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Cultural differences and immigrants' wages

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Cultural differences and immigrants' wages

Morgan Raux *

January 27, 2021

Abstract

In this paper, I investigate how cultural differences affect the labor-market performance of immigrant workers in Germany. I document a negative relationship between hourly wages and the cultural distance between immigrants' countries of origin and Germany. This result is robust across the three main indicators used in the gravity literature: linguistic, religious, and genetic distances. This cultural wage penalty disappears after five to ten years spent in Germany. Controlling for language proficiency as well as for selective in- and out-migration, these results highlight the cultural integration of immigrant workers. I finally provide evidence suggesting that lower wage progression may be explained by fewer job-to-job transitions.

Keywords: Cultural distance, Immigrant Workers.

JEL Classification: J61, Z10.

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1 Introduction

Expected performance on the labor market influences migration decisions.[1] Chiswick (1978) first mentions the role of linguistic and cultural dimensions on the labor market performance of recent immigrants. Since then, the literature has mostly focused on the linguistic dimension.[2] This research highlights the positive impact of language proficiency on labor-market outcomes and how the acquisition of linguistic skills fosters economic integration. Isphording and Otten (2014) show that acquiring these skills is more difficult for immigrants whose origin and destination languages are more linguistically distant. These results help to explain the negative effect of linguistic distance on migration flows.[3] In addition to the role of language, cultural differences between countries also reduce migration flows.[4] But contrary to language, we know little about the effect of cultural differences on labor-market performance. The only available results relate to the wage penalty associated with the adoption of an ethnic identity (Islam and Raschky, 2015).[5] However, these results depend on immigrants' choices and the literature does not explore the overall effect of cultural differences. In this paper, I go beyond the scope of ethnic identity and investigate how cultural differences in general affect the labor market performance of immigrant workers in Germany.

This paper documents a wage penalty associated with cultural differences between Germany and immigrants' countries of origin. It also illustrates the cultural integration of immigrant workers, as this penalty disappears after five to ten years spent in Germany. I exploit the heterogeneity of immigrants' origins recorded in the German Socio-Economic Panel (GSOEP) to measure cultural differences at the country level. I successively consider religious, linguistic, and genetic distances: the main bilateral indices from the trade and migration literatures.

[1] Sjaastad (1962) Borjas (1987)

[2] McManus et al. (1983), Dustmann and Soest (2002), Dustmann and Fabbri (2003), Bleakley and Chin (2004), Chiswick and Miller (2012), Guven and Islam (2015) and Lochmann et al. (2018)

[3] Adsera and Pytlikova (2015) document the negative relationship between linguistic distance and migration flows.

[4] Perdersen et al. (2008), Mayda (2010), Belot and Ederveen (2012), Adsera and Pytlikova (2015)

[5] Mason (2004), Battu and Zenou (2010), Casey and Dustmann (2010) and Bisin et al. (2011) provide additional evidence in this literature.

The results are robust across these three indices. I also control for the unobserved abilities of immigrants. I distinguish between static and dynamic selection issues. I include individual fixed effects in the regressions to eliminate the former. I then implement several robustness tests to ensure that the results are not driven by the latter. I also show that this result reflects cultural dimensions other than linguistic skills by controlling for fluency in German. Finally, I explore the mechanism that drives the results and document a negative relationship between immigrants' cultural distance and job-to-job transitions: an important source of wage progression.

In this paper, I use bilateral indices to measure the cultural differences experienced by immigrant workers in Germany. I successively examine religious, linguistic and genetic distances between Germany and immigrants' countries of origin, which respectively depend on the history of religions, languages and populations across countries. According to Spolaore and Wacziarg (2016), cultural differences "include language and religion but also a broader set of norms, values and attitudes that are transmitted intergenerationally and therefore display persistence over long stretches of time". The first index is based on the family tree of religions (Fearon and Laitin, 2003), which reflects their successive divisions throughout history. Within this tree, religions are first grouped into broad categories, and then broken down into more precise classifications. The religious distance index constructed by Spolaore and Wacziarg (2016) depends on the number of ramifications shared by each pair of religions. Linguistic and genetic distances follow the same logic (Spolaore and Wacziarg, 2016). All three indices measure cultural differences at the country-pair level. They depend on the relative representation of religions, languages and genes in each country. In this paper, I exploit these country variations to measure the effect of cultural differences on wages. To this end, I exploit the heterogeneity of immigrants' origins observed in the GSOEP.

I quantify how cultural differences affect immigrants' wages over the time spent in Germany. I identify the effect of culture by regressing the log of hourly wages on the interaction between cultural-distance indices and the number of years spent in Germany. The benchmark

specifications control for most individual and firm characteristics. I include employment experience, employment status, firm size, occupation and industry fixed effects. More importantly, I exploit the longitudinal feature of the GSOEP by including individual fixed effects. In this way, I eliminate the constant unobserved ability of immigrant workers. I also implement several robustness tests to ensure that the effect is not driven by dynamic selection issues. As the value of cultural distance is fixed for each individual, I capture its effect by focusing on its interaction with the number of years spent in Germany, which enables me to examine how cultural differences affect the labor market performance of immigrant workers over time. Finally, I also control for fluency in German, which allows me to separate the effect of cultural values, norms and behaviors from linguistic skills, in view of the fact that both dimensions can be correlated.

The final section of the paper shows that cultural distance is associated with fewer occupational changes. In a similar manner to wages, this negative relationship disappears after ten years spent in Germany. This result highlights one of the mechanisms driving the cultural wage penalty. The dynamics of occupational changes are similar to the evolution of immigrants' wages. They both show that the negative effect of cultural differences on labor market performance disappears after a few years spent in Germany. Replicating the analysis with a sub-sample of immigrants who had all spent at least twenty years in Germany did not change the results. This robustness test shows that the results are not driven by composition effects. In particular, it rejects the role of selective out-migration. Overall, these results suggest that immigrant workers become culturally integrated into the German labor market. Over time, they progressively acquire cultural norms specific to their new working environment, and suffer less discrimination.

By documenting the cultural wage penalty of immigrant workers, this paper contributes to the literature that quantifies the effect of culture on labor-market outcomes. Mason (2004), Battu and Zenou (2010), Casey and Dustmann (2010), Bisin et al. (2011) show that immigrants reporting a stronger ethnic identity have poorer employment prospects. Islam

and Raschky (2015) is the closest study to my own work. In this paper, the authors use a measure of the genetic distance between Canada and immigrants' countries of origin to instrumentally determine their degree of ethnic identity. They use this instrumental variable approach to study the effect of ethnic identity on wages and employment. While they do not find any effect on wages, their results for employment are consistent with the aforementioned papers. I differ from this paper by exploring the overall effect of cultural differences rather than exclusively focusing on the role of ethnic identity. In this manner, I study the cultural penalties applying to all immigrant workers. I also address endogeneity issues in a different way. In their instrumental variable approach, Islam and Raschky (2015) assume that cultural distance is orthogonal to the unobserved ability of immigrant workers. My results reject this assumption in the context of Germany. This is why I rely on individual fixed-effect specifications controlling for this source of endogeneity. Finally, I complement their approach by comparing the results obtained with the three main indices used in both trade and migration literatures. Fernandez et al. (2004), Fernandez (2007), Fernandez and Fogli (2009), Blau et al. (2011), Blau et al. (2013), Blau and Kahn (2015) highlight how the transmission of cultural traits related to fertility decisions affects the female labor supply. My paper complements this literature by exploring the effect of culture on labor-market outcomes at the intensive margin. Moreover, it explores the effect of culture for both immigrant men and women. Finally, McManus et al. (1983), Dustmann and Soest (2002), Dustmann and Fabbri (2003), Bleakley and Chin (2004), Chiswick and Miller (2012), Guven and Islam (2015) and Lochmann et al. (2018) report consistent evidence indicating the negative effect of language deficiency on labor-market outcomes. My results complement this literature. By controlling for linguistic skills, I show that other cultural dimensions affect immigrants' wages. Studying how cultural aspects affect labor-market outcomes independently of language is particularly important, as integration policies only consider culture through the lens of language.

The results of this paper suggest that immigrant workers are progressively integrated into the German labor market. Therefore, these findings complement the literature studying the

economic assimilation of immigrants. Chiswick (1978) documents the earnings gap between native and immigrant workers in the United States. He also uses successive census cross-sections to show how this gap closes over several decades. Chiswick argues that this pattern results from the assimilation of immigrant workers into the US labor market. Borjas (1985) argues that the narrowing wage gap observed in the data results from a decline in productivity throughout the successive cohorts of immigrants. Using longitudinal data, Lubotsky (2007) and Abramitzky et al. (2014) attribute the decreasing wage gap to the effects of selective immigration. Finally, Dustmann and Görlach (2016) highlight the role of selective out-migration as an additional explanation for this earnings pattern. These papers provide evidence that qualify the degree of economic integration experienced by immigrant workers. In this paper, I control for selective in- and out-migration. However, my results still highlight the integration pattern of immigrant workers into the German labor market.

Finally, this paper contributes to the literature studying the influence of culture on migration decisions. It first builds on the work of Belot and Ederveen (2012) and Adsera and Pytlikova (2015) who explore the effects of cultural distance on bilateral migration flows. In the present paper, I use the same measures of cultural differences to assess their effects on wages. Other papers present evidence on this relationship at the micro level. Docquier et al. (2019) show that cultural traits matter in the choice of migration destination. Falck et al. (2016) estimate the psychic migration cost resulting from cultural differences between places of origin and destination. By documenting the wage penalty associated with the cultural differences of immigrants, my paper highlights another channel through which cultural aspects can affect migration decisions.

The rest of the paper is structured in the following manner. Section 2 introduces the fixed effects specification and the empirical strategy used to address endogeneity issues. Section 3 presents the two sources of data and starts by describing the cultural distance indices. It then presents the German Socio-Economic Panel and highlights the key features on which the identification strategy is based. Section 4 presents the results. It first focuses on the

wage penalty experienced by immigrant workers upon their arrival in Germany, and then describes the dynamics and pattern of integration. Finally, Section 5 explores alternative interpretations of the results. It shows that the effects are not the result of selective in- and out-migration. Section 6 concludes this paper.

2 Empirical strategy

This section presents the empirical strategy of the paper. The first part describes the main specification in order to identify the effect of cultural distance on hourly wages. The second part presents the identification concerns and the strategy implemented to address these issues.

2.1 Econometric specification

This paper quantifies the wage penalty associated with cultural differences. To interact and work with each other, individuals need to share a common set of norms and values, usually referred to as their "culture". On the one hand, this common set of norms and values is, by definition, a decreasing function of cultural differences. On the other hand, it increases as individuals spend time in the same environment. I approximate the first component using cultural distance indices measured at the country level. I use the number of years spent in Germany as a proxy for the second component. Therefore, I estimate the effect of cultural differences on wages by focusing on the interaction between cultural distance indices and a series of dummy variables measuring years since migration in five-year intervals. The main specification uses variations over time (indexed by t) and across immigrant workers (indexed by i), as follows:

$$\log(w_{it}) = \eta_i + \sum_y [\beta_y \text{YSM}_{iy(t)} \times \text{CD}_{O(i)}] + \gamma X_{it} + u_{it}. \quad (1)$$

This specification follows the standards of the literature. The dependent variable is the logarithm of hourly wages denoted w_{it}. I focus on the changes in the wage penalty associated with the cultural distance ($\text{CD}_{O(i)}$) between the country of origin O of individual i and

Germany. I use variations at the country level and take into account the weight of each country in my estimations. I successively estimate equation (1) based on the main indicators of cultural distance used in the migration literature (Belot and Ederveen, 2012, Adsera and Pytlikova, 2015). These indices depend on the distribution of religions, languages and genes in each of the immigrants' countries of origin. I study the evolution of this effect through the interaction terms between the cultural distance indices and a series of dummy variables measuring the number of years spent in Germany in five-year intervals, denoted $\sum_y \text{YSM}_{iy(t)}$. I measure the number of years spent in Germany as the difference between the year in which immigrants participated in the survey and the first year in which they arrived in Germany. This approach estimates the relationship between cultural distance and earnings separately for each five-year spell. The reference group consists of immigrants who have spent at least 30 years in Germany, representing eight percent of the individuals. I control for the unobserved ability of immigrant workers through individual fixed effects denoted η_i. Section 2.2 provides additional explanations about this dimension. I also control for most individual and firm characteristics. This set of control variables is denoted X_{it}. In particular, it includes a self-reported measure of proficiency in spoken German. In this way, the coefficient associated with cultural distance identifies a channel other than linguistic skills through which cultural differences affect the labor market performance of immigrant workers.

The main specification controls for proficiency in the German language. I identify a channel other than linguistic skills through which cultural differences affect the labor market performance of immigrant workers. Isphording and Otten (2014) show that cultural distance is a good predictor of immigrants' proficiency in their destination language. Without controlling for fluency in German in equation (1), the coefficient of interest (β) could capture variations associated with linguistic skills. I use the GSOEP, which includes a self-reported measure of language fluency, to separate both channels. It is particularly important to identify the effect of cultural differences independently of the linguistic dimension, as it sheds light on another dimension that can be used to enhance integration policies.

In addition to proficiency in German, the main specification enables more precise identification by controlling for many other covariates. I ensure that the effect of cultural differences on wages is not driven by any composition effect due to the sorting of immigrant communities into specific industries or occupations. The set of control variables X_{it} also includes the number of years spent on the labor market in both linear and quadratic terms. It also takes into account the expected length of stay in Germany, the number of years spent in the current occupation, the industry and occupation fixed effects, and the size of the company. Moreover, it controls for time fixed effects corresponding to the year in which the interview was conducted. It also accounts for specific employment status, such as part-time employment or vocational training. Finally, it also controls for any job and wage polarization that occurred over the period of analysis. It ensures that the estimation of interest is not driven by such phenomena by interacting the industry and occupation fixed effects with the years of the survey in linear form.

2.2 Addressing selection concerns

The unobserved ability of immigrant workers is usually a potential co-founder when studying the determinants of immigrants' wages. In order to assess the role of unobserved ability in this analysis, I separately consider the static and dynamic dimensions of the effect of cultural distance on immigrants' wages. Equation 1 first identifies the static dimension by measuring the effect of cultural differences at the beginning of migration episodes. It then studies how this effect evolves during the time spent in the country. While unobserved ability may affect both dimensions, there are different ways to address this potential bias.

First, the initial effect of cultural distance on wages could be driven by a correlation between the unobserved ability of immigrant workers and their cultural distance from Germany. Indeed, the literature shows that cultural differences can affect both labor supply (Moriconi and Peri, 2019) and migration decisions (Docquier et al., 2019, Falck et al., 2016). The results of both channels therefore affect the selection of immigrant workers. To address this issue, I control for individual fixed effects (η_i) in equation 1. This strategy is based on the

assumption that the unobserved ability of immigrant workers is constant over time. Because cultural distance and unobserved ability are both constant over time, estimating the effect of cultural distance on log hourly wages with first differences resolves this issue. Nevertheless, interacting cultural distance with years since migration still allows me to identify the effect of interest. By controlling for individual fixed effects, the correlation between log hourly wages and cultural distance at the beginning of migration episodes can no longer be driven by unobserved ability.

Second, the dynamics of the effect could also be driven by a change in the average ability of immigrant cohorts that have successively arrived in Germany over time. Borjas (1987) describes this composition effect in the U.S. context. In this paper, the dynamic pattern could be driven by a change in the correlation between unobserved ability and cultural distance across successive cohorts. For instance, the relationship between cultural distance and wages, which increases over the years since migration, could result from the correlation between immigrants' ability and their cultural distance, which decreases across successive cohorts. Unfortunately, I was unable to remove this channel from my specification. As I control for specific variations associated with the years of the survey, the arrival cohorts and years since migration are perfectly correlated. Section 3 tests whether the results are driven by these changes across cohorts. It provides descriptive evidence mitigating the importance of this alternative scenario in the context of this paper. In addition, Section 5 implements a robustness analysis that supports the effect of cultural distance, independently of this selection channel.

Finally, the dynamics of the effect could also be driven by a change in the average ability of immigrants who successively leave Germany. This kind of selection based on return migration was first highlighted by Dustmann and Görlach (2016). In this paper, selection based on return migration could drive the dynamic pattern by changing the correlation between immigrants' ability and their cultural distance. For instance, if this correlation were greater for the group of immigrants who have spent more years in Germany, this might produce an

increasing trend in the relationship between cultural distance and wages over the years since migration. To ensure the identification of the cultural distance effect, Section 5 implements a robustness analysis excluding the return migration channel.

3 Data

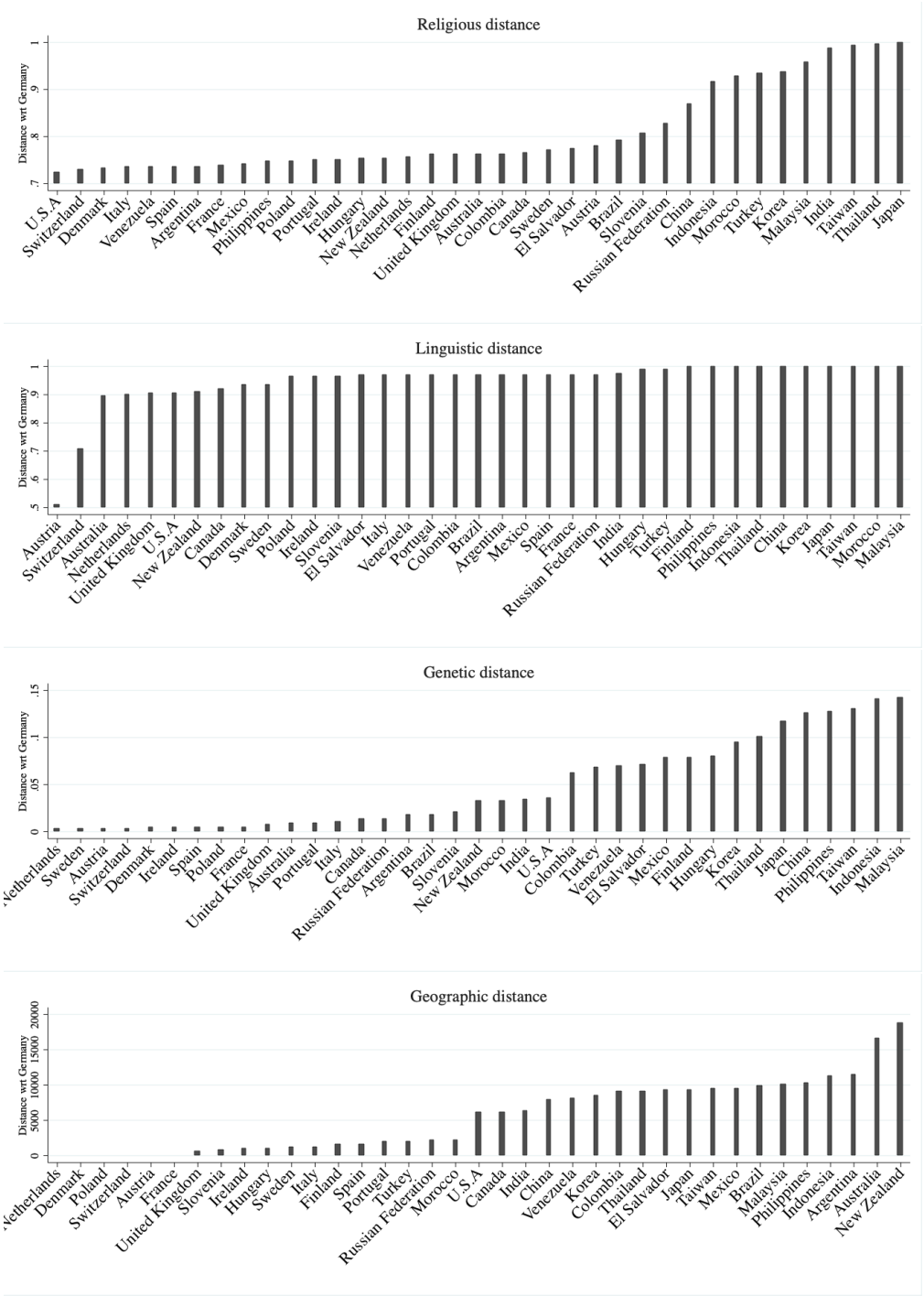
This paper relies on two sources of data. To measure cultural differences, I use bilateral indices of cultural distance. The first part of this section presents these indicators. To study immigrants' wages in Germany, I referred to the German Socio-Economic Panel. The second part of this section highlights the key features of this survey.

3.1 Cultural distance indices

In this paper, I measure cultural differences between the immigrants' origins and Germany by using bilateral indices of cultural distance. I rely on the three main indicators used in the migration literature: religious, linguistic and genetic distances. These indices have been used to quantify the effect of cultural differences on migration flows. I use these proxies to quantify the effect of cultural differences on the labor-market performance of immigrant workers. These measures depend on the composition of religions, languages and genes in each country. They take the cultural diversity of each country into account. Figure 1 presents the distribution of cultural distances with respect to Germany. It ranks countries from the closest to the most distant according to each index. Although the indices are globally correlated, significant differences persist. To assess the robustness of the results, I successively estimate the wage penalty based on each indicator. In this paper, I use data from Spolaore and Wacziarg (2016) to measure religious, linguistic and genetic distance. Finally, I also use a measure of geographic distance between countries as a placebo test. Figure 1 also presents the distribution of this index.

According to Spolaore and Wacziarg (2016), religious and linguistic distances are the best proxies for measuring cultural differences between countries. Both indices follow the same logic and depend on the history of populations. Spolaore and Wacziarg (2016) summarize

Figure 1: Distribution of cultural distance indices.

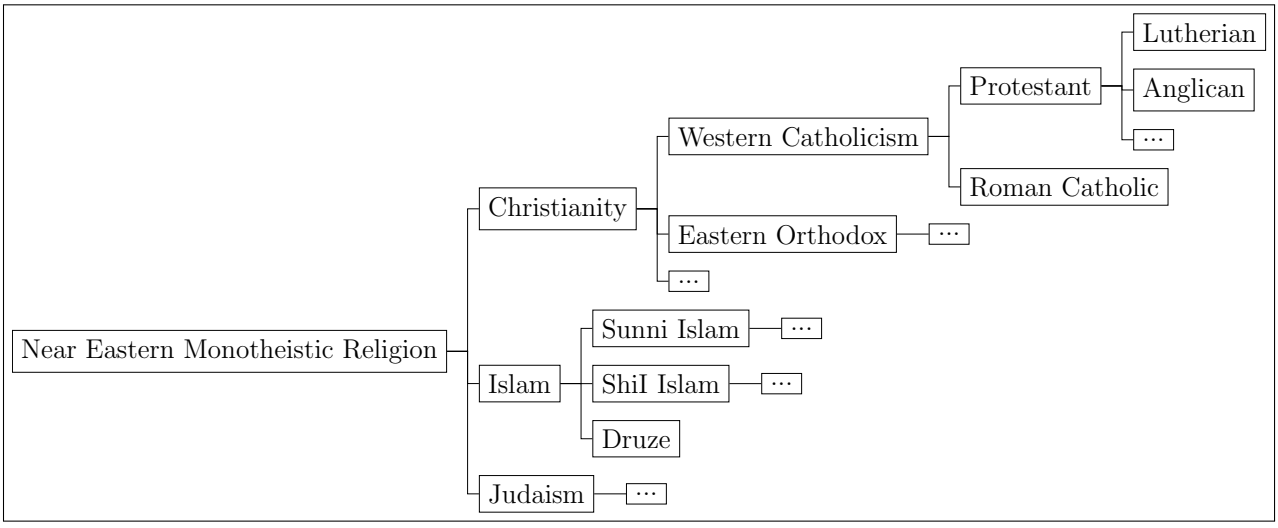


Notes: This graph plots the distribution of cultural distance indices. All distances are calculated with respect to Germany. These distances are presented on the y-axes. The first panel focuses on the religious distance between each country of origin and Germany. The second panel presents the ranking of countries according to linguistic distance. The third panel highlights the distribution of genetic distance. The final panel presents the ranking of countries according to geographic distance.**Source:** German Socio-Economic Panel 1984-2017

this idea as follows: "when populations split apart and diverge over the long span of history, their cultural traits also diverge. These cultural traits include language and religion but also a broader set of norms, values and attitudes that are transmitted intergenerationally and therefore display persistence over long stretches of time." This evolution can be graphically represented by a tree structure. Figure 2 presents one branch of the religion tree according to Fearon and Laitin (2003). The distance between two religions depends on the number of common nodes shared by them. The religious distance between two countries is then calculated as the weighted sum of the distances between both sets of religions represented in each country. Linguistic distance is also calculated using a tree-based approach and follows exactly the same logic.

The genetic distance between two countries is the third index used to measure cultural differences in the literature. This measure depends on the genetic composition of each country. Like religious and linguistic distances, it reflects the common history of nations. People with common ancestors share similar genes, but their genetic portfolios diverge from each

Figure 2: Religion tree from Fearon and Laitin (2003).



Notes: This graph represents one branch of the religion tree. Over the long span of history, religions and populations break away from each other. This graph summarizes these separations by highlighting the common origins of each religion. The distance between two religions therefore depends on the number of common nodes shared by them. **Source:** Fearon and Laitin (2003)

other as the number of generations separating these people from their common ancestor increases. From a global perspective, all human beings share a common ancestor: Homo sapiens. Genetic distance therefore reflects the history of population separations. The greater the differences between two genetic portfolios, the longer the duration since both populations were separated from each other. Measuring cultural differences according to genetic distance assumes that the divergence in cultural traits between two populations is positively correlated with the duration of their separation. In this paper, the cultural distance index is based on the genetic composition of the population calculated by Cavalli-Sforza et al. (1994). Appendix A.2 presents the calculation index.

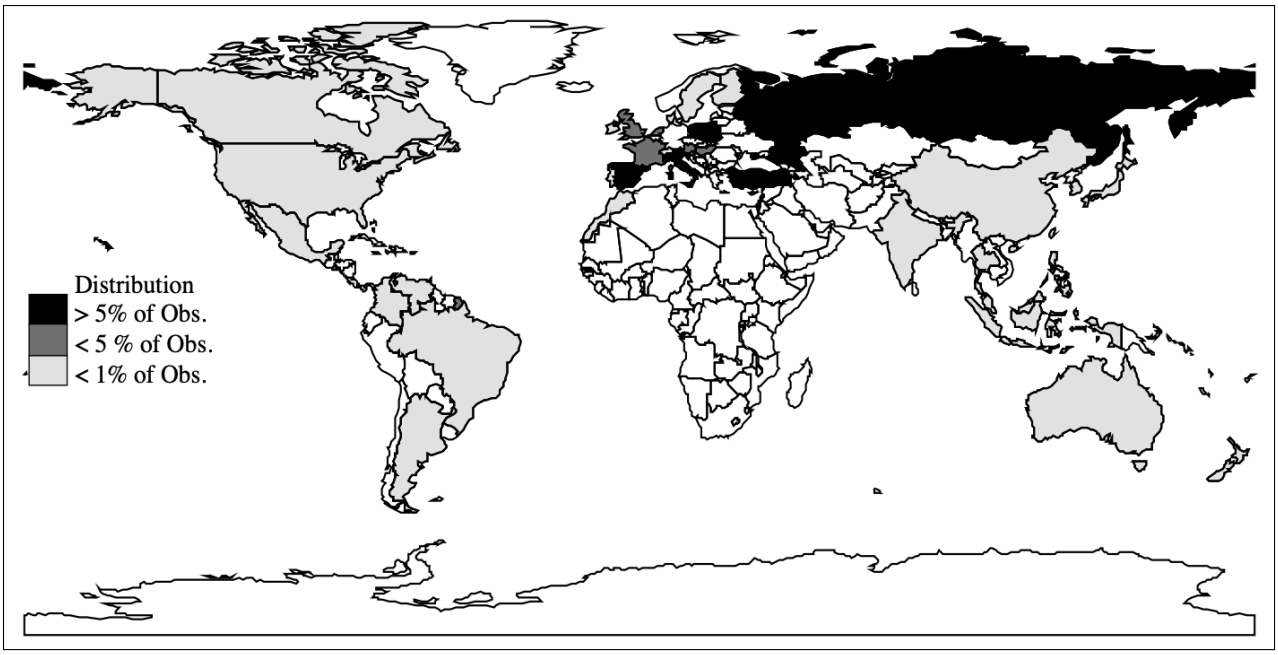
Finally, I also use a measure of geographic distance between immigrants' countries of origin and Germany as a placebo test for cultural differences. While geographic distance and cultural differences are partly correlated, the literature studying the determinants of migration flows (Perdersen et al., 2008, Mayda, 2010, Belot and Ederveen, 2012, Adsera and Pytlikova, 2015) shows that the results obtained with geographic distance differ from the results obtained with the three other proxies. In this paper, the geographic distance reflects the distance in kilometers separating the capital of each country from Berlin. Appendix A.2 compares the distribution of this index with the three others.

3.2 German Socio-Economic Panel: 1984-2017

This paper uses the German Socio-Economic Panel to study the determinants of immigrants' wages in Germany between 1984 and 2017. The identification strategy relies on three features of the survey. First, it exploits the heterogeneity of immigrants' origins to measure cultural differences with bilateral indicators. Second, it relies on the longitudinal dimension of the data to address endogeneity issues related to the unobserved ability of immigrant workers. Finally, it exploits the information on proficiency in the German language to identify the effect of cultural differences, independently of the role of linguistic skills. While this section only focuses on the dimensions used in the regressions, Appendix B provides additional descriptive statistics to characterize the composition of the sample.

To measure the cultural differences experienced by immigrant workers in Germany, this paper uses bilateral indices at the country level. These indicators come from the literature studying the effect of cultural differences on trade or migration flows between countries. Using these indices within individual wage regressions requires significant variations in the immigrants' countries of origin. The GSOEP meets this requirement. My final sample consists of 5,111 immigrant workers born in 37 different countries, and includes immigrants interviewed by the GSOEP between 1984 and 2017. Finally, It removes cells with missing values for the variables included in the main specification (see Section 2). Figures 3 and 4 present the distribution of immigrants' origins worldwide and in Europe, and show that most of the immigrants included in this sample come from European countries. Nevertheless, the sample also includes highly heterogeneous origins from more distant countries in Asia and

Figure 3: Distribution of immigrants by country of origin in the world.

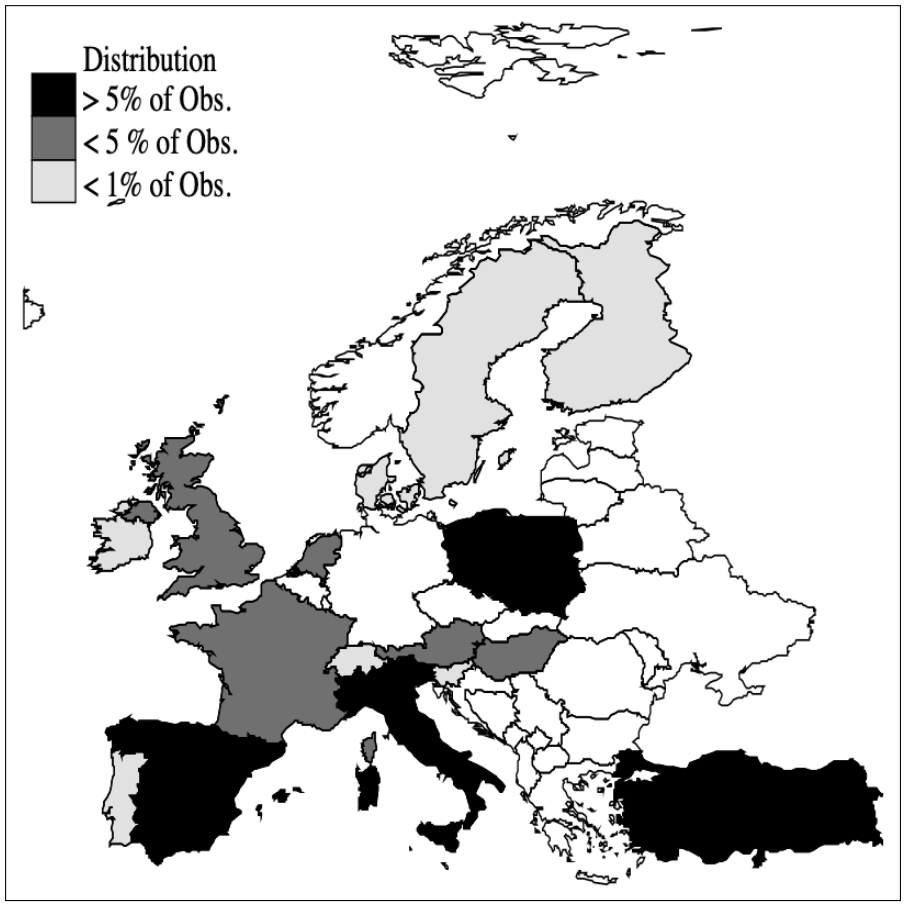


Notes: This graph presents the distribution of immigrant workers in Germany by country of origin. The sample consists of 5,111 individuals born in 37 different countries. Countries shaded in light gray send less than one percent of the sample. Countries shaded in gray send between one and five percent of the sample. Countries shaded in black send more than five percent of the sample.
Source: German Socio-Economic Panel 1984-2017

Oceania, as well as North and South America. This distribution enables me to study the effect of cultural differences from both neighboring and very distant countries.

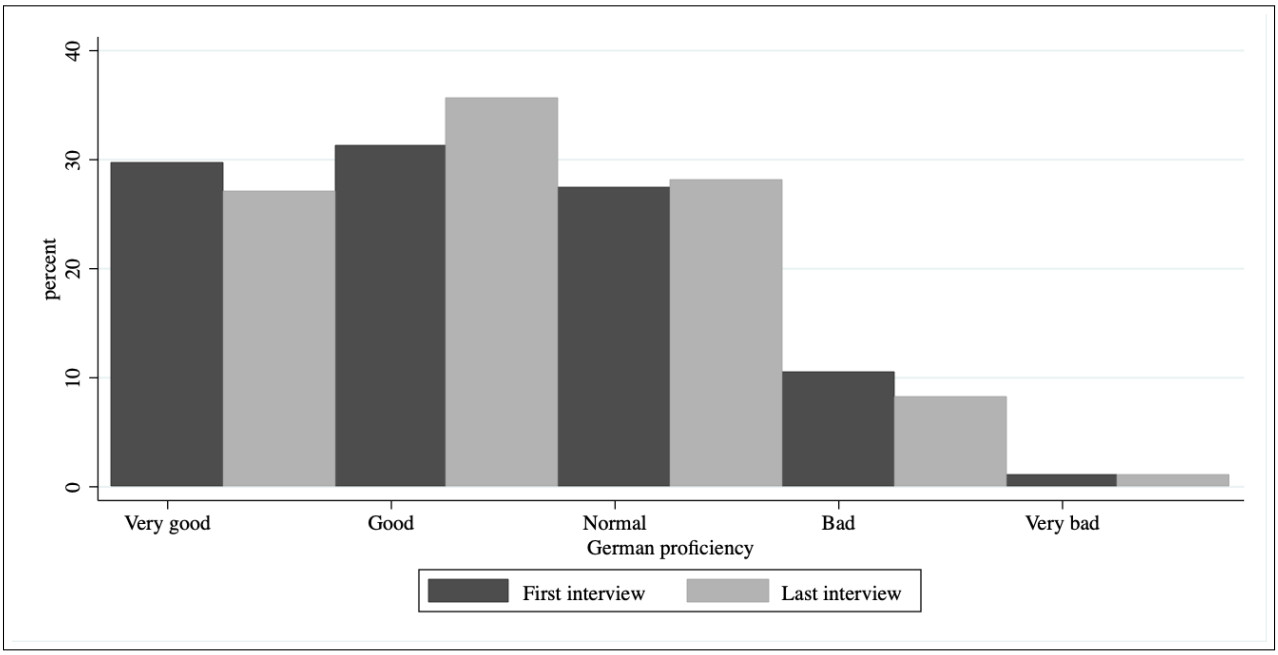
To distinguish between the effect of cultural differences on wages and the effect of linguistic skills, I use a measure of proficiency in German reported in the GSOEP. During each interview, immigrants are asked to report their level of proficiency in German. The questionnaire asks them about both their writing and speaking skills. The answers to these questions are divided in 5 categories from very good to very poor. The fact that these same questions are asked during each interview allows me to observe the immigrants' improvements in fluency

Figure 4: Distribution of immigrants by country of origin in Europe.



Notes: This graph presents the distribution of immigrant workers in Germany by country of origin. The sample includes 5,111 individuals born in 37 different countries. Countries shaded in light gray send less than one percent of the sample. Countries shaded in gray send between one and five percent of the sample. Countries shaded in black send more than five percent of the sample. **Source:** German Socio-Economic Panel 1984-2017

Figure 5: Distribution of proficiency in German.



Notes: This graph presents the distribution of fluency in the German language throughout the sample. Dark gray bars depict the distribution of answers given during the first interview. Light gray bars represent the distribution of answers given during the last interview. **Source:** German Socio-Economic Panel 1984-2017

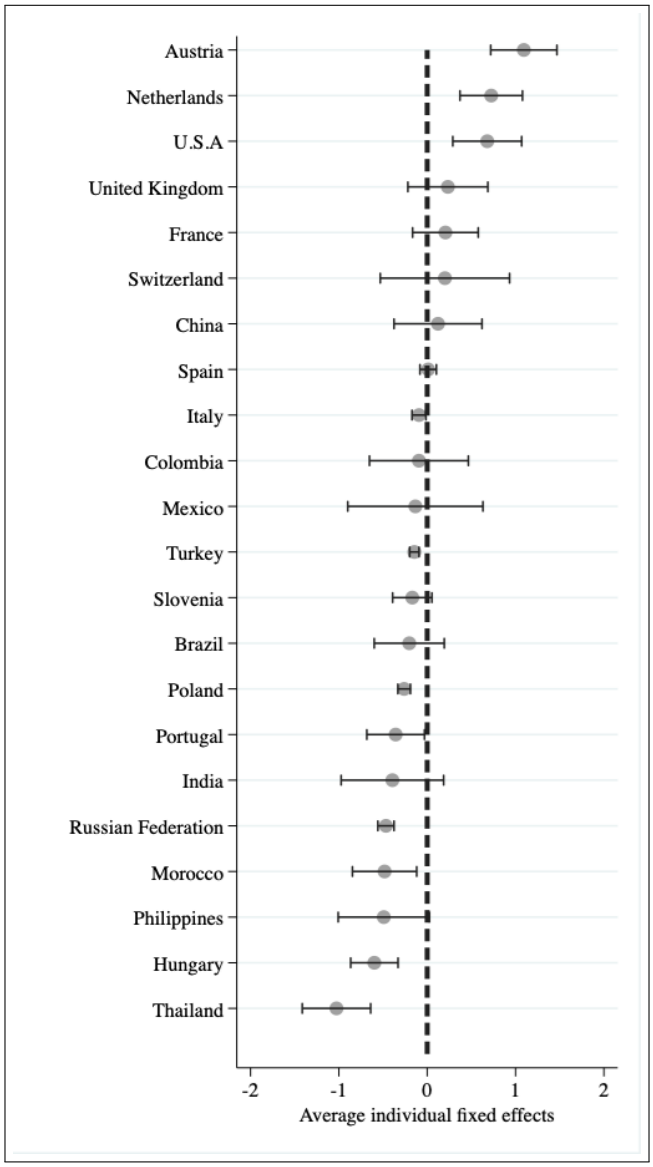
in German. Figure 5 presents the distribution of proficiency in German in the final sample. The solid gray bars show the distribution of answers given during the first interview. The black dashed line represents the distribution of answers given during the last interview. It shows that over their migration period, the share of immigrants reporting a poor level of proficiency in German decreases. On the other hand, the share of immigrants reporting a good level of proficiency in German increases.

This paper draws on the longitudinal dimension of the GSOEP to address the static endogeneity issue associated with the unobserved ability of immigrant workers. On average, the immigrant workers included in my sample are followed over 5 years. This feature allows me to calculate individual fixed effects in wage regressions, which represent the average wage variations associated with each individual after controlling for several characteristics. The GSOEP also includes information on many labor-market characteristics of immigrants.

By controlling for most individual and firm characteristics in wage regressions, individual fixed effects approximate the unobserved ability of immigrant workers. Figure 6 presents individual fixed effects (η_i) and plots the average value by country of origin. These fixed effects are obtained by estimating equation (1) without taking into account the interaction term of interest. This ranking suggests a negative correlation between unobserved ability and cultural distance. This result contradicts the main assumption made by Islam and Raschky (2015). Moreover, it supports the inclusion of individual fixed effects in equation (1). Without controlling for unobserved ability, I could not identify the initial wage penalty associated with cultural differences.

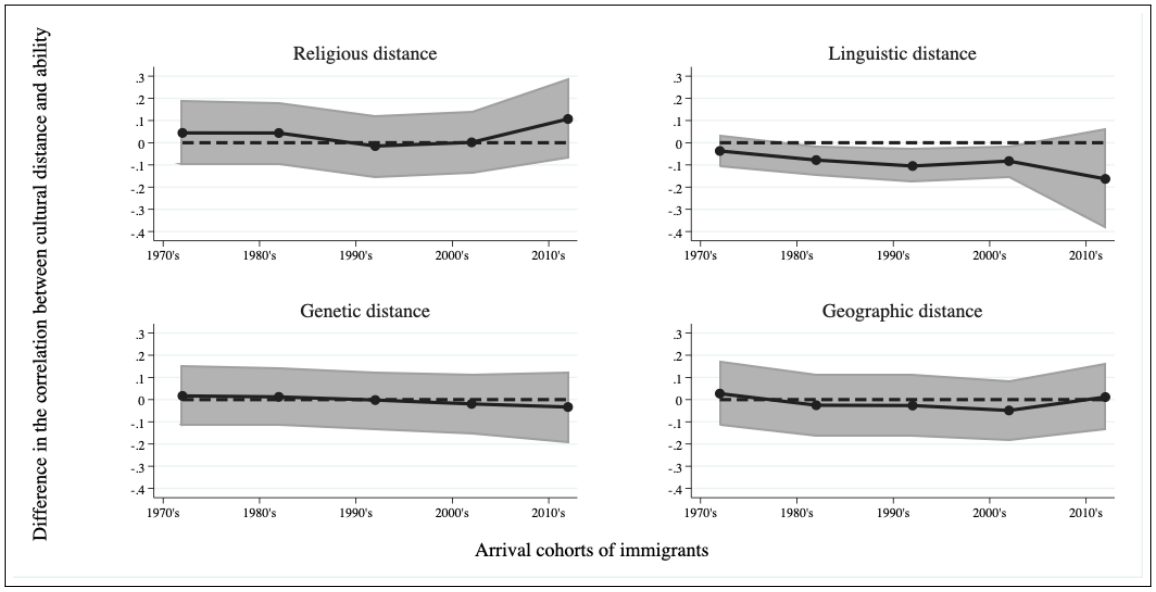
The second issue associated with the unobserved ability of immigrant workers is dynamic. As explained in Section 2.2, a change in the correlation between immigrants' ability and cultural distance across successive cohorts could affect the dynamics of the effect. Figure 7 tests this scenario. It shows the changes in the correlation between immigrants' ability and cultural distance across successive cohorts. Immigrants' unobserved ability is proxied by individual fixed effects. Arrival cohorts are calculated per decade between 1960 and 2016. Each panel focuses on a given bilateral index. These graphs compare these correlations with respect to the first observable cohort of immigrants, which arrived in the 1960s. Black dots represent the point estimates. Grey areas depict 95% confidence intervals. Overall, this figure rejects the variation in the correlation between immigrants' ability and cultural distance. This suggests that the dynamic composition bias presented in Section 2.2 is not likely to affect the results. Only the linguistic distance panel highlights a small but significant decrease in this correlation for the cohorts that arrived between the 1980s and the 2000s. Section 5 implements a robustness analysis to account for this potential issue associated with the dynamic correlation between immigrants' ability and linguistic distance. This robustness test separately replicates the main analysis with the cohort of immigrants arriving between 1960 and 1979, and for those arriving between 1980 and 2009.

Figure 6: Average individual fixed effects per country of origin.



Notes: This graph plots average individual fixed effects per country of origin. These fixed effects are obtained from a first step regressing the hourly log wage of immigrants in Germany with ordinary least squares. This specification controls for employment status, years of professional experience, years of tenure in current position, German speaking proficiency, industry fixed effects using the two-digit NACE classification, and occupation fixed effects using the two-digit ISEI classification. This graph excludes countries that have fewer than ten observations in the final sample. **Source:** German Socio-Economic Panel 1984-2017

Figure 7: Correlation between cultural distance and ability of immigrants across cohorts of arrival.



Notes: This graph compares how cultural distance and individual fixed effects correlate over arrival cohorts of immigrants. Each dot represents the mean difference with respect to the first cohort of immigrants, which arrived during the 1960s. These relationships are estimated with ordinary least squares. The cultural distance indices are standardized. Black dots represent point estimates. Gray areas represent 95% confidence intervals. **Source:** German Socio-Economic Panel 1984-2017

4 Results

This section documents the immigrants' wage penalty associated with cultural differences. The first part of this section highlights the initial penalty encountered at the beginning of migration episodes. The second part of this section presents a dynamic perspective, which shows that the wage penalty disappears after five to ten years spent in Germany. This suggests that immigrants adapt to the cultural specificities of the German labor market. The final part explores the mechanism in play, documenting a negative relationship between cultural differences and occupational mobility. Like the wage penalty, this negative relationship vanishes after a few years spent in Germany. As job-to-job transitions are a important channel for wage progression, this could help to explain the reasons for this wage penalty.

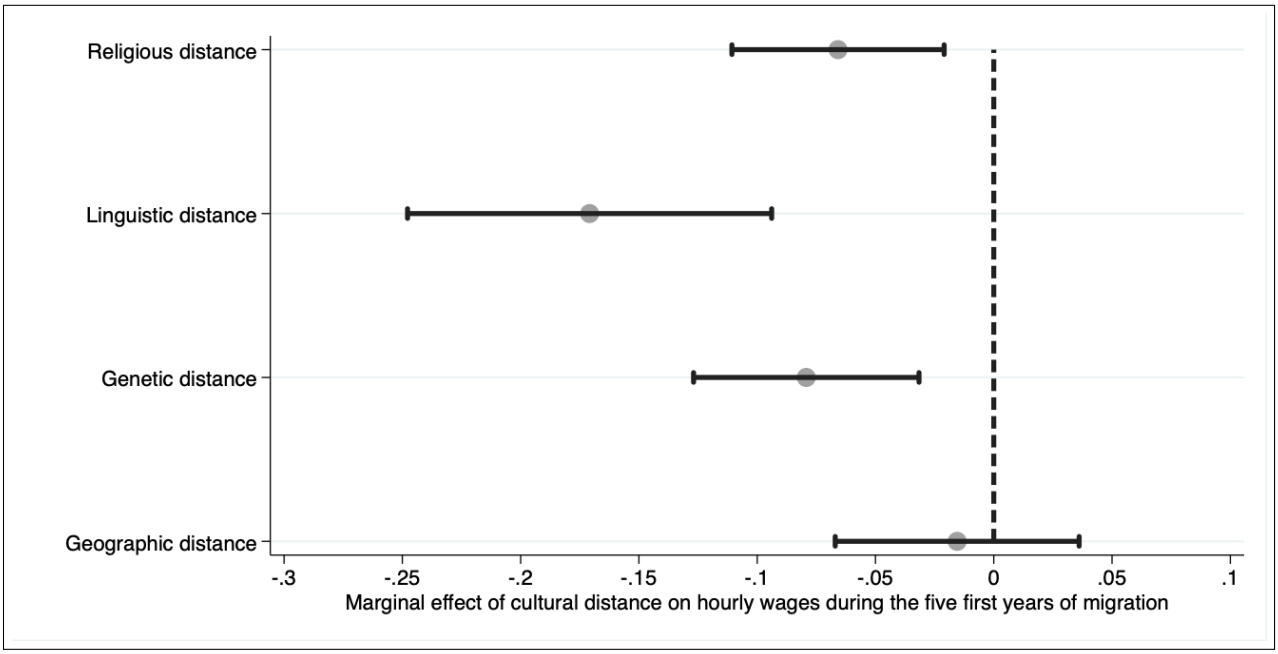
4.1 The initial wage penalty

This section shows that immigrants have to contend with a wage penalty associated with their cultural differences when they enter the German labor market. Figure 8 documents this wage penalty. As presented in equation (1), the estimates rely on wage regressions that control for both unobserved ability and linguistic skills. To capture the effect of cultural differences through indices measured at the country level, these specifications focus on the interaction terms between cultural distance and the number of years spent in Germany. The results show that a one standard deviation increase in cultural distance is associated with a decrease of between 0.07 and 0.17 in the logarithm of hourly wages.

Figure 8 compares the results obtained with religious, linguistic, genetic and geographic distances. It shows that the largest wage penalty occurs during the five first years of migration episodes. In addition, wage penalties are robust across all three measures of cultural differences. On the contrary, the relationship between geographic distance and wages is not significant. The geographic distance index is used as a placebo test, and shows that the results are not driven by another dimension correlated with the geographical distance between countries. These results complement Islam and Raschky (2015). In this paper, the authors

investigate the effect of genetic distance on the wages and employment of immigrant workers in Canada. They use genetic distance as an instrument to predict the degree of ethnic identity. Focusing exclusively on this channel, they report non-significant effects on wages. Here, I show that genetic distance is associated with a significant wage penalty at the beginning of migration episodes. There are several possible explanations for this difference. Firstly, I do not focus exclusively on the ethnic identity channel, in contrast to Islam and Raschky (2015). Secondly, my identification strategy differs. While the aforementioned authors relied on an instrumental variable approach, I preferred to control for the unobserved ability of

Figure 8: Initial wage penalty associated with cultural distance.

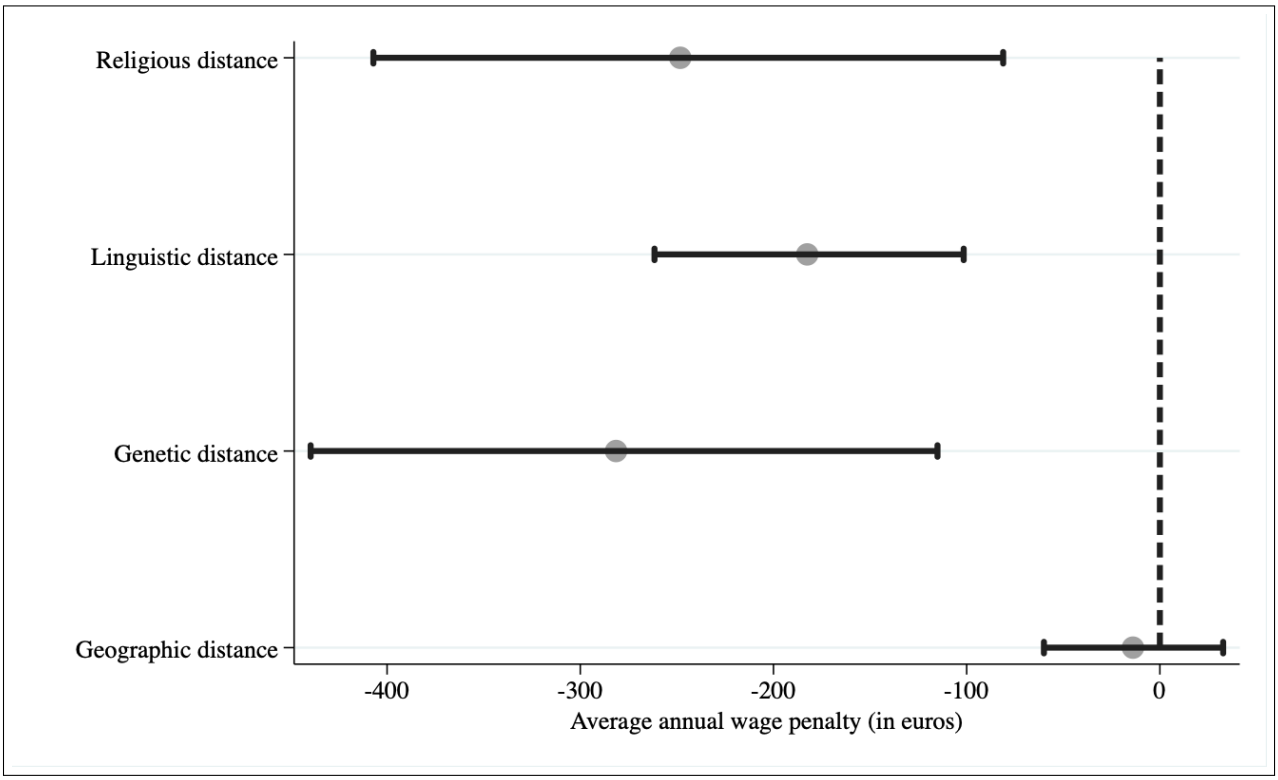


Notes: This graph compares the effect of cultural differences on log hourly wages obtained using different cultural distance indices. It shows both point estimates and confidence intervals. These correlations are estimated with ordinary least squares. The cultural distance indices are standardized. All specifications control for fluency in German, employment status and year-of-survey fixed effects, individual fixed effects, occupation fixed effects using the two-digit ISEI classification, industry fixed effects using the two-digit NACE classification, and the size of the company in which the immigrants are working. They also include interaction terms between industry and occupation fixed effects and the years of survey. **Source:** German Socio-Economic Panel 1984-2017

immigrant workers with individual fixed effects. Finally, this difference could be a result of different contexts in Germany and Canada.

Figure 9 presents the magnitude of the initial wage penalty associated with cultural differences. It focuses on the example of Turkish immigrants who form the largest community of immigrants in Germany. It compares the annual wage penalty in euros across all four indices. On average, this amounts to between €180 and €280 in lost earnings per year.

Figure 9: Magnitude of the annual wage penalty associated with cultural distance: Example of Turkish immigrants.



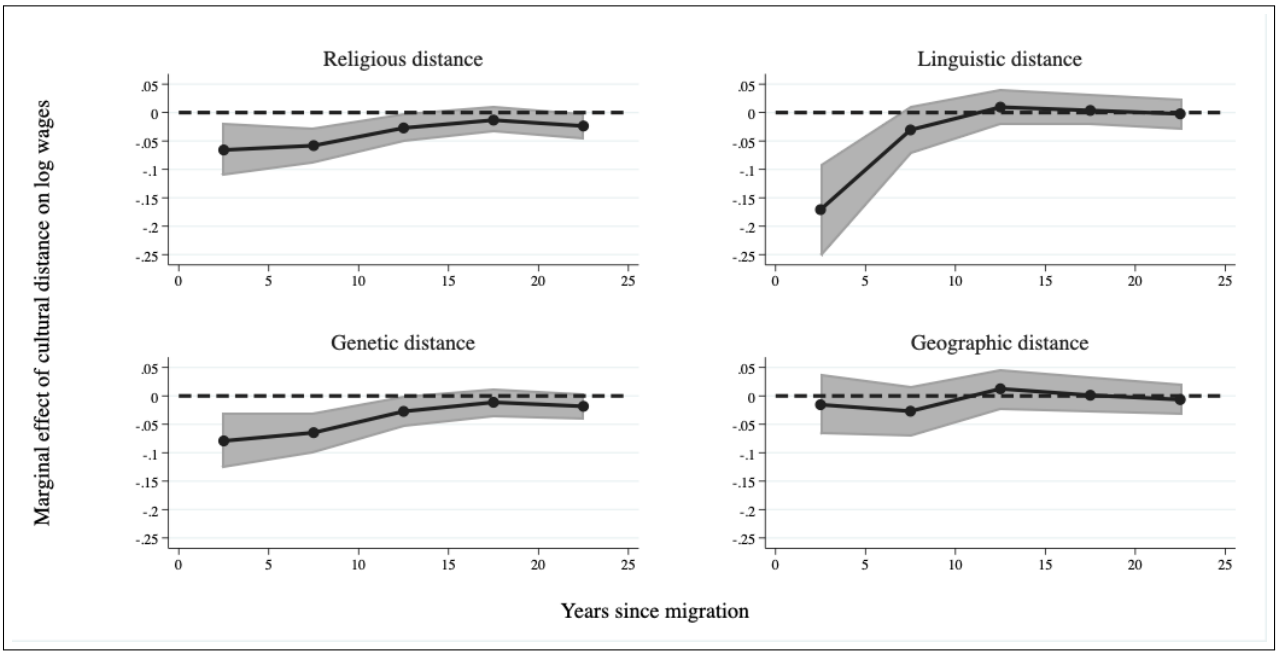
Notes: This graph presents the magnitude of the initial wage penalty by focusing on the example of Turkish immigrants in Germany. It compares the effect of cultural differences on log hourly wages obtained using different cultural distance indices. It shows both point estimates and confidence intervals. These relationships are estimated with ordinary least squares. The cultural distance indices are standardized. All specifications control for fluency in German, employment status and year-of-survey fixed effects, individual fixed effects, occupation fixed effects using the two-digit ISEI classification, industry fixed effects using the two-digit NACE classification, and the size of the company in which the immigrants are working. They also include interaction terms between industry and occupation fixed effects and the years of survey. **Source:** German Socio-Economic Panel 1984-2017

These results only apply to the first five years of migration episodes. The following section presents the evolution of this effect according to the length of immigrants' stays in Germany.

4.2 Cultural integration

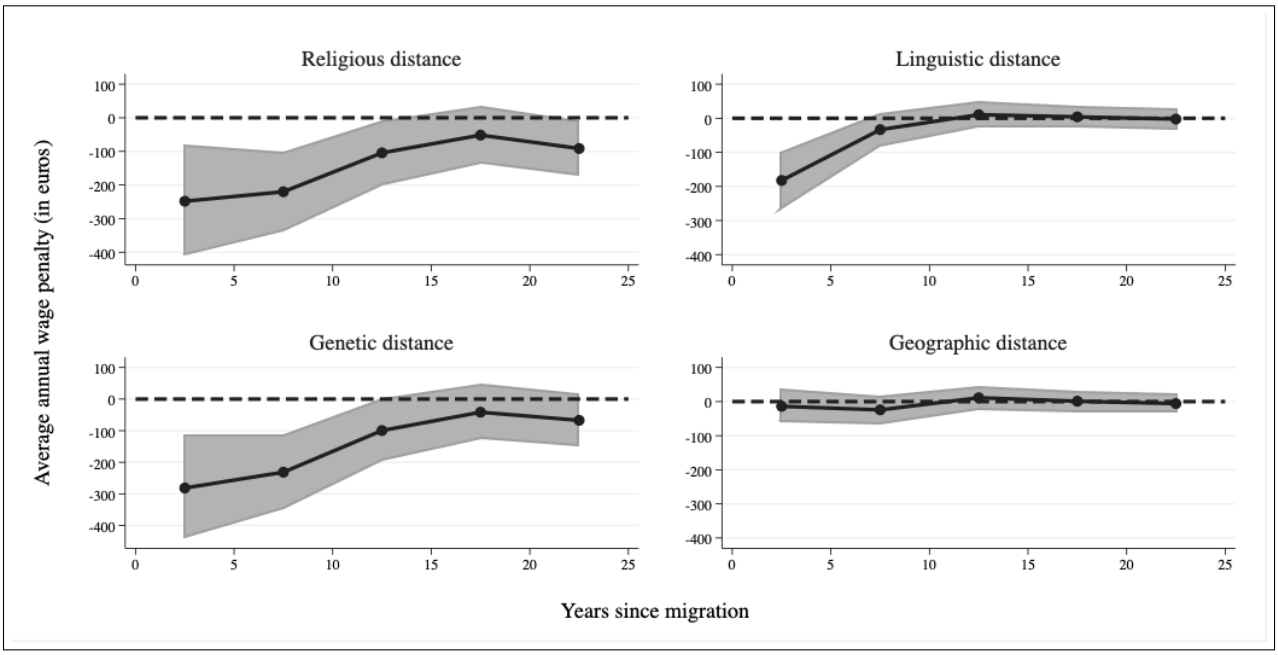
After a few years spent in Germany, the wage penalty associated with cultural differences gradually disappears. This suggests that immigrants are integrated into the German labor market. Figure 10 compares this evolution across all three indicators of cultural differences. Replicating the results presented above, they first highlight an initial wage penalty encountered during the five first years of migration episodes. As the length of the immigrants' stay in Germany increases, the magnitude of this wage penalty gradually decreases. This negative

Figure 10: Evolution of the wage penalty associated with cultural distance.



Notes: This graph presents the evolution of wage penalties associated with cultural differences. It shows both point estimates and confidence intervals. The dependent variable is the log of hourly wages. These relationships are estimated with ordinary least squares. The cultural distance indices are standardized. All specifications control for fluency in German, employment status and year-of-survey fixed effects, individual fixed effects, occupation fixed effects using the two-digit ISEI classification, industry fixed effects using the two-digit NACE classification, and the size of the company in which the immigrants are working. They also include interaction terms between industry and occupation fixed effects and the years of survey. **Source:** German Socio-Economic Panel 1984-2017

Figure 11: Magnitude of the annual wage penalty over time: Example of Turkish immigrants.



Notes: This graph presents the evolution of wage penalties associated with cultural differences. It higlights the magnitude of the estimates by focusing on the example of Turkish immigrants in Germany. It shows both point estimates and confidence intervals. The dependent variable is the log of hourly wages. These relationships are estimated with ordinary least squares. The cultural distance indices are standardized. The entire specification controls for fluency in German, employment status and year-of-survey fixed effects, individual fixed effects, occupation fixed effects using the two-digit ISEI classification, industry fixed effects using the two-digit NACE classification, and the size of the company in which the immigrants are working. They also include interaction terms between industry and occupation fixed effects and the years of survey. **Source:** German Socio-Economic Panel 1984-2017

relationship disappears altogether after five to ten years, depending on the measure of cultural differences. This integration pattern is robust across religious, linguistic and genetic distances. Nevertheless, the specification relying on linguistic distance describes a slightly faster integration process. The results for geographic distance are not significant over the entire migration episode. Used as a placebo test, this last result supports the identification of the effect of cultural differences. Figure 11 presents the magnitude of the integration process across all four indicators. As in Figure 9, it focuses on Turkish immigrants. Overall, the magnitude is fairly similar across religious, linguistic, and genetic distances. Immigrants are subject to an annual wage penalty ranging from €180 to €280 at the beginning of their

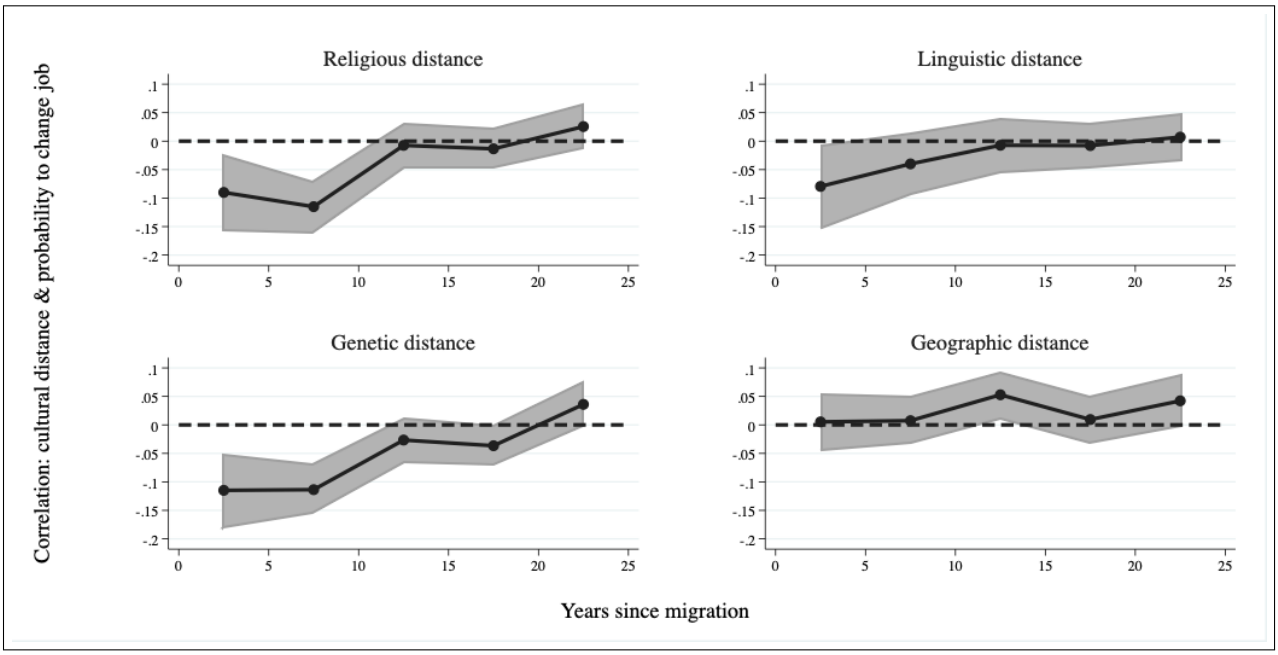
migration episode. This wage loss decreases slightly over the five next years and disappears altogether after ten years spent in Germany. These results show that immigrants progressively integrate to the German labor market. As immigrants spend more time in Germany, they may be subject to less discrimination on the German labor market and/or adapt to its cultural specificities. This paper does not distinguish between both mechanisms.

In addition, Appendix C tests the sensitivity of the results to the manner in which the years since migration are measured. It shows that the results are similar when ranges of 2, 3, 5, or 10 years are adopted. It also explores the heterogeneity of the effect associated with cultural distance and shows that this effect is driven by immigrants with a high-school level of education. It also shows that immigrants originating from countries bordering Germany are not affected by this effect. Finally, it provides evidence that the integration pattern is not a result of the acquisition of German citizenship.

4.3 The role of job-to-job transitions

Finally, I explore the mechanism driving the wage penalty associated with cultural differences. I document a negative relationship between cultural differences and job-to-job transitions. Using a probit specification, I regress the probability of changing jobs between two interviews on the interaction between cultural distance indices and the number of years spent in Germany. Figure 12 compares this relationship across all three indicators of cultural differences. It highlights a pattern similar to the wage penalty. The negative relationships between cultural differences and job-to-job transitions are the largest at the beginning of migration episodes. After five to ten years, this negative correlation disappears. In line with previous results, this pattern is robust across religious, linguistic and genetic distances. The association with geographic distance is not significant and therefore supports the role of cultural differences. The similarity of the patterns for wage regressions and those concerning job-to-job transitions suggests a link between both phenomena. Job-to-job transitions are a key determinant of wage progression (Abowd et al., 1999). Therefore, this result could help to explain the wage penalty associated with cultural differences, suggesting that immigrants with the largest

Figure 12: Cultural distance and probability of changing jobs.



Notes: This graph presents the evolution of the relationship between the probability of changing jobs and cultural distance indices. Using a probit specification, these results are obtained by regressing the probability of changing jobs on the interaction between cultural distance indices and the number of years spent in Germany. All regressions control for the number of years of education. The cultural distance indices are standardized. **Source:** German Socio-Economic Panel 1984-2017

cultural differences are least likely to move from one job to another. This may explain the smaller wage progression at the beginning of the immigrants' migration episode. As immigrants spend more time in Germany, they are integrated into the German labor market and attain the same job-to-job transition rates, regardless of their cultural differences.

5 Robustness tests

This final section challenges the integration of immigrant workers as the main interpretation of the results. It explores whether the dynamic results are affected by changes in the unobserved ability of immigrant workers. This section is divided into two parts. The first focuses on variations across cohorts of immigrants. It excludes the cohort effect presented in Section 2.2 by replicating the main analysis with immigrants who arrived between 1960 and 1979, and those who arrived between 1980 and 2009. This exercise produces similar results across

cohorts and therefore supports the integration interpretation. The second part explores whether the dynamic results are driven by selective return migration. It eliminates this channel by replicating the main analysis with a sub-sample of immigrants who have all spent at least twenty years in Germany. It shows that the results are robust for this method and also support the integration interpretation.

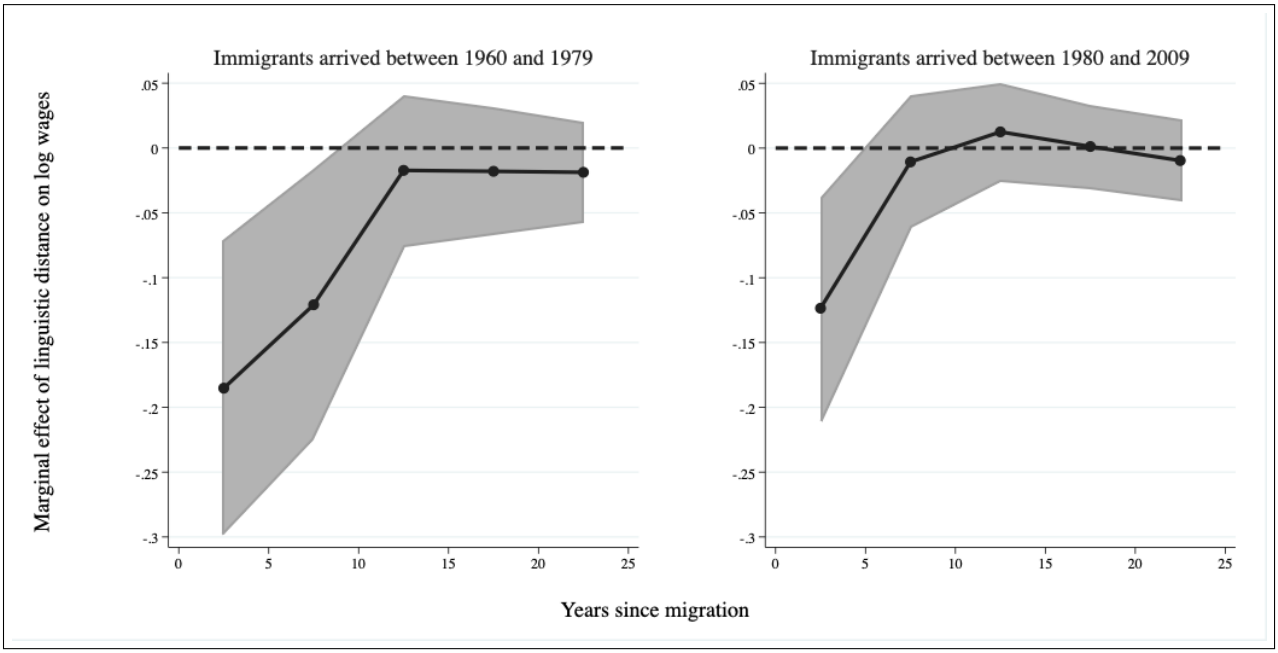
5.1 Cohort selection

This first part tests whether the dynamic results are robust with the exclusion of the cohort selection channel. The main specification controls for individual fixed effects, thereby ensuring that the initial wage penalty is not driven by the unobserved ability of immigrant workers. However, as mentioned in Section 2.2, variations in correlations between ability and cultural distance across successive cohorts of immigrants could potentially drive the dynamic results. A decreasing trend in this correlation across cohorts could produce the increasing relationship between cultural distance and wages over time spent in Germany. Section 3 presented evidence mitigating this phenomenon. Figure 7 shows that the correlation between immigrants' ability and cultural distance indices does not change over time, except for linguistic distance. Focusing on the linguistic distance index, this correlation exhibits a small but significant decrease for the cohorts of immigrants who arrived between 1980 and 2009.

Figure 13 shows that the results are robust with this cohort selection effect. It separately replicates the analysis with two sub-samples. The left-hand panel focuses exclusively on immigrants who arrived in Germany between 1960 and 1979. The right-hand panel focuses on those who arrived between 1980 and 2009. The separate analyses of these two cohorts ensure that the correlation between immigrants' unobserved ability and linguistic distance is stable over time within each of these regressions, thereby eliminating the cohort selection effect. Moreover, this shows that the results are fairly similar to those estimated using the complete sample and presented in Figure 10. The initial wage penalty indicates that a one standard deviation increase in linguistic distance decreases the log hourly wages by .12 to .18 units. Finally, this figure highlights a small heterogeneity in the dynamic pattern across

cohorts. The wage penalty disappears after 10 to 15 years for the first cohort, which arrived between 1960 and 1979. This drops to 5 to 10 years for immigrants who arrived between 1980 and 2009. Overall, these results show that the dynamic results are robust with the exclusion of the cohort selection channel.

Figure 13: Comparing the dynamic results across arrival cohorts of immigrant workers.



Notes: This graph compares the main results for two cohorts of immigrants. The left-hand panel focuses exclusively on immigrant workers who arrived in Germany between 1960 and 1980. The right-hand panel focuses exclusively on those who arrived between 1980 and 2000. Point estimates and confidence intervals are shown. The dependent variable is the log of hourly wages. These relationships are estimated with ordinary least squares. The cultural distance indices are standardized. All specifications control for fluency in German, employment status and year-of-survey fixed effects, individual fixed effects, occupation fixed effects using the two-digit ISEI classification, industry fixed effects using the two-digit NACE classification, and the size of the company in which the immigrants are working. **Source:** German Socio-Economic Panel 1984-2017

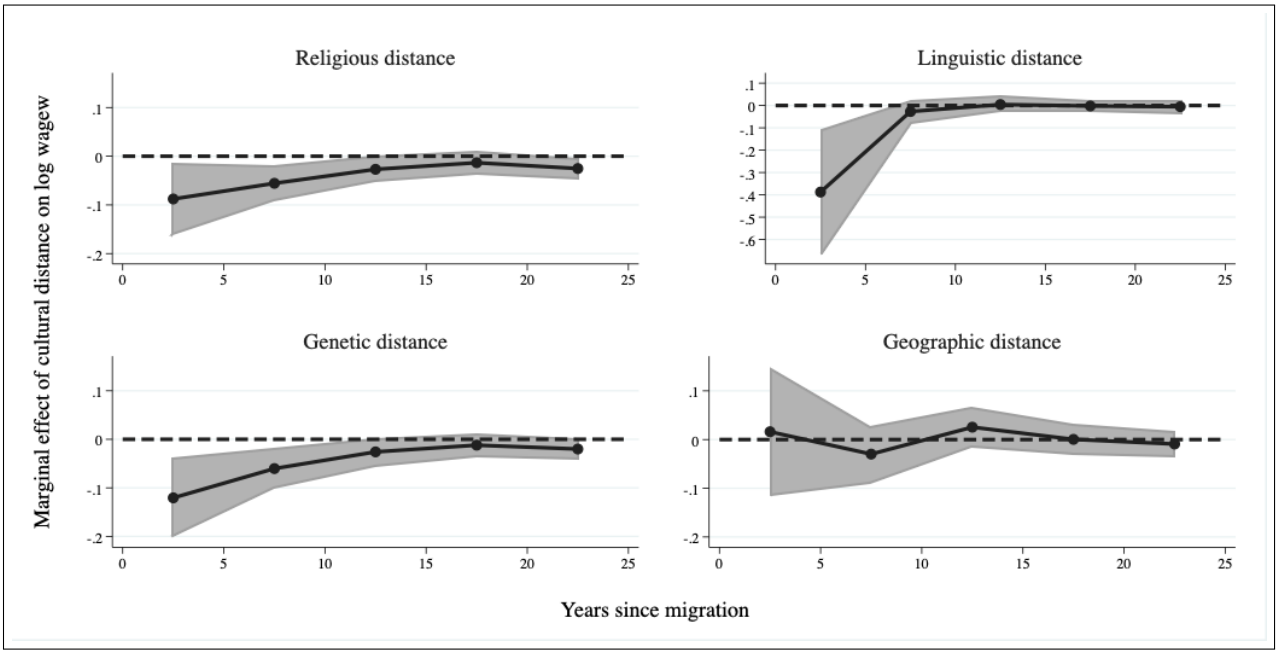
5.2 Selection by return migration

This second part tests whether the dynamic results are robust with the exclusion of selective return migration. As mentioned in Section 2, changes in selection associated with return migration could potentially drive the dynamic pattern by changing the correlation between immigrants' ability and cultural distance. In this section, I eliminate this channel by replicating

the main analysis with a sub-sample of immigrant workers. I estimate equation 1 for immigrant workers who have spent at least twenty years in Germany. These regressions apply to fifty percent of the initial sample. By focusing on this sub-sample, this specification prevents changes in selection associated with return migration, thereby ensuring that the dynamic pattern is not driven by this composition effect for the first twenty years of migration episodes.

Figure 14 presents the results obtained for religious, linguistic, genetic and geographic distances. The wage penalties associated with cultural differences follow similar patterns and are robust for this sub-sample. Moreover, the magnitude of the effect is larger for all

Figure 14: Evolution of the wage penalty in the absence of selective out-migration.



Notes: This graph presents the evolution of wage penalties associated with cultural differences. In contrast to Figure 10, it focuses exclusively on immigrants who have spent at least twenty years in Germany. It shows both point estimates and confidence intervals. The dependent variable is the log of hourly wages. These relationships are estimated with ordinary least squares. The cultural distance indices are standardized. All specifications control for fluency in German, employment status and year-of-survey fixed effects, individual fixed effects, occupation fixed effects using the two-digit ISEI classification, industry fixed effects using the two-digit NACE classification and the size of the company in which the immigrants are working. It also includes interaction terms between industry and occupation fixed effects and the years of survey. **Source:** German Socio-Economic Panel 1984-2017

religious, linguistic, and genetic distances. The placebo test implemented with geographic distance remains non-significant over the entire duration of migration episodes. Finally, reducing the sample size increases the confidence intervals, but the wage penalty associated with cultural differences remains significant for all three indicators during the first five years. This wage loss remains significant for five to ten years after arrival in Germany when religious and genetic distances are considered. Overall, these results support the interpretation that immigrant workers are progressively integrated into the German labor market.

6 Conclusion

This paper documents a wage penalty associated with cultural differences. It shows that immigrant workers in Germany suffer from wage loss at the beginning of their migration episode. This negative effect disappears after five to ten years spent in Germany. This paper shows that this pattern results from the integration of immigrant workers into the German labor market. Several empirical strategies are implemented to support this interpretation. First, the roles of cultural differences and language are distinguished by controlling for proficiency in the German language. Second, a control for individual fixed effects is carried out to ascertain that the initial wage penalty is not driven by the unobserved ability of immigrant workers. Third, robustness tests are conducted to ensure that the dynamic pattern is not driven by temporal changes in the correlation between the unobserved ability of immigrant workers and cultural distance. In addition, the paper presents evidence suggesting that this wage penalty could be driven by occupational mobility. The relationship between cultural differences and job-to-job transitions shows the exact same pattern as the wage penalty. This similarity suggests that both phenomena could be related. Unfortunately, I was unable to further analyze the mechanisms in play. In particular, the sample size of my data was not large enough to distinguish between two potential mechanisms. I was unable to determine whether this integration pattern resulted from a decline in discrimination or from the acquisition of cultural specificities. Nevertheless, these results show that cultural differences negatively

affect the labor market performance of immigrant workers. In a similar manner to linguistic skills, these results could be related to the negative relationship between cultural distance and migration flows.

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A Cultural distance indices

This section presents additional material to explain the cultural distance indices. Section A.1 details the construction of the genetic distance index. Section A.2 compares the distributions of all four indices.

A.1 Genetic distance

This paper uses data on genetic distance compiled by Spolaore and Wacziarg (2016). This section presents the construction of this index as explained by the authors. The genetic distance index, called F_{ST}, measures differences in gene frequencies between two populations. This index is defined as:

$$F_{ST} = \frac{V_p}{\bar{p}(1-\bar{p})},$$

where V_p represents the variance between gene frequencies across populations and $\bar{p}$ their average gene frequency.

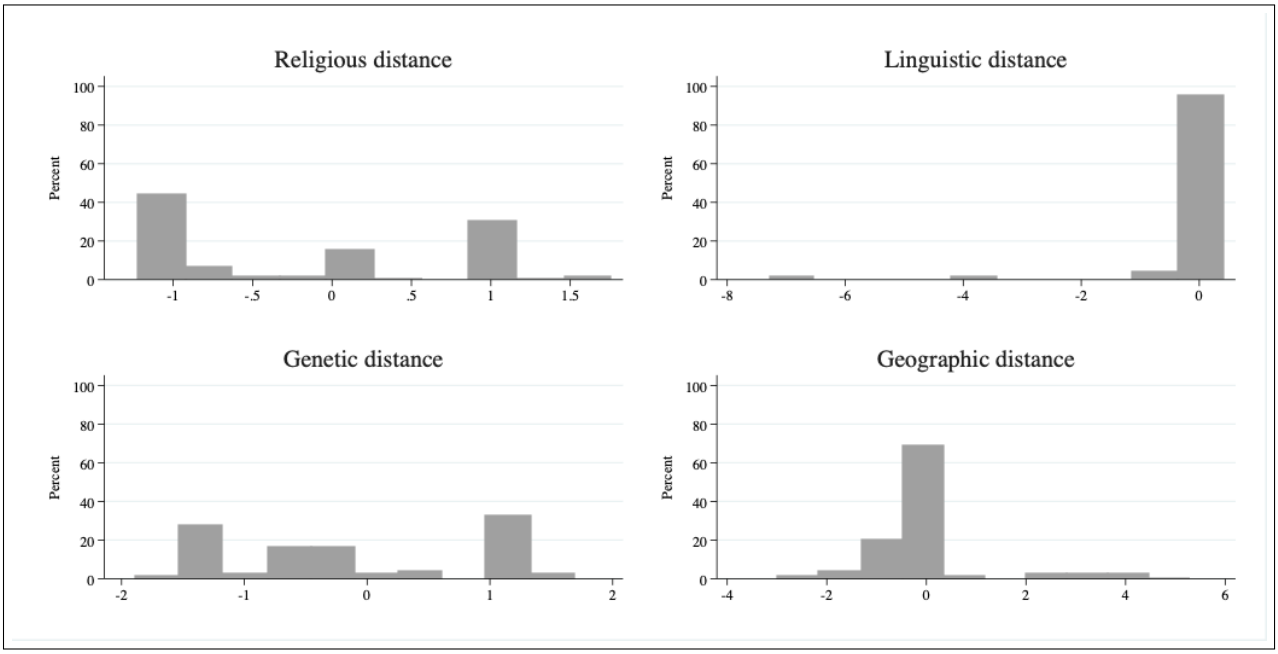
The measure of gene frequencies builds on genetic distance data provided by Cavalli-Sforza et al. (1994). However, this data is computed at the population level. Spolaore and Wacziarg (2016) calculate the genetic distance index at the country level by using the ethnic composition data by country proposed by Alesina et al. (2003).

A.2 Cultural distance distribution

This section compares the distribution of all four cultural distance indices in the sample of interest. Figure 15 presents the distributions of religious, linguistic, genetic and geographic distances and highlights important differences across all four measures. The religious and genetic distances both follow trimodal distributions, whereas the linguistic and geographic distributions are unimodal.

Figure 16 compares these distributions for European and Asian immigrants, the two largest subgroups in my sample. For both subgroups, the shapes of these distributions diverge from those presented in Figure 15 for the complete sample. In addition, the distributions differ

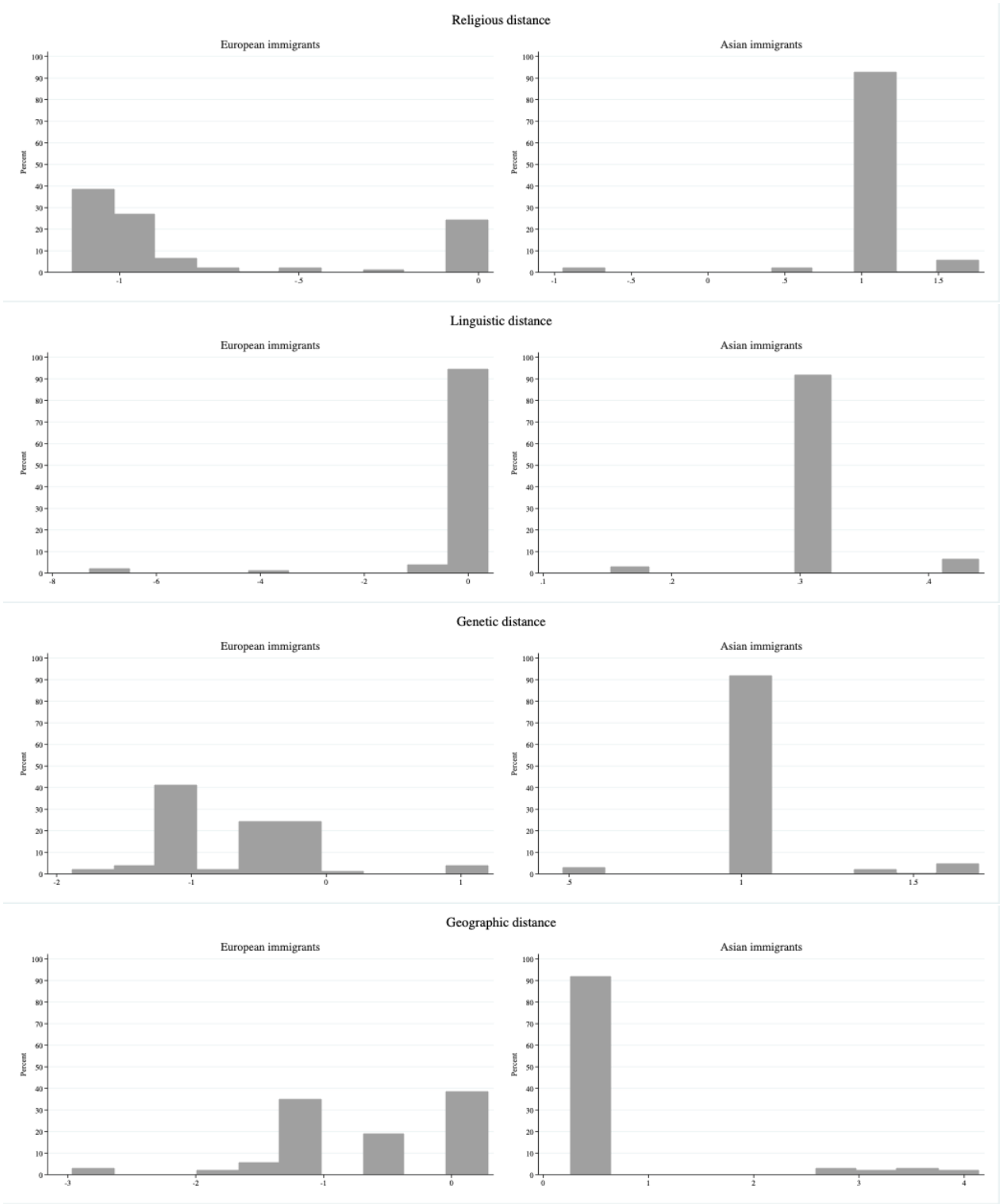
Figure 15: Comparing the distribution of standardized cultural distance indices of European and Asian immigrants.



Notes: This graph presents the distribution of the indices of cultural distance between Germany and the countries of origin of immigrants included in my sample. Each index is standardized. **Source:** German Socio-Economic Panel 1984-2017

significantly for European and Asian immigrants. For European immigrants, the religious, genetic and geographic distances follow bimodal and trimodal distributions. On the contrary, Asian distributions are skewed toward one value. This results from the over-representation of Turkish immigrants who represent more than 90% of the individuals in this sub-sample.

Figure 16: Distribution of standardized cultural distance indices.



Notes: This graph presents the distribution of indices of cultural distance between Germany and the country of origin of the immigrants included in my sample. Each index is standardized. **Source:** German Socio-Economic Panel 1984-2017

B Sample description

This paper builds on the German Socio-Economic Panel (GSOEP) and concerns immigrants living in Germany. It focuses on the wage penalty associated with cultural distance between the immigrants' countries of origin and destination. To exclude most of the potential co-founders, it relies on econometric specifications that take numerous control variables into account. Missing values led to the exclusion of many survey respondents from the analysis. I retained only 5,111 out of 9,018 immigrant workers. This section provides descriptive statistics to assess the representativity of my sub-sample with respect to the entire population of immigrant workers included in the GSOEP. I refer to them as the "complete sample" in the following section.

Table 1 compares the time-invariant characteristics of my sample with the complete sample. It focuses on gender representation, years of education and the four bilateral measures of cultural distance. Column 1 presents the average values for my sample. Column 2 focuses on the complete sample. Column 3 compares the average values of both samples with a t-test. This last column shows both average differences and standard errors. Both samples differ statistically in terms of gender representation, years of education and geographic distance. These results suggest that my analysis sample is not perfectly representative of the entire population of immigrants included in the GSOEP. Nevertheless, both samples do not differ in terms of cultural distance, suggesting that the results of the paper may be fairly edifying vis-à-vis the entire population.

Table 2 documents the labor-market characteristics taken into account in the analysis. It successively describes the hourly wage in euros, the number of years since migration, the expected number of years before leaving Germany, the number of years of experience on the labor market and the number of years of tenure with their current employer. All these variables are time-variant. All three columns present the average value of my sample per decade since migration. The first column lists the average values calculated over the first

Table 1: Representativity of the sample

	Immigrants in my sample	All immigrant workers in GSOEP	T-test
Share of males (in percentages)	55.49	58.86	-3.37 (.86)
Years of education	10.81	11.04	-.24 (.05)
Linguistic distance	.97	.96	0 (0)
Religious distance	.82	.83	-.01 (0)
Genetic distance	.03	.03	0 (0)
Geographic distance (in km)	1736.53	2440.98	-704.45 (39.05)
Number of individuals	5111	9018	

Notes: This graph compares the demographics of immigrants included in my sample to all immigrants in the GSOEP. Standard errors are presented between parentheses. **Source:** German Socio-Economic Panel 1984-2017.

ten years since migration. Column 2 concerns years ten to twenty. Column 3 focuses on the rest of the period. During the time spent in Germany, the average wage increases slightly from €6.82 to €7.62 per hour. Labor experience and tenure increase with the years since migration. It is worth noting that the average expected length of stay in Germany does not change over the period.

Figures 17 and 18 complete this description of labor market characteristics over the years since migration. Figures 17 and 18 respectively describe the distribution of immigrant workers

Table 2: Description of the sample

	Years since migration		
	One to ten	Ten to twenty	More than twenty
Hourly wage (in euros)	6.82	6.3	7.62
	(1.88)	(1.83)	(1.73)
Years since migration	5	14	24
	(2.4)	(2.9)	(6)
Expected length of stay (in years)	2	2	2
	(.5)	(.5)	(.5)
Labor market experience (in years)	9	11	16
	(8.9)	(10.4)	(11.8)
Tenure (in years)	2	5	9
	(2.3)	(4.9)	(8.1)
Number of observations	1465	2948	2308

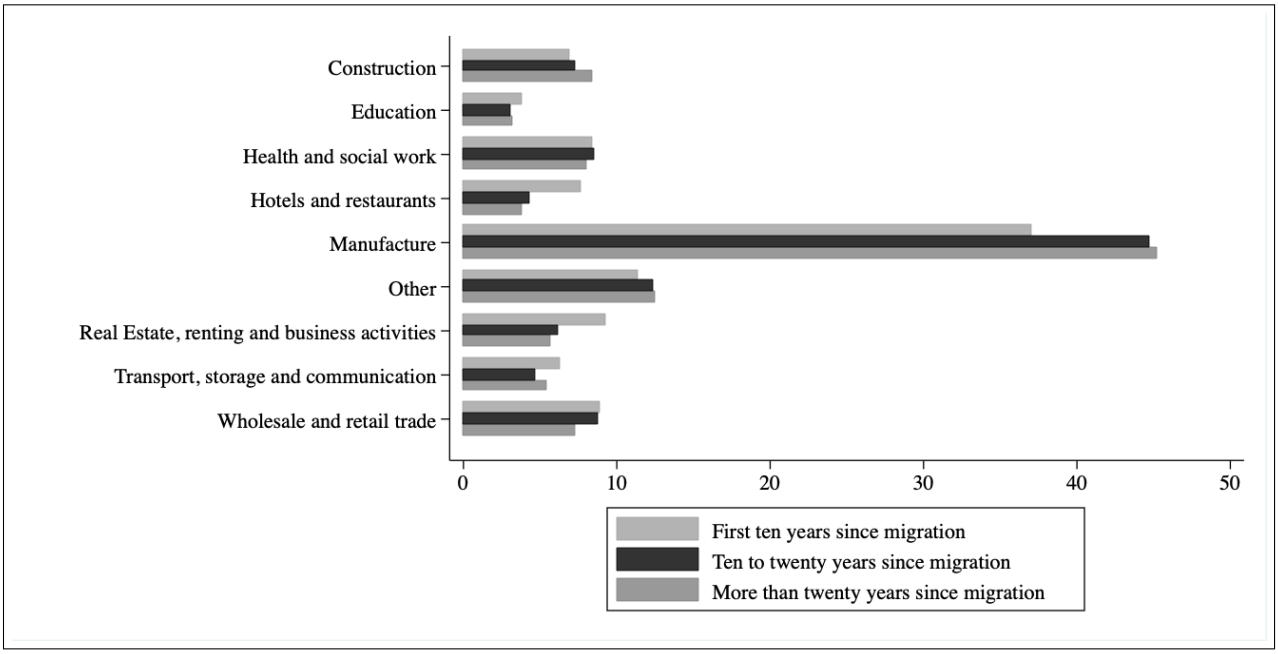
Notes: This graph compares the demographics of immigrants included in my sample to all immigrants in the GSOEP. Standard deviations are presented between parentheses. **Source:** German Socio-Economic Panel 1984-2017.

across industries and occupations. Both figures present the evolution of these distributions over the decades since migration. Each bar of these graphs represents the average value calculated over ten years.

Around 40% of immigrants work in the manufacturing industry. Half of the immigrant workers are almost equally distributed across seven sectors including construction, education, health and social work, hotels and restaurants, real estate, transport and retail trade. The final ten percent work in other industries. Over the three different periods, there is little change in the distribution. However, it is worth noting that the share of immigrants working

in the manufacturing industry increases over time whereas it decreases in the hotel and restaurant category, and also in the real estate sector.

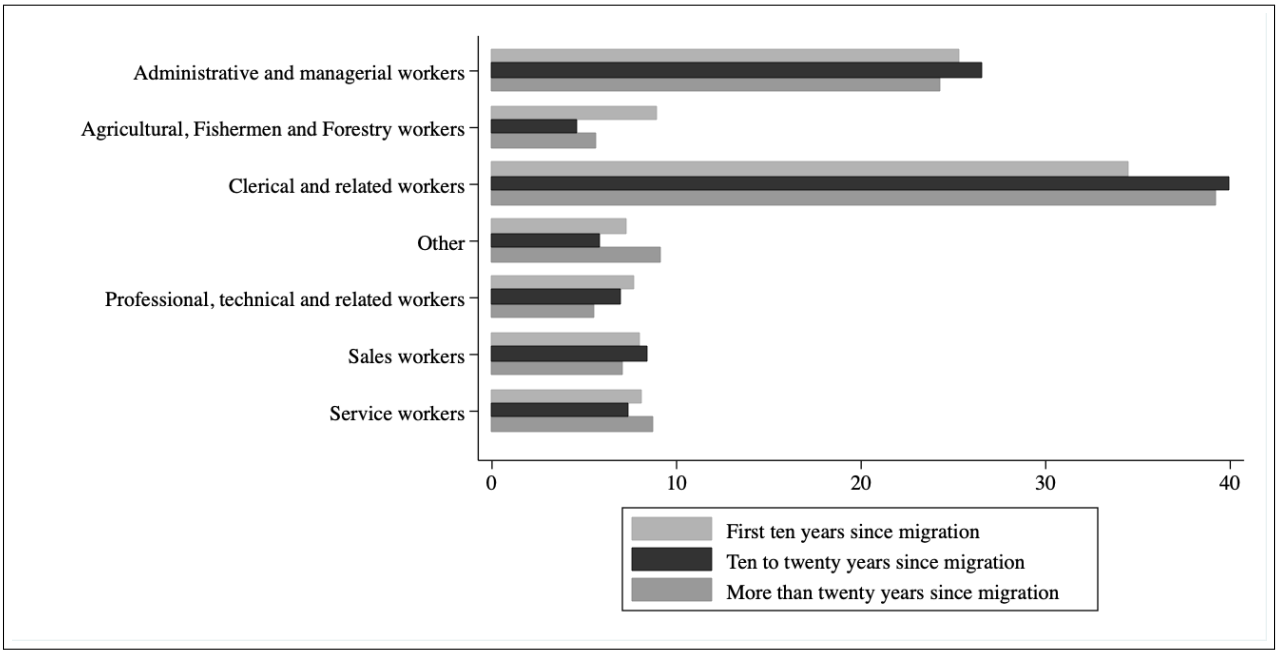
Figure 17: Evolution of the distribution per industry over the years since migration.



Notes: This graph presents the distribution of immigrants per industry. **Source:** German Socio-Economic Panel 1984-2017

Figure 18 shows that the occupational distribution is also skewed towards a few categories. Most of the immigrants are employed as clerical or related workers, but also as administrative and managerial workers. The rest of them are divided into agricultural, professional and technical, sales and service occupations. The final ten percent work in other occupations. As in Figure 17, there is little change in the occupational distribution over time. Only the share of immigrants working as clerical or related workers increases slightly over the decades since migration, whereas the share of agricultural workers decreases slightly.

Figure 18: Evolution of the occupational distribution over the years since migration.



Notes: This graph presents the distribution of immigrants per occupation. This graph is based on the ISEI classification developed by Ganzeboom et al. (1992). **Source:** German Socio-Economic Panel 1984-2017

C Robustness checks

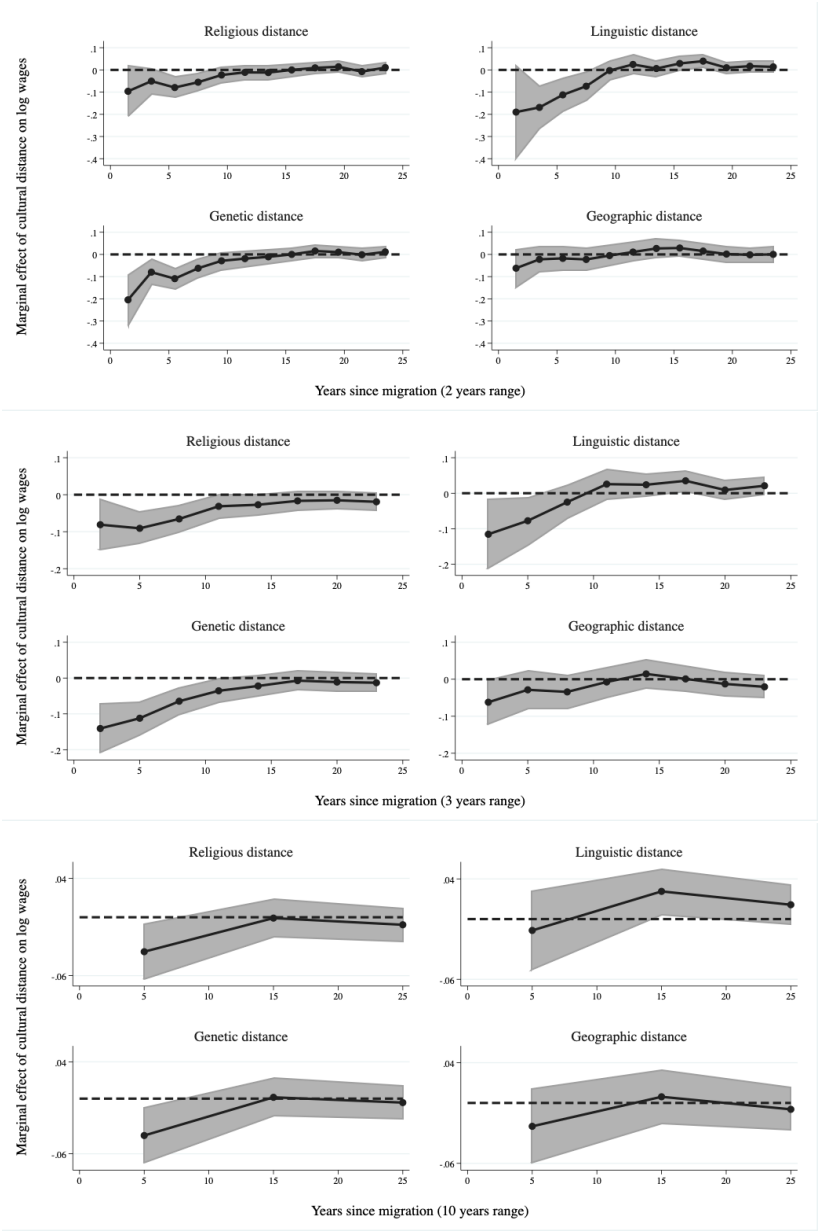
This section presents several tests which are conducted to assess the robustness of the results presented above. It focuses on the dynamic specification regressing the log hourly wages on the interaction between cultural distance and the years since migration. This section is divided into three parts. The first part examines the measure of years since migration. It shows that the results follow similar patterns when considering ranges of 2, 3 and 10 years rather than the 5-year span used in the main specification. The second part shows that the labor-market integration of immigrant workers is not driven by the acquisition of the German citizenship. The final part explores the heterogeneity of the effect associated with cultural distance. It first shows that cultural differences do not affect the labor-market outcomes of immigrants coming from countries bordering Germany, and also stresses that the effect is mostly driven by immigrants without college education.

C.1 Year ranges

This paper studies the correlation between cultural distance and log hourly wages over years spent in Germany. To control for as many co-founders as possible, my econometric specifications include a large number of control variables. These controls implicitly create cells of similar observations in which I examine the relationship between cultural distance and wages. My estimate then becomes a weighted average of these correlations. Within these cells, the number of observations is limited. This is why I group the observations according to ranges of years spent in Germany. The larger the range, the larger the number of observations. Below a certain threshold, I do not make sufficient observations in these cells to credibly estimate the effect of cultural distance on log hourly wages.

The main specification presented in Figure 10 measures the years since migration in 5-year ranges. Figure 19 shows that the results are fairly similar when the years since migration are grouped according to ranges of 2, 3 or 10 years. At the beginning of migration episodes, the log hourly wages are negatively associated with cultural distance. This wage penalty

Figure 19: Comparing the dynamic results over several time ranges.



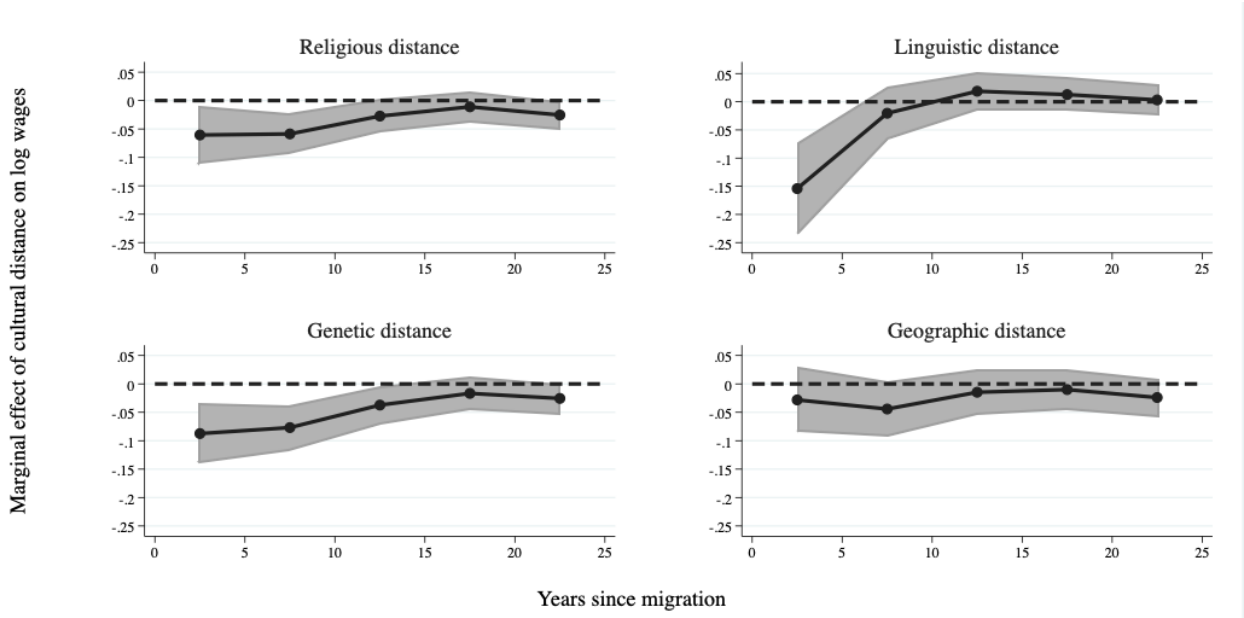
Notes: This graph presents the evolution of wage penalties associated with cultural differences. All three panels vary in their definition of years since migration. They respectively adopt 2, 3 and 10 years range. This graph shows both point estimates and confidence intervals. The dependent variable is the log of hourly wages. These relationships are estimated with ordinary least squares. The cultural distance indices are standardized. All specifications control for fluency in German, employment status and year-of-survey fixed effects, individual fixed effects, occupational fixed effects using the two-digit ISEI classification, industry-specific fixed effects using the two-digit NACE classification, and the size of the company in which the immigrants are working. **Source:** German Socio-Economic Panel 1984-2017

gradually disappears over time. This pattern applies to all four indices. However, the initial wage penalty is not significant when cultural distance is measured according to geographic distance. The magnitudes of these effects are also slightly greater. This could be due to the increasing pattern of the results. Aggregating the years over a longer period of time reduces the magnitude of the average.

C.2 Citizenship

This section shows that the dynamic effect associated with cultural distance is not driven by the acquisition of German citizenship. Heinmueller et al. (2019) and Govind (2020) have documented the positive effect of citizenship acquisition on the labor-market outcomes

Figure 20: Dynamic results for immigrants without German citizenship.



Notes: This graph presents the evolution of wage penalties associated with cultural differences. It only takes immigrants without German citizenship into account. It shows both point estimates and confidence intervals. The dependent variable is the log of hourly wages. These relationships are estimated with ordinary least squares. Cultural distance indices are standardized. All specifications control for fluency in German, employment status and year-of-survey fixed effects, individual fixed effects, occupation fixed effects using the two-digit ISEI classification, industry fixed effects using the two-digits NACE classification and the size of the company in which the immigrants are working. There are 3,921 immigrants with high-school education and 1,190 immigrants with college education.
Source: German Socio-Economic Panel 1984-2017

of immigrant workers. I specifically control for this phenomenon by replicating the main analysis with a subsample of immigrants. This subsample only includes immigrants without German citizenship. Figure 20 shows that the results are almost identical to the main analysis presented in Figure 10.

C.3 Heterogeneity analysis

This section explores the heterogeneity of the effect of cultural differences on wages. The analysis is twofold. First, it studies how the effects of cultural differences vary for immigrants originating from countries bordering Germany, and immigrants from other countries. Second, it compares the effects on immigrants with a high-school level of education and those with college education.

C.3.1 Neighboring countries

This section studies the heterogeneity of the effect throughout the distribution of cultural distance. It replicates the main analysis with two distinct groups of immigrant workers. It initially focuses on immigrants originating from countries bordering Germany, and then examines the rest of the immigrants. The former belong to the lower tail of the cultural distance distribution. Figures 21 and 22 present the results.

The specifications focusing on immigrants originating from countries bordering Germany can be interpreted as placebo tests. They show that these workers are almost unaffected by cultural differences. The results estimated for religious, genetic and geographic distances are not significant over the entire duration of migration episodes. The second panel of Figure 21, estimated for linguistic distance, reports a small but significant negative effect on immigrants' wages. This effect only appears for the first five years spent in Germany.

On the contrary, the specification focusing on the rest of the immigrants highlights a wage penalty associated with cultural differences. These results present similar patterns to those presented in the main analysis and shown in Figure 10. The coefficients estimated for religious, linguistic and genetic distances are significantly negative at the beginning of

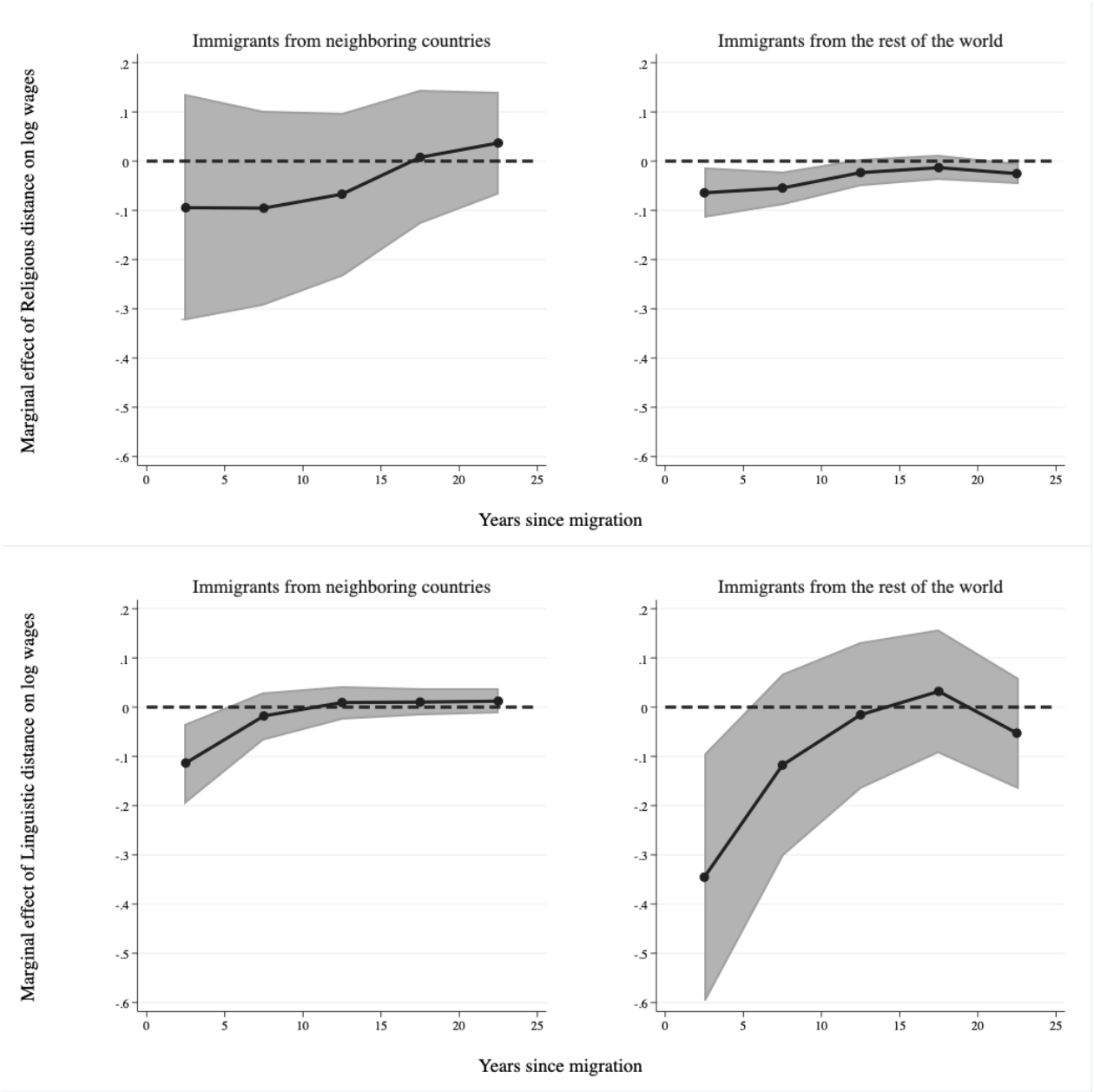
migration episodes. After five to ten years, these wage penalties disappear. The magnitudes of these coefficients are slightly different than those shown in Figure 10. This difference results from the heterogeneity presented in this section.

C.3.2 Education level

This section explores the heterogeneity of the results across levels of education. It replicates the main specification presented in Section 2 with two distinct subsamples. The first subsample focuses on the 3,921 immigrants with a high-school level of education. The second subsample focuses on the 1,190 immigrants with a college level of education. The results are presented in Figures 23 and 24.

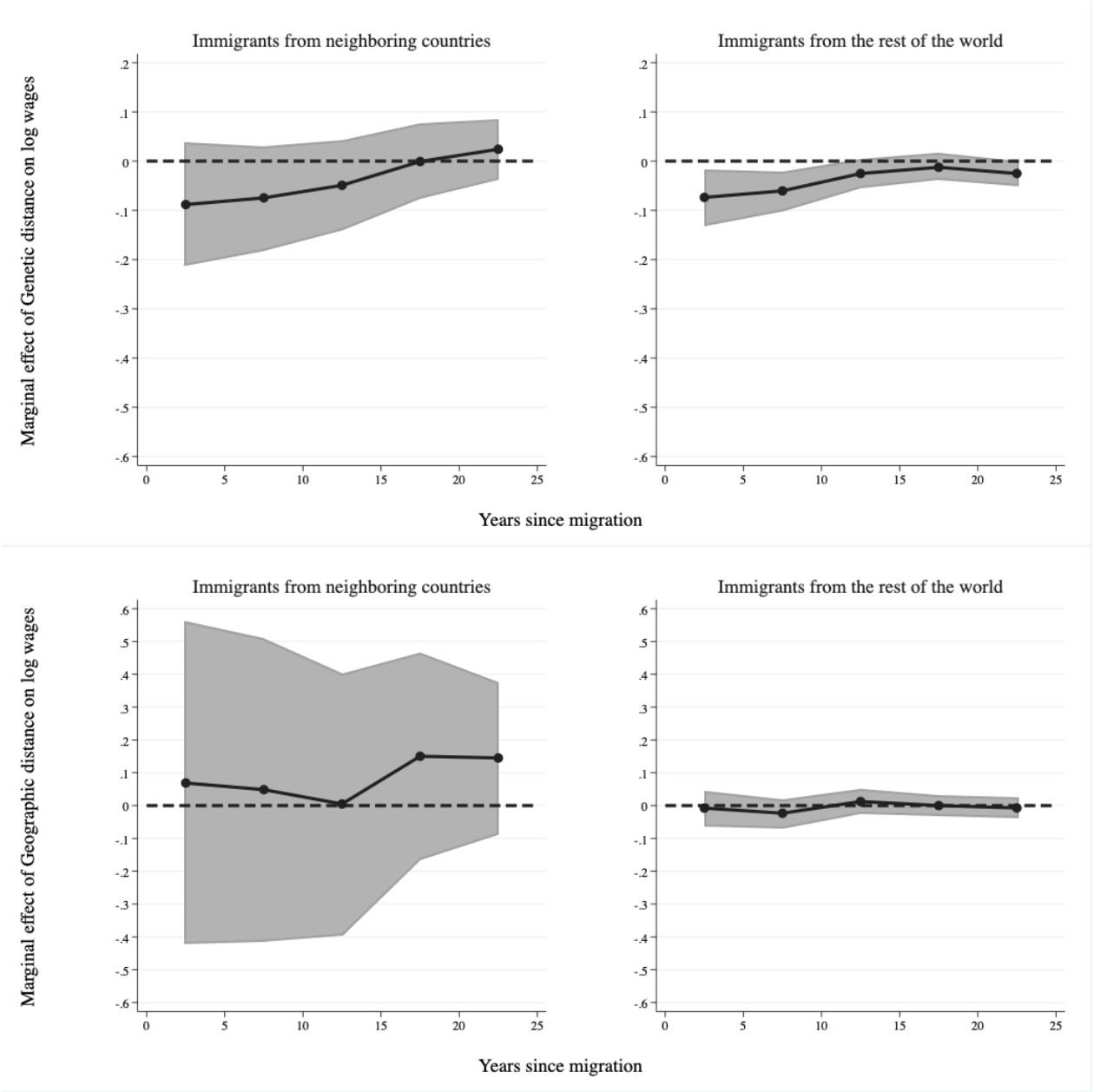
These figures show that the effect of cultural difference on immigrants wages only applies to immigrants with a high-school level of education. Specifications that focus on this category report results that are fairly similar to the rest of the analysis. The coefficients estimated with religious, linguistic, and genetic distances are significantly negative during the first ten years spent in Germany. After ten years, these coefficients are no longer significant. On the contrary, specifications focusing on immigrants with college education only report non-significant estimates.

Figure 21: Comparing the dynamic results for immigrants from neighboring countries with the rest of the immigrants.



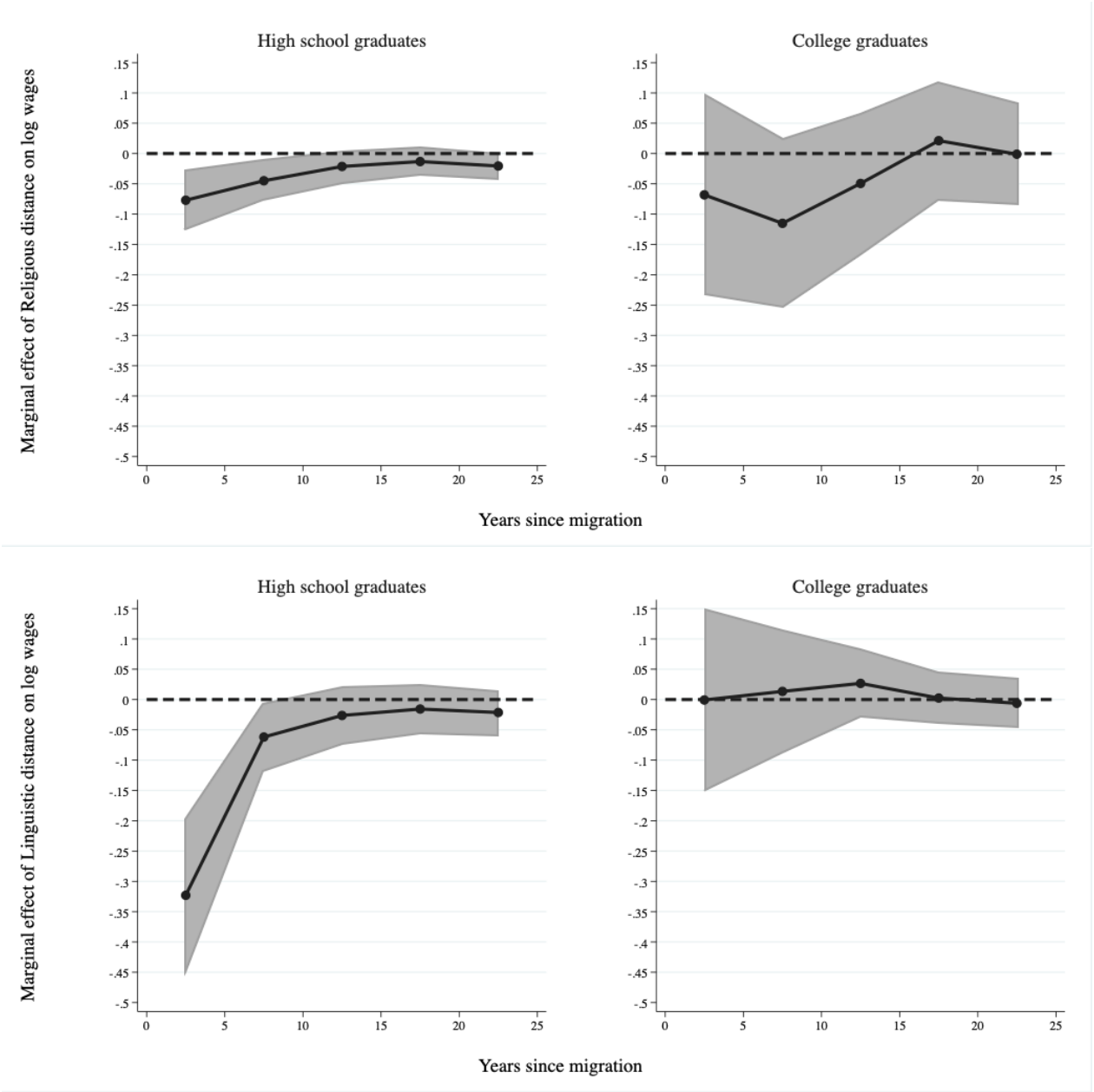
Notes: This graph presents the evolution of wage penalties associated with cultural differences. It shows both point estimates and confidence intervals. The dependent variable is the log of hourly wages. These relationships are estimated with ordinary least squares. The cultural distance indices are standardized. All specifications control for fluency in German, employment status and year-of-survey fixed effects, individual fixed effects, occupation fixed effects using the two-digit ISEI classification, industry fixed effects using the two-digit NACE classification and the size of the company in which the immigrants are working. The sample including neighboring countries consists of 1,195 immigrants. The other sample includes 3,916 immigrants. **Source:** German Socio-Economic Panel 1984-2017

Figure 22: Comparing the dynamic results for immigrants from neighboring countries with the rest of the immigrants.



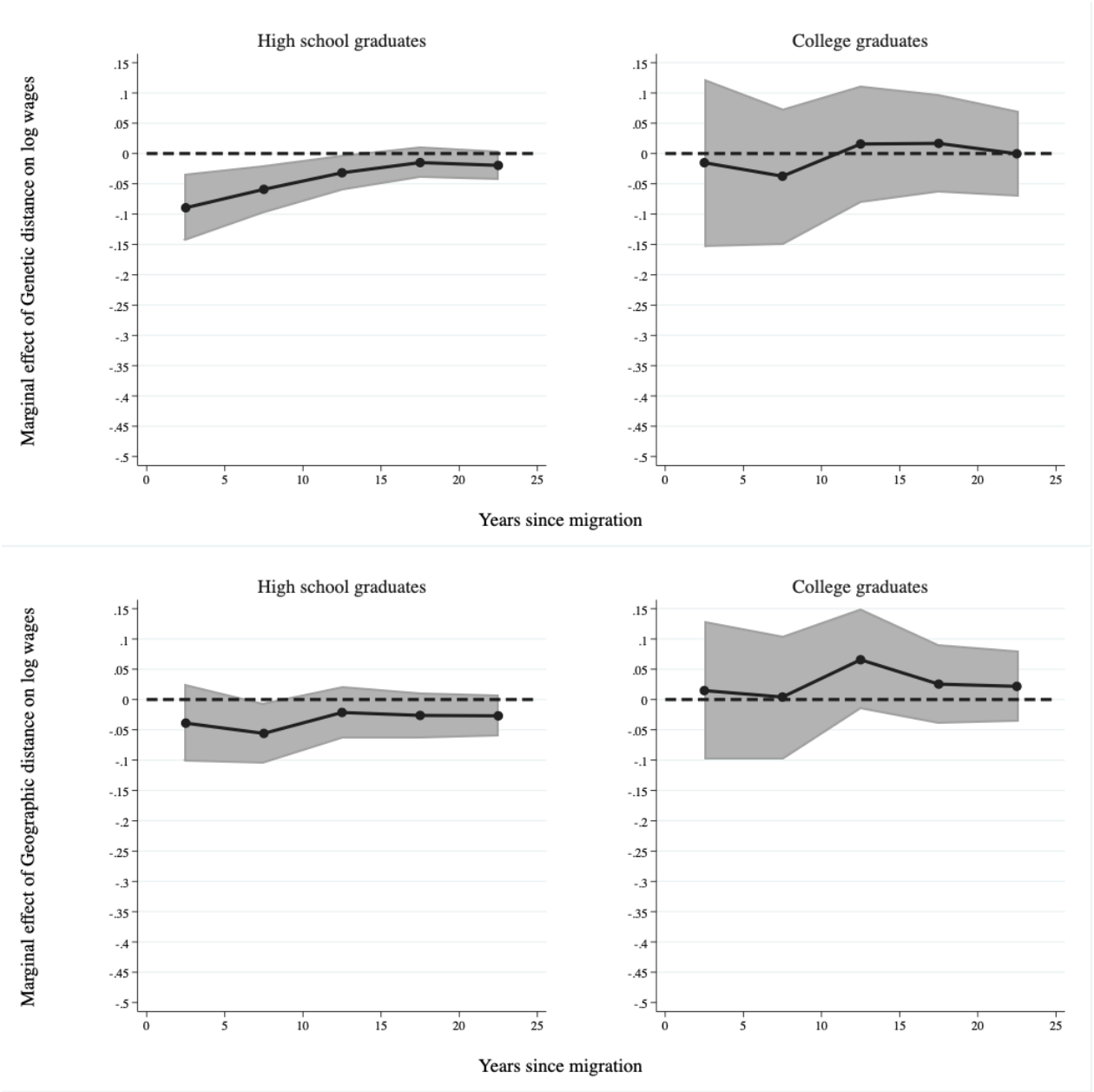
Notes: This graph presents the evolution of wage penalties associated with cultural differences. It shows both point estimates and confidence intervals. The dependent variable is the log of hourly wages. These relationships are estimated with ordinary least squares. The cultural distance indices are standardized. All specifications control for fluency in German, employment status and year-of-survey fixed effects, individual fixed effects, occupation fixed effects using the two-digit ISEI classification, industry fixed effects using the two-digit NACE classification and the size of the company in which the immigrants are working. The sample including neighboring countries consists of 1,195 immigrants. The other sample includes 3,916 immigrants. **Source:** German Socio-Economic Panel 1984-2017

Figure 23: Comparing the dynamic results of immigrants with a high-school education and immigrants with a college education.



Notes: This graph presents the evolution of wage penalties associated with cultural differences. It shows both point estimates and confidence intervals. The dependent variable is the log of hourly wages. These relationships are estimated with ordinary least squares. The cultural distance indices are standardized. All specifications control for fluency in German, employment status and year-of-survey fixed effects, individual fixed effects, occupation fixed effects using the two-digit ISEI classification, industry fixed effects using the two-digit NACE classification and the size of the company in which the immigrants are working. There are 3,921 immigrants with a high-school education and 1,190 immigrants with a college education.**Source:** German Socio-Economic Panel 1984-2017

Figure 24: Comparing the dynamic results between immigrants with a high-school education and immigrants with a college education.



Notes: This graph presents the evolution of wage penalties associated with cultural differences. It shows both point estimates and confidence intervals. The dependent variable is the log of hourly wages. These relationships are estimated with ordinary least squares. The cultural distance indices are standardized. All specifications control for fluency in German, employment status and year-of-survey fixed effects, individual fixed effects, occupation fixed effects using the two-digit ISEI classification, industry fixed effects using the two-digit NACE classification and the size of the company in which the immigrants are working. There are 3,921 immigrants with a high-school education and 1,190 immigrants with a college education. **Source:** German Socio-Economic Panel 1984-2017