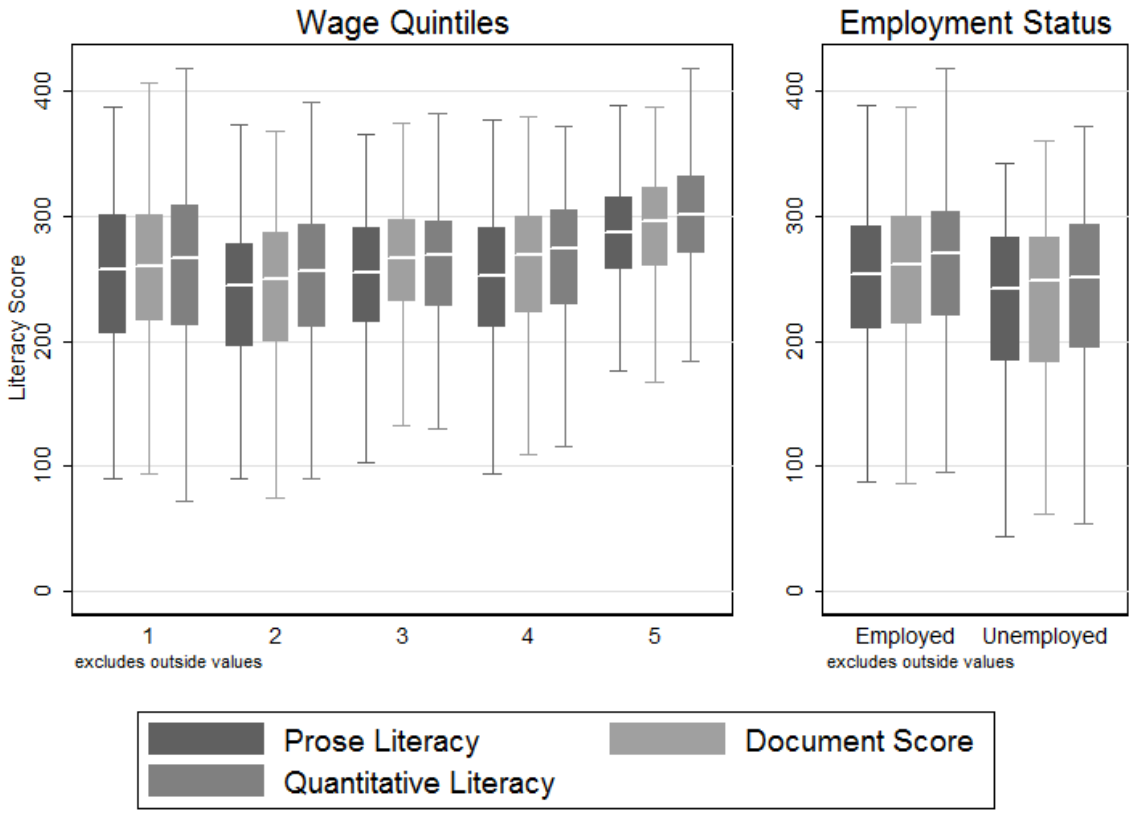
Literacy test scores from the International Adult Literacy Survey are regressed on a novel measure of linguistic distance between the mother tongue and the destination country language of immigrants. The results indicate significant differences in literacy scores among immigrants that can be attributed to their respective linguistic origin. Linguistically distant immigrants face a strong disadvantage in literacy scores that is distinctively larger for late arrivals immigrating at the age of 12 or older. This increasing importance of the linguistic origin by age at arrival confirms the linguistic Critical Period hypothesis. Although I observe a moderate convergence in test scores over time of residence, the disadvantages in literacy scores prevail over a long period after immigration. The differentials in literacy scores by linguistic origin exceed the average difference in literacy scores between the employed and unemployed subpopulations as well as the increase in average literacy scores along the wage distribution. As such, the linguistic origin is expected to have a significant influence on the economic success of immigrants in the host country, as directly estimated by Isphording and Sinning (2012) and Bleakley and Chin (2004) for the US.

These results broaden the previous evidence on the heterogeneity by linguistic origin

using national datasets (Chiswick and Miller 1999, Van der Slik 2010, Isphording and Otten 2013) to a cross-national perspective. By using objective measures of literacy, the results confirm the previous findings on the effect of linguistic distance on subjective indicators of language ability and allow for a quantification of the effects. The operationalization of the concept of linguistic distance offers important insights into a previously unobservable source of heterogeneity in the assimilation of immigrants, attributed to the "black box" of cultural barriers and differences (Epstein and Gang 2010).

8 Tables and Figures

Figure 1: Literacy and Labor Market Outcomes (Box-Whisker-Plots)



Notes: – Own calculations from IALS data. – Boxes bordered at 25th and 75th percentile, median line indicated at 50th percentile. – Whiskers of 1.5 × interquartile range.

Table 1: DESCRIPTIVES

	All	CH(G)	CH(F)	CH(I)	N	SW	GB	I	SL	CZ	FIN	HU
Female	0.53	0.58	0.54	0.52	0.51	0.56	0.49	0.58	0.53	0.58	0.41	0.59
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
Age at entry 12 or older	0.65	0.93	0.80	0.78	0.51	0.74	0.70	0.44	0.65	0.44	0.60	0.51
	(0.48)	(0.26)	(0.40)	(0.42)	(0.50)	(0.44)	(0.46)	(0.50)	(0.48)	(0.50)	(0.49)	(0.51)
Born before 1940	0.12	0.33	0.20	0.15	0.11	0.17	0.12	0.01	0.08	0.10	0.01	0.26
	(0.33)	(0.47)	(0.40)	(0.36)	(0.32)	(0.38)	(0.33)	(0.08)	(0.27)	(0.30)	(0.12)	(0.45)
Born 1940-49	0.17	0.19	0.23	0.27	0.27	0.22	0.17	0.04	0.19	0.52	0.09	0.27
	(0.38)	(0.39)	(0.42)	(0.45)	(0.44)	(0.42)	(0.38)	(0.20)	(0.39)	(0.51)	(0.29)	(0.45)
Born 1950-59	0.22	0.17	0.22	0.21	0.21	0.28	0.25	0.18	0.33	0.19	0.17	0.03
	(0.42)	(0.38)	(0.41)	(0.41)	(0.41)	(0.45)	(0.43)	(0.39)	(0.47)	(0.40)	(0.38)	(0.18)
Born 1960-69	0.30	0.24	0.22	0.24	0.28	0.21	0.31	0.42	0.26	0.11	0.24	0.26
	(0.46)	(0.43)	(0.42)	(0.43)	(0.45)	(0.41)	(0.46)	(0.50)	(0.44)	(0.32)	(0.43)	(0.45)
Born 1970-84	0.18	0.07	0.13	0.13	0.13	0.12	0.15	0.34	0.15	0.08	0.49	0.18
	(0.39)	(0.25)	(0.34)	(0.33)	(0.34)	(0.33)	(0.36)	(0.48)	(0.36)	(0.28)	(0.50)	(0.39)
Years since migration	21.98	23.43	21.27	23.97	23.60	20.81	21.04	21.17	26.51	33.47	13.95	29.47
	(12.86)	(13.28)	(12.74)	(12.28)	(12.62)	(13.26)	(12.80)	(10.25)	(11.95)	(16.21)	(11.75)	(21.50)
No Schooling	0.02	0.00	0.00	0.03	0.05	0.03	0.02	0.02	0.01	0.00	0.00	0.03
	(0.13)	(0.00)	(0.00)	(0.18)	(0.22)	(0.17)	(0.13)	(0.12)	(0.07)	(0.00)	(0.00)	(0.17)
ISCED 1	0.12	0.17	0.29	0.25	0.15	0.21	0.11	0.03	0.08	0.26	0.00	0.04
	(0.33)	(0.38)	(0.45)	(0.43)	(0.36)	(0.41)	(0.32)	(0.18)	(0.28)	(0.45)	(0.00)	(0.19)
ISCED 2	0.32	0.24	0.19	0.29	0.25	0.11	0.41	0.29	0.41	0.44	0.46	0.21
	(0.47)	(0.43)	(0.39)	(0.46)	(0.44)	(0.32)	(0.49)	(0.46)	(0.49)	(0.50)	(0.50)	(0.41)
ISCED 3	0.32	0.44	0.33	0.33	0.34	0.47	0.19	0.48	0.41	0.22	0.37	0.30
	(0.47)	(0.50)	(0.47)	(0.47)	(0.47)	(0.50)	(0.39)	(0.50)	(0.49)	(0.42)	(0.49)	(0.47)
ISCED 5	0.05	0.08	0.09	0.03	0.00	0.05	0.06	0.05	0.05	0.00	0.01	0.12
	(0.22)	(0.27)	(0.28)	(0.17)	(0.00)	(0.22)	(0.24)	(0.22)	(0.22)	(0.00)	(0.11)	(0.33)
ISCED 6/7	0.16	0.07	0.11	0.06	0.21	0.13	0.21	0.13	0.04	0.08	0.16	0.31
	(0.37)	(0.25)	(0.31)	(0.23)	(0.41)	(0.33)	(0.41)	(0.33)	(0.20)	(0.27)	(0.37)	(0.47)
Linguistic Distance	41.36	46.45	53.07	24.32	46.82	71.08	41.43	29.46	27.40	31.66	50.45	10.06
	(44.25)	(45.73)	(36.93)	(37.86)	(43.71)	(42.24)	(46.92)	(38.55)	(21.05)	(29.72)	(46.16)	(29.96)
Distance between capitals	3763.24	819.15	938.69	1224.08	4686.52	10726.36	4559.22	2376.89	680.39	1531.73	1460.44	659.64
	(4272.56)	(298.59)	(469.33)	(1843.50)	(4291.51)	(3901.37)	(4244.19)	(2945.99)	(1633.83)	(1903.56)	(2446.70)	(387.50)
Prose Literacy	245.83	212.66	237.05	230.50	257.90	264.01	246.77	250.26	212.12	260.41	267.57	253.72
	(72.99)	(75.04)	(67.70)	(57.18)	(51.63)	(59.77)	(85.69)	(53.28)	(61.43)	(57.23)	(84.02)	(51.89)
Document Score	246.62	215.08	252.36	236.84	261.37	266.49	246.38	247.81	209.27	265.93	268.11	252.97
	(78.24)	(84.09)	(63.03)	(60.49)	(57.83)	(60.61)	(92.67)	(56.86)	(66.81)	(67.55)	(76.14)	(58.39)
Quantitative Literacy	253.23	235.56	259.35	238.51	260.10	270.32	252.80	253.61	221.78	273.06	263.57	261.62
	(75.93)	(77.20)	(64.63)	(63.14)	(59.72)	(61.98)	(89.19)	(57.74)	(66.70)	(72.07)	(72.86)	(70.68)
Observations	1521	120	220	324	88	140	140	76	282	36	69	26

Notes: – Weighted means and standard deviations (in parantheses) by country. – CH(G): Switzerland (German), CH(F): Switzerland (French), CH(I): Switzerland (Italian), N: Netherlands, SW: Sweden, GB: Great Britain, I: Italy, SL: Slovenia, CZ: Czech Republic, FIN: Finland, HU: Hungary.

Table 2: Linguistic Distance: Computational Examples

Word	Spanish	English	Distance
you	*tu*	yu	1
not	*no*	nat	2
Person	*persona*	pers3n	2
Night	*noCe*	nEit	3
Mountain	*monta5a*	maunt3n	5

Source: Brown (2008).

Table 3: Closest and Furthest Languages

English				**German**			
Closest		Furthest		Closest		Furthest	
Language	*Distance*	*Language*	*Distance*	*Language*	*Distance*	*Language*	*Distance*
Dutch	63.22	Tamil	100.81	Swiss-German	48.34	Tamil	100.2
Norwegian	64.12	Turkish	101.04	Dutch	51.50	Hebrew	100.39
Swedish	64.40	Finnish	102.27	Norwegian	64.92	Indonesian	101.75
Danish	69.63	Somalian	103.03	Swedish	66.56	Malay	101.75
German	72.21	Vietnamese	104.06	Danish	66.96	Korean	104.3
French				**Czech**			
Closest		Furthest		Closest		Furthest	
Language	*Distance*	*Language*	*Distance*	*Language*	*Distance*	*Language*	*Distance*
Catalano	71.6	Irish	100.22	Slovak	32.59	Hebrew	99.55
Italian	73.89	Hungarian	100.65	Croatian	43.74	Vietnamese	99.72
Portuguese	74.36	Vietnamese	101.81	Serbian	43.74	Korean	99.85
Romanian	74.39	Japanese	101.94	Serbo-croatian	43.95	Chinese	101.12
Friulano	74.54	Korean	102.74	Polish	44.93	Japanese	101.76

Notes: – Source: Own calculations using programs for calculating ASJP distance matrices (Version 2.1), see `http://email.eva.mpg.de/~wichmann/software.htm`.

Table 4: Literacy and Linguistic Origin

	Prose	Document	Quantitative
Linguistic Distance	-0.328**	-0.128	-0.247*
	(0.09)	(0.10)	(0.11)
Ling. Dist. × Age at entry 12 or older	-0.446***	-0.518***	-0.413***
	(0.06)	(0.07)	(0.08)
Ling. Dist. × years since migration	0.013***	0.008**	0.011***
	(0.00)	(0.00)	(0.00)
Age at entry 12 or older	0.397	7.211†	9.333*
	(4.15)	(3.68)	(3.79)
Years since migration	-0.333	0.054	0.106
	(0.22)	(0.22)	(0.22)
Female	2.686	-8.694**	-17.621***
	(2.21)	(2.49)	(2.74)
Born 1940-49	30.436***	32.123***	25.491***
	(5.40)	(5.93)	(5.44)
Born 1950-59	37.270***	45.309***	40.902***
	(5.25)	(5.67)	(5.37)
Born 1960-69	35.115***	39.948***	36.678***
	(6.75)	(7.34)	(7.15)
Born 1970-84	50.196***	54.610***	42.278***
	(8.45)	(8.81)	(8.51)
ISCED 2	26.925***	26.830***	22.465***
	(3.48)	(3.81)	(3.94)
ISCED 3	52.008***	57.721***	58.877***
	(3.50)	(3.82)	(3.89)
ISCED 5	68.633***	65.066***	65.026***
	(4.28)	(4.71)	(5.05)
ISCED 6/7	78.334***	75.788***	76.834***
	(3.43)	(3.73)	(3.92)
Parents: ISCED 1	11.804†	10.320	11.091†
	(5.82)	(6.17)	(6.06)
Parents: ISCED 2	5.980	5.963	7.634
	(6.10)	(6.48)	(6.10)
Parents: ISCED 3	13.444†	12.657	17.285*
	(6.88)	(7.60)	(7.55)
Parents: ISCED 5	12.467†	16.517*	10.961
	(6.94)	(7.31)	(7.08)
Parents: ISCED 6/7	5.664	-0.679	-0.711
	(6.15)	(6.72)	(6.64)
Distance between capitals	-0.007	-0.008	-0.010*
	(0.01)	(0.00)	(0.00)
Destination-fixed effects	yes	yes	yes
Origin-fixed effects	yes	yes	yes
R^2	0.602	0.589	0.569
N	1521	1521	1521

*Notes: – Significant at: ***0.1% level; **1% level; *5% level; †10% level. – Standard errors in parantheses, computed using replicate weights and mean of plausible values to take sampling structure into account. – Education base category: ISCED1/No schooling. – Reference birth cohort: Born before 1940. – The dependent variable: Literacy test scores (range 0-500).*

Table 5: Literacy and Linguistic Origin: Gender Differences

	Men			Women		
	Prose	Document	Quantitative	Prose	Document	Quantitative
Linguistic Distance	-0.274**	-0.146†	-0.225*	-0.277**	-0.026	-0.149
	(0.08)	(0.08)	(0.09)	(0.09)	(0.11)	(0.09)
Ling. Dist. × Age at entry 12 or older	-0.529***	-0.505***	-0.397***	-0.389***	-0.641***	-0.570***
	(0.10)	(0.10)	(0.10)	(0.09)	(0.11)	(0.09)
Ling. Dist. × years since migration	0.009***	0.006*	0.005†	0.014***	0.009**	0.015***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age at entry 12 or older	9.807†	15.149*	20.125**	-12.498	-0.249	1.665
	(5.21)	(5.66)	(5.75)	(9.32)	(9.18)	(8.58)
Years since migration	0.099	0.619*	0.745*	-0.710*	-0.612†	-0.575†
	(0.23)	(0.24)	(0.28)	(0.27)	(0.30)	(0.29)
Born 1940-49	23.157**	21.437**	10.192	38.286***	43.966***	46.764***
	(6.52)	(6.16)	(6.03)	(7.57)	(8.53)	(7.78)
Born 1950-59	41.594***	49.708***	39.822***	26.804**	37.798***	44.449***
	(6.68)	(7.99)	(7.72)	(9.16)	(8.34)	(8.35)
Born 1960-69	48.550***	53.986***	44.440***	18.331†	23.869*	30.220**
	(7.23)	(7.83)	(8.39)	(9.61)	(9.82)	(9.72)
Born 1970-84	61.787***	69.886***	50.053***	41.432**	47.623**	47.498***
	(10.00)	(10.53)	(10.94)	(12.38)	(12.80)	(11.63)
ISCED 2	32.284***	33.407***	28.236***	10.470	8.967	4.328
	(5.77)	(5.52)	(5.86)	(6.20)	(7.51)	(6.67)
ISCED 3	44.957***	55.948***	53.876***	50.095***	49.221***	49.887***
	(5.35)	(5.46)	(5.28)	(6.67)	(8.07)	(7.53)
ISCED 5	63.326***	59.439***	56.837***	56.276***	51.409***	53.167***
	(6.51)	(6.20)	(6.12)	(6.57)	(7.69)	(7.32)
ISCED 6/7	79.161***	84.523***	80.118***	66.640***	53.898***	58.813***
	(6.35)	(7.40)	(6.11)	(6.54)	(6.97)	(6.16)
Parents: ISCED 1	13.857**	10.739*	20.588***	28.156**	26.858***	19.943**
	(4.75)	(4.19)	(5.18)	(7.58)	(6.38)	(6.35)
Parents: ISCED 2	12.715*	5.636	15.784**	13.160†	18.377*	14.311*
	(5.35)	(4.42)	(5.10)	(6.79)	(6.82)	(6.54)
Parents: ISCED 3	15.178*	8.864	20.995*	23.976**	24.878**	19.189**
	(6.73)	(7.46)	(8.09)	(6.99)	(6.76)	(6.76)
Parents: ISCED 5	16.344†	18.864†	25.114**	31.994**	42.727***	25.387**
	(8.26)	(9.77)	(8.14)	(9.70)	(8.01)	(8.47)
Parents: ISCED 6/7	11.120*	1.492	12.433†	25.746*	21.122*	10.587
	(4.96)	(5.16)	(6.19)	(9.77)	(9.44)	(8.89)
Distance between capitals	-0.034*	-0.030†	-0.044*	0.008	0.002	0.002
	(0.02)	(0.02)	(0.02)	(0.00)	(0.01)	(0.01)
Destination-fixed effects	yes	yes	yes	yes	yes	yes
Origin-fixed effects	yes	yes	yes	yes	yes	yes
R^2	0.689	0.678	0.651	0.649	0.641	0.635
N	871	871	871	650	650	650

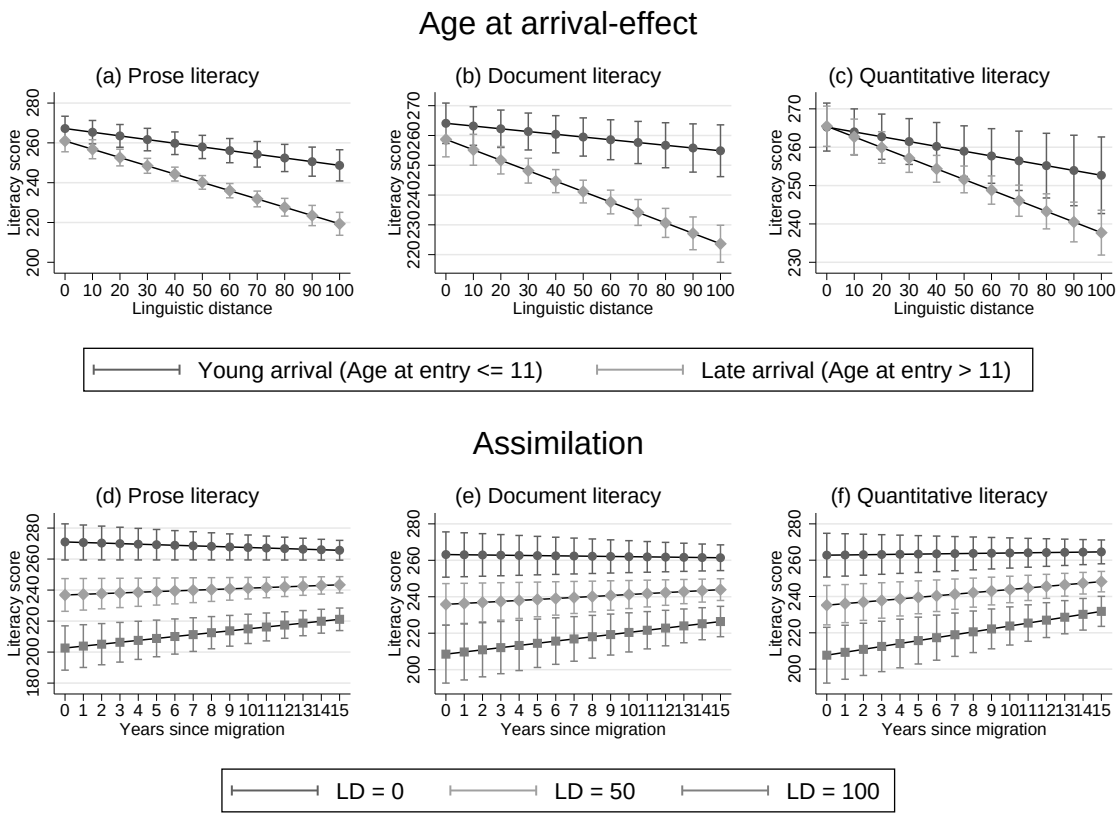
*Notes: – Significant at: ***0.1% level; **1% level; *5% level; †10% level. – Standard errors in parantheses, computed using replicate weights and mean of plausible values to take sampling structure into account. – Education base category: ISCED1/No schooling. – Reference birth cohort: Born before 1940. – The dependent variable: Literacy test scores (range 0-500).*

Table 6: Literacy and Linguistic Origin: Robustness checks

	(1)	(2)	(3)	(4)
Linguistic Distance	-0.288**	-0.279**	-0.322**	-0.263*
	(0.09)	(0.08)	(0.11)	(0.10)
Ling. Dist. × Age at entry 12 or older	-0.438***	-0.468***	-0.395***	-0.385***
	(0.06)	(0.06)	(0.08)	(0.08)
Ling. Dist. × years since migration	0.012***	0.012***	0.013***	0.012***
	(0.00)	(0.00)	(0.00)	(0.00)
Migrant stock	0.015**			0.014*
	(0.00)			(0.01)
Cultural distance		-18.597*		-36.300***
		(7.98)		(9.21)
Labor force participation			17.535***	19.138**
			(4.46)	(5.41)
Wage quintile			1.645	1.521
			(1.56)	(1.68)
Destination-fixed effects	yes	yes	yes	yes
Origin-fixed effects	yes	yes	yes	yes
R^2	0.606	0.606	0.605	0.620
N	1521	1444	1238	1176

*Notes: – Significant at: *** 0.1% level; ** 1% level; * 5% level; † 10% level. – Standard errors in parantheses, computed using replicate weights and mean of plausible values to take sampling structure into account. – Further controls omitted: Own and parental education, gender, birth cohort, geographical distance. – The dependent variable: Prose literacy test scores (range 0-500).*

Figure 2: Interaction Effects: Linguistic Distance, Age at Entry and Years since Migration



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9 Appendix

Table 7: Literacy and Linguistic Origin, Excluding Native Speakers

	Prose	Document	Quantitative
Linguistic Distance	-0.837**	-0.980*	-1.193**
	(0.23)	(0.37)	(0.38)
Ling. Dist. × Age at entry 12 or older	-0.391*	-0.514**	-0.385*
	(0.15)	(0.14)	(0.14)
Ling. Dist. × years since migration	0.029***	0.021**	0.018**
	(0.01)	(0.01)	(0.01)
Age at entry 12 or older	22.201	14.672	9.871
	(13.79)	(11.30)	(10.96)
Years since migration	-0.885	-0.555	-0.261
	(0.53)	(0.58)	(0.56)
Female	-0.951	-12.758*	-22.006***
	(4.05)	(4.94)	(4.87)
Born 1940-49	40.718***	29.889**	24.075**
	(6.53)	(7.98)	(7.41)
Born 1950-59	61.420***	56.657***	51.278***
	(6.78)	(9.95)	(9.34)
Born 1960-69	55.527***	50.707***	44.676***
	(6.49)	(11.82)	(10.85)
Born 1970-84	87.568***	84.299***	64.132***
	(8.83)	(14.04)	(13.25)
ISCED 2	38.887***	8.681	2.198
	(6.33)	(7.52)	(7.19)
ISCED 3	64.617***	46.049***	43.908***
	(6.17)	(6.24)	(5.89)
ISCED 5	94.265***	59.532***	58.103***
	(7.22)	(9.30)	(9.66)
ISCED 6/7	122.861***	82.735***	82.784***
	(8.57)	(7.41)	(6.58)
Parents: ISCED 1	16.625**	17.561**	20.486***
	(5.51)	(5.89)	(5.36)
Parents: ISCED 2	15.884†	2.799	3.683
	(7.96)	(9.25)	(8.82)
Parents: ISCED 3	30.977**	19.845*	24.022*
	(8.57)	(9.30)	(9.02)
Parents: ISCED 5	-3.945	2.454	7.839
	(10.49)	(8.39)	(8.28)
Parents: ISCED 6/7	-3.444	-16.309*	-13.540†
	(7.31)	(7.81)	(7.59)
Distance between capitals	0.004***	-0.011	-0.014
	(0.00)	(0.01)	(0.01)
Destination-fixed effects	yes	yes	yes
Origin-fixed effects	yes	yes	yes
R^2	0.432	0.646	0.633
N	830	830	830

*Notes: – Significant at: ***0.1% level; **1% level; *5% level; †10% level. – Standard errors in parantheses, computed using replicate weights and mean of plausible values to take sampling structure into account. – Education base category: ISCED1/No schooling. – Reference birth cohort: Born before 1940. – The dependent variable: Literacy test scores (range 0-500). – Native-speakers with LD = 0 are excluded from the estimations.*

Table 8: Different Thresholds for Critical Period

	(1)	(2)	(3)	(4)
Prose literacy				
Linguistic distance	-0.613***	-0.460***	-0.535***	-0.482***
	(0.10)	(0.09)	(0.09)	(0.08)
Ling. Dist. × Age at entry older than 5	-0.133†			
	(0.07)			
Age at entry older than 5	7.713†			
	(4.00)			
Ling. Dist. × Age at entry older than 8		-0.307***		
		(0.06)		
Age at entry older than 8		-4.098		
		(3.33)		
Ling. Dist. × Age at entry older than 11			-0.231***	
			(0.06)	
Age at entry older than 11			-6.251	
			(3.87)	
Ling. Dist. × Age at entry older than 14				-0.288***
				(0.06)
Age at entry older than 14				-6.035
				(4.44)
R^2	0.402	0.409	0.407	0.411
N	1521	1521	1521	1521
Document literacy				
Linguistic distance	-0.582***	-0.321**	-0.380***	-0.307**
	(0.10)	(0.10)	(0.09)	(0.09)
Ling. Dist. × Age at entry older than 5	-0.034			
	(0.06)			
Age at entry older than 5	0.611			
	(3.74)			
Ling. Dist. × Age at entry older than 8		-0.317***		
		(0.06)		
Age at entry older than 8		-6.936*		
		(3.02)		
Ling. Dist. × Age at entry older than 11			-0.258***	
			(0.06)	
Age at entry older than 11			-5.393	
			(3.90)	
Ling. Dist. × Age at entry older than 14				-0.342***
				(0.06)
Age at entry older than 14				-1.210
				(4.99)
R^2	0.359	0.368	0.366	0.369
N	1521	1521	1521	1521
Quantitative literacy				
Linguistic distance	-0.675***	-0.397***	-0.453***	-0.351***
	(0.12)	(0.11)	(0.10)	(0.09)
Ling. Dist. × Age at entry older than 5	0.092			
	(0.07)			
Age at entry older than 5	8.291*			
	(3.40)			
Ling. Dist. × Age at entry older than 8		-0.208**		
		(0.07)		
Age at entry older than 8		1.411		
		(3.08)		
Ling. Dist. × Age at entry older than 11			-0.152*	
			(0.06)	
Age at entry older than 11			0.220	
			(3.59)	
Ling. Dist. × Age at entry older than 14				-0.272***
				(0.06)
Age at entry older than 14				4.348
				(4.37)
R^2	0.373	0.373	0.372	0.376
N	1521	1521	1521	1521

*Notes: – Significant at: ***0.1% level; **1% level; *5% level; †10% level. – Standard errors in parantheses, computed using replicate weights and mean of plausible values to take sampling structure into account. – Omitted variables and specification: see Table 4 – The dependent variable: Literacy test scores (range 0-500).*

Table 9: Matrix of Linguistic Distance

Test language	Czech	Dutch	French	German	English	Finnish	Italian	Swedish	Hungarian	Slovenian
Albanian	93.23	95.86	94.03	95.78	95.64	98.77	93.75	98.36	98.54	93.17
Arabic	99.48	100	97.20	98.96	97.95	98.15	96.56	98.02	98.68	98.97
Byelorussian	51.32	92.94	93.05	90.27	90.28	99.13	92.54	91.47	93.68	53.04
Catalano	89.90	89.53	71.60	89.45	86.51	100.94	64.03	93.13	100.33	89.95
Chinese	101.12	99.68	98.74	99.43	98.67	101.52	99.02	99.51	102.53	99.95
Croatian	43.74	90.99	89.18	91.98	87.79	97.89	89.29	89.41	94.55	28.79
Czech	0.00	92.96	90.49	92.04	90.98	97.76	89.52	91.65	94.58	35.40
Danish	94.24	66.92	93.11	66.96	69.63	100.67	90.06	50.73	98.55	91.68
Dutch	92.96	0.00	91.06	51.50	63.22	99.00	87.28	64.95	99.16	90.92
English	90.98	63.22	91.02	72.21	0.00	102.27	89.23	64.40	95.22	90.46
Estonian	98.51	97.77	98.57	95.51	98.77	45.59	97.80	96.95	86.19	97.11
Finnish	97.76	99.00	98.08	96.31	102.27	0.00	100.46	98.11	84.53	97.35
French	90.49	91.06	0.00	95.87	91.02	98.08	73.89	93.95	100.65	90.92
Friulano	92.73	91.04	74.54	95.80	89.96	100.72	64.95	91.28	99.43	92.69
German	92.04	51.50	95.87	0.00	72.21	96.31	87.89	66.56	98.43	88.66
Greek	96.42	96.02	95.08	97.25	97.15	100.2	92.01	96.65	97.60	97.21
Hebrew	99.55	98.29	93.26	100.39	97.49	99.16	98.57	95.79	96.76	100.26
Hungarian	94.58	99.16	100.65	98.43	95.22	84.53	101.03	97.92	0.00	93.94
Indonesian	98.88	101.09	99.91	101.75	99.28	99.41	95.49	100.96	97.98	98.46
Irish	94.08	99.39	100.22	95.20	96.02	96.20	96.93	97.50	100.31	92.09
Italian	89.52	87.28	73.89	87.89	89.23	100.46	0.00	91.12	101.03	87.76
Japanese	101.76	101.92	101.94	100.14	99.39	96.98	99.80	100.34	98.18	102.19
Korean	99.85	99.04	102.74	104.3	99.12	100.18	98.51	99.44	100.92	96.96
Macedonian	50.58	91.08	89.68	89.08	91.21	96.26	87.90	92.85	97.04	35.45
Malay	98.88	101.09	99.91	101.75	99.28	99.41	95.49	100.96	97.98	98.46
Moroccan	99.48	100	97.20	98.96	97.95	98.15	96.56	98.02	98.68	98.97
Norwegian	90.57	63.29	94.38	64.92	64.12	101.21	91.67	45.52	99.17	88.90
Persian	94.93	92.19	91.11	93.89	94.31	97.36	90.31	98.93	99.38	93.92
Polish	44.93	94.55	92.89	96.09	93.80	95.28	91.11	95.28	95.59	46.51
Portuguese	95.49	94.86	74.36	93.59	95.18	99.44	62.50	95.47	99.04	93.82
Punjabi	93.26	92.09	95.56	91.81	97.38	96.34	86.19	93.90	94.43	93.64
Romanian	90.37	87.21	74.39	87.66	85.55	99.53	52.03	92.85	99.25	88.61
Romansch	87.89	90.16	77.73	92.15	89.04	99.23	72.12	91.70	100.48	86.31
Romany (gypsy)	96.49	97.19	92.37	93.05	98.98	98.08	90.51	96.88	97.81	93.33
Russian	60.40	95.19	92.83	94.41	94.02	96.49	95.24	96.67	96.96	56.65
Serbian	43.74	90.99	89.18	91.98	87.79	97.89	89.29	89.41	94.55	28.79
Serbo-croatian	43.95	91.26	89.89	91.49	88.40	96.63	89.40	87.91	96.84	33.94
Slovak	32.59	92.17	90.81	93.05	91.99	98.76	91.53	90.71	95.80	44.26
Somalian	99.00	98.97	100.07	100.15	103.03	97.17	98.90	99.58	100.83	100.14
Spanish	90.55	91.82	81.07	94.69	93.08	99.18	56.51	93.31	102.12	90.90
Swedish	91.65	64.95	93.95	66.56	64.40	98.11	91.12	0.00	97.92	90.22
Swiss-german	89.68	68.27	93.23	48.34	73.51	94.65	90.78	71.17	98.00	87.48
Tamil	97.37	96.93	96.82	100.2	100.81	99.57	99.97	101.62	101.93	98.18
Turkish	98.81	102.33	98.12	99.91	101.04	96.70	98.22	101.35	94.55	98.89
Ukrainian	60.23	95.06	95.41	94.00	97.35	99.12	94.70	92.87	95.77	54.34
Vietnamese	99.72	100.81	101.81	96.14	104.06	97.80	100.39	99.17	98.86	101.25

Notes: – Source: Own calculations using programs for calculating ASJP distance matrices (Version 2.1), see `http://email.eva.mpg.de/~wichmann/software.htm`.