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IZA DP No. 10514

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ABSTRACT

Persistent Occupational Hierarchies among Immigrant Worker Groups in the United States Labor Market*

This paper examines the phenomenon of occupational hierarchies among immigrant labor groups in the United States. Using census data for 1940-2011 we document the persistent ranking of immigrant labor groups in major metropolitan areas reflected by their position in the empirical distribution of occupations based on the corresponding Duncan Socioeconomic Index values. Having established the existence and persistence of these hierarchies across regions and time we estimate a structural model of the allocation of immigrant labor to the occupational distribution on the basis of employers' perception of their perceived productivity. The model estimates suggest that while human capital characteristics are relevant determinants of location in the occupational distribution the key factor, and the cause of persistence, is the presence of immigrant networks in regional labor markets.

JEL Classification: J24, J61, J62

Keywords: occupational hierarchies, immigrant networks, empirical distribution of occupations

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1 Introduction

Data from the 1940 US Census reveal immigrants from Canada and Northern Europe were more frequently employed in "higher ranked" occupations than those from Asia, South America and Southern and Eastern Europe. For example, 30 percent of Canadian and 36 percent of English immigrants were employed in white collar occupations compared to 18 percent of Italian, 21 percent of Polish and 11 percent of Mexican immigrants.[1] Although the share of white collar employment grew from 30 to about 60 percent by 2011 the disparity not only remained but had sometimes grown. For example, the shares increased to 70 percent of Canadian and 76 percent of English immigrants compared to 38 and 18 percent for Polish and Mexicans workers respectively. Moreover, these patterns also appear at the regional level for individual cross sections. For example, in 1940 Chicago 19 percent of Italian workers found white collar jobs compared to 15 percent of Polish workers while in Buffalo Italian immigrants (24 percent) also did better than Polish (16 percent). In 2011 46 and 30 percent of Italians in Chicago and Buffalo respectively were in white collar employment compared to 30 and 20 percent respectively of Polish workers. Similarly, in 1940 New York 34 percent of Canadian and 26 percent of German workers were in white collar employment. By 2011 both countries almost doubled their shares, to 64 percent and 45 percent respectively, while preserving the ranking.

As human capital differences might explain these patterns we examine the corresponding shares for individuals without post high school education noting that between 1940 and 2011 47 percent of immigrants obtained no more than a high school degree. This share decreased from 83 percent in 1940 to 36 percent in 2011. In 1940 25 percent of Canadian, 30 percent of English, 23 percent of German, 16 percent of Italian and 19 percent of Polish unskilled workers had white collar jobs. In 2011 Canadian and English workers continued to exhibit the highest shares, 47 and 49 percent respectively, compared to 32 percent of Italians, 19 percent of Polish, 30 percent of Filipinos and 23 percent of Vietnamese. While the initial disparity might partially reflect differences in the literacy rates and educational attainment it is not clear why this pattern has persisted.

Although the above discussion is based on a very simple characterization of the labor market it suggests that immigrants from certain countries locate higher in the occupational distribution than those from other countries and the ranking persists across years and regions. This paper provides a detailed investigation of this phenomena. That is, when the same pair of immigrant groups repeatedly appear in the same region does one consistently do better than another? Moreover, which groups do best when paired and which economic factors are at play?

Previous economic investigations of the labor market activity of immigrants in the

[1] These and the following figures refer to the population of employed male immigrants aged 16-70 years.

United States have primarily focused on their impact on the native born (Altonji and Card, 2007, Borjas, 1994a, Card, 1997, 2005, Ottaviano and Peri, 2008, 2012, Borjas et al., 1997). These studies typically investigate the effect of immigration on native borns' labor market activity as measured by wages (Card, 1997, Ottaviano and Peri, 2008, 2012, Borjas et al., 1997), employment opportunities (Altonji and Card, 2007, Card, 2005) and internal migration (Borjas, 2006b, Card, 2001, DiNardo et al., 2000). Studies on the performance of immigrants typically examine how they perform relative to the native born. An early literature examined the rate at which their wages converged to native born wages (Borjas, 1994b). Others considered how Hispanic and Asian American workers compare to natives (Tolnay, 2001, Bohon, 2005, Model, 2002). A feature of this work is that immigrants are viewed as a homogeneous group when in reality they comprise individuals that differ on a number of dimensions including from where and when they came (Borjas, 1985, 1994b), their capacity to speak English and other features which reflect their capacity to perform in the labor market. Examining how these various features influence their position in the occupational distribution of migrants seems a valuable investigation.

Others have studied various aspects of immigrants' occupational choices. Model (2002) compared six nonwhite immigrant groups in the US and the UK and found that labor market outcomes across migrants from the same origin differ across destinations. Bohon (2005) shows that the occupational attainment of Latino immigrants in the US is influenced by their place of origin and their destination. Waldinger (1996, 1994), Beaman (2012) and Laschever (2009) studied the emergence of immigrant niche economies and the presence of networks in the labor market. These networks influenced the labor market outcomes of generations of immigrants. The choice of occupations of the early cohorts of immigrants was determined by both immigrant and regional characteristics. Differences in regional characteristics, such as ethnic composition, can have a long lasting effects on career choices as shown in Munshi and Wilson (2011). Patel and Vella (2013) provide evidence that the occupational choices of recent immigrants differ by destination and are affected by those of the previous cohorts of immigrants located in that destination. More specifically, the evidence suggests that immigrants from specific countries cluster in particular occupations in different regions and that the allocation to these sectors generally does not depend on observed or unobserved skills.

Patel and Vella (2013) assign the persistence in occupational choice to network effects. We investigate whether these effects also contribute to the creation of occupational hierarchies. Consider two countries, A and B. From Patel and Vella (2013) we know that if immigrants from these two countries locate in the same region they are likely to be employed in different occupations. Moreover, if the same groups locate in a second region they are likely to locate in different occupations than the first region. We investigate whether if immigrants from country A are generally doing better than immigrants from

country B in one region are they also doing better in another region. Moreover, if we consider 3 groups or more do hierarchical patterns emerge?

Our focus is location in the occupational distribution and not the actual occupational choice. We are motivated by the earlier literature that finds immigrants are employed in different occupations depending on the region in which they locate. We examine whether the ranking of immigrant labor is invariant to the occupational composition of the region. Location in the occupational distribution incorporates the regional differences in the occupational composition and accounts for the "quality" of the workers present in the region. Moreover, while uncovering the existence and the determinants of immigrant occupational hierarchies is itself interesting it has implications for the welfare of new immigrants and their offspring through inter-generational transmission of socioeconomic status (Borjas, 1992, 2006a). Persistent occupational hierarchies may lead to stagnation in the socioeconomic standings of immigrant workers and their subsequent generations. This phenomena might also explain other socioeconomic behavior of immigrants such as residential location.

The next section describes the data and presents some evidence on the choice of occupations of immigrants in the United States as captured by a measure of socioeconomic standings. Section 3 provides evidence on the existence of occupational hierarchies of immigrant groups in the United States labor market. Section 4 presents a descriptive regression analysis while section 5 introduces a structural model of occupational hierarchies based on the sorting of workers into sectors on the basis of productivity. This section also provide a discussion of the model estimates. Section 6 investigates implications of these estimates. Section 7 provides some concluding comments.

2 Occupational Prestige Scores

Our empirical investigation employs data from 1940-2000 US Census and the 2011 5-year sample from the American Community Survey (Steven Ruggles et al., 2010). For 1980, 1990 and 2000 we use the 1 percent samples and for 1940, 1950, 1960 and 1970 we use the 5 percent samples. We exclude data prior to 1940 as information regarding the individual's educational attainment was not available.

Our analysis below ranks occupations via the Duncan Socioeconomic Index (SEI). The SEI is based on the 1950 classification of occupations and employs the median educational attainment and income associated with each occupation for the 1947 survey of men. It takes values from 0 to 100 noting that the lowest score in our data is 3 and the highest is 96. The SEI score provides a consistent measure of occupational prestige using the 1950 classification of occupations and allows inter-temporal comparisons. While the SEI is useful for our purposes it has some shortcomings. Its values are time invariant and do not capture changes in the occupation's prestige. Such a change might, for instance, manifest

itself in large increase in the occupation's average wage. However, the SEI score appears to capture the variation in average wages across occupations. The correlation between the SEI score and average wages in each year in the period considered is between 0.7 and 0.79. Moreover, there are no occupations with a low (high) SEI score and unusually high (low) average income. Another shortcoming is that the distances between values are not generally informative. That is, the distance in socioeconomic status is not accurately reflected in this measure. Nevertheless, despite its limitations it has certain advantages given our focus. Occupational hierarchies are a long term phenomena and we prefer a measure unaffected by short term fluctuations. The SEI score is robust to shocks to local economies that temporarily affect a status of an occupation but do not reflect its long term place in occupational distribution. Similarly, since it is based on native workers' wages it does not reflect any sorting into occupations by immigrants and its impact on wages. Furthermore, with the exception of two occupations (*Operative and kindred workers* and *Managers and proprietors*) the variance of individual wages within occupations is relatively low. Thus the observed variance in wages among immigrant workers is due to differences in wages across, rather than within, occupations.

We begin by identifying the immigrant groups with a substantial and consistent presence in the United States. To reduce concerns related to selection bias associated with labor force participation and unemployment we restrict our sample to males aged 16 to 70 years who are employed in an identified occupation in an identified metropolitan area. We focus our analysis on immigrants originating in the fifteen large sending countries and we require at least 50 other immigrants from their country in given metropolitan area. As we investigate a country's relative position we exclude metropolitan areas with less than two different groups satisfying our size requirement. This reduces the sample of individuals by 20 percent producing a final sample of 115 metropolitan areas. The final sample consists of individuals from Canada, Mexico, Cuba, England, Italy, Germany, Poland, Russia, China, Korea, Philippines, Vietnam and India, Africa and the Middle East.[2] These fifteen countries represent 68 percent of total immigration of males in the considered age group into the US in the period we examine. The groups in our resulting sample represent 11 percent of all males aged 16 to 70 years and 70 percent of all immigrants of this age.

Table 1 reports the composition of our sample for *"all"* and *"unskilled"* individuals recalling that the latter group comprises those who did not achieve education beyond high school. Prior to 1970 the largest groups were from Canada, Germany, Poland, Italy and Russia. From 1980 Mexican immigration began to dominate reaching 46 percent of the *"all"* sample in 2000 and 73 percent of the sample of the *"unskilled"* in 2011. European immigration has markedly decreased recently while immigration from Asia and Africa has

[2]Russia includes all individuals who declare Russia or USSR as country of birth. Moreover, even though we include some regions we will refer to them as countries.

increased. Since 1980 China, India and the Philippines are the largest sending countries after Mexico. China and Vietnam are the two largest providers of unskilled workers after Mexico. Total immigration from the Middle East has remained at around 3 percent while its share of the *"unskilled"* has increased slightly over the time period we consider. The regions' ethnic composition show substantial variation. Very few metropolitan areas have received a large number of immigrants from multiple origins throughout the whole period considered. Boston, Chicago, Detroit, Los Angeles, New York, Philadelphia and San Francisco have at least 5 different groups in every time period between 1940 and 2011. Many metropolitan areas have at most three large groups and have experienced large inflows of immigrants from 1980 onward.

Table 2 presents summary statistics for some variables of interest by country of origin by year. These include *age*, *education* (measured with years of schooling), *English proficiency* (measured as an indicator that the individual speaks English well) and SEI. The average age varies from about 32 to 58 years. Between 1950-1970 immigrants from the early sending countries are generally older than in later years. Those from Mexico, India, Korea, Vietnam, Africa and the Middle East are generally younger. Large educational differences exist across time and countries despite a common increasing trend in educational attainment. Immigrants from Africa, Korea, Vietnam and India are the exceptions with relatively constant average years of schooling throughout the time period considered. The average individual from each of these countries is relatively skilled with 15, 14, 14 and 12.5 years of schooling completed. The lowest levels of education are reported among Mexicans with an average of less than high school degree. Italian, Polish and Cuban immigrants also reveal relatively low levels of educational attainment. The most highly educated are those from India, Canada, England, Germany, Russia, China, Korea, the Philippines and Africa.

The joint analysis of education trends and occupational prestige scores does not reveal an obvious positive relationship. For example, in 1970 an average worker originating from Canada or Germany completed 11.4 years of schooling and was employed in an occupation with a prestige score of 43. In the same year the average worker from the Philippines completed almost one more year of schooling but was employed in a job with a prestige score lower by 6 points. Similarly, in 2000 the average worker from England or Canada had 14.5 years of education and an occupation score of 56. Average workers from Korea, Russia and the Philippines also completed about 14 years of schooling but were employed in jobs with prestige scores 4, 9 and 14 points lower respectively.

English proficiency also varies greatly across and within countries. Immigrants from Canada, Germany, England, the Philippines, Africa, India and the Middle East report proficiency, or close to proficiency, throughout the whole period. For most countries the share proficient remained relatively constant at about 70-85 percent between 1980-2011.

Italian and Korean workers are notable as their fractions of workers proficient went from 85 and 69 percent in 1980 to 95 and 76 percent in 2011 respectively. Only 50 percent of Mexican and 68 percent of Cuban workers report a good command of English throughout the time period considered.

In determining an individual's position in the occupational distribution one could rank each occupation by its prestige score and rank workers according to this score. A worker would then be in the p^{th} percentile of the occupational distribution if he was in the occupation which corresponds to that location in the distribution. This, however, does not capture regional differences in the occupational distribution nor the "quality" of the other immigrants in the region. That is, the occupations in the p^{th} percentile in one region may not be the same as another depending on regional demand factors and which other groups are present. An alternative method is to compute the empirical distribution of each region in each time period separately. An individual in the p^{th} percentile of the occupational distribution now has a job in the p^{th} percentile of the occupational distribution for that region in that time period. This is a more accurate characterization of the hierarchy phenomenon.

Using this latter approach we consider the changes in the shares of workers employed in the "top" sector over time. Throughout the paper we refer to a collection of jobs as a "sector" where the term refers to a part of the empirical distribution and the occupations therein. As the empirical distribution is derived for each region separately the sector's composition of occupations may vary by metropolitan area and time period. Specifically, for each metropolitan area in each time period we rank all workers based on the occupational prestige score. Those located in the top 50 percent of the empirical distribution in each region are assigned to the top sector. Table 3 summarizes the results. Throughout the time period considered Indian, Canadian and English workers enjoy the highest shares of individuals employed in the top sector while Mexican, Polish and Italian workers display the lowest. Filipino and Chinese workers experienced the largest increase in the shares in the top sector of 41 and 45 percentage points respectively. The patterns among the *"unskilled"* resemble those of the *"all"* workers. Canadian and English migrants display the highest shares between 1940 and 2011, while Mexican, Cuban and Chinese workers consistently display the lowest. Indian and Chinese unskilled workers consistently display lower shares than those observed among *"all"* while Polish, Italian and Vietnamese migrants exhibit an opposite trend. Among the *"unskilled"* almost all groups enjoyed a steady increase except those from Russia, Vietnam, India and Africa who maintained their positions. Contrasting these trends with the changes in the average SEI score presented in Table 2 highlights the benefits of our approach in characterizing regional labor markets. Table 2 reports that almost all groups enjoyed a steady increase in the average SEI score since 1940 suggesting that the position of each group improved

over time.[3] Table 3 indicates the shares of individuals employed in the top sector grew at a smaller rate or changed by a small amount. For instance, the average prestige score among Italian workers almost doubled between 1940 and 2011 while the share of workers employed in the top sector increased by only 30 percent. Vietnam is notable as it has one of the lowest average SEI score and a relatively high share of workers in the top part of the empirical distribution (54 to 64 percent) throughout the time period considered. This highlights that the ranking based on average SEI score does not account for the regional occupational composition.

Using the changes in the differences between the average prestige score of groups within a region we examine the stability of the rankings over time. We compute the difference in each metropolitan area for which a given pair is present and then average these differences over all regions in given year. In 67 percent of the *"all"* sample and 65 percent of the *"unskilled"* sample the ordering remained unchanged over the entire time period. This implies that if the first time we observe immigrants from two origins those from country A were, on average, doing better than those from country B they are generally doing better in the last year we observe them. Moreover, in many instances, and particularly for the *"unskilled"*, the average difference remains relatively constant. For example, in 1980 in metropolitan areas where unskilled Canadian and Vietnamese workers appear together, the latter were employed in occupations with an average prestige score lower by 7.2 points. In 2011 this difference was 7.7 points. The differences between average prestige scores between unskilled English and German or English and Italian workers varied slightly between 1.2 and 3.8 points, and 7.4 and 10.3 points, respectively, over the entire time period. However, some workers' relative positions deteriorated. These include unskilled Russians against German, Canadian, English or Middle Eastern workers or unskilled Polish workers against Filipinos and unskilled Germans against Indians.

These patterns do not capture information regarding the types of occupations into which different immigrant groups sort. One explanation of occupational hierarchies is that within regions workers sort into different occupations. This could be driven by regional labor markets characteristics and/or by country of origin specific skills. In the former case we should observe groups sorting into different occupations across regions while in the latter immigrants from the same countries should generally sort into the same occupations. Patel and Vella (2013) provide evidence that the choice of low skilled occupation varies by metropolitan areas suggesting that the allocation to occupation is not driven by specific skills of the immigrants. However, even if workers sort into different occupations in different regions there could be significant overlap between popular

[3]India and Africa appear to show different patterns. However, there are only three metropolitan areas with large concentrations of African and Indian workers in 1970, New York and Los Angeles and New York and Chicago respectively. Immigrants from both groups were frequently employed as Physicians and Managers and Administrators. In addition, Indians built large networks in engineering and African workers in actuarial occupations.

occupations among groups in this region. The observed hierarchies would then reflect differences in shares in each occupation within a region. To gain insight into the potential causes of the hierarchical pattern we characterize each country's most popular occupational location in the US. An occupation is defined to be "popular" among workers of given origin if the share of workers of that origin employed in it is at least 5 percent.

Using this measure of "popular" we examine two issues. First, how frequently does a country develop large networks in the same occupations across metropolitan areas in the same census year? In the time period we consider the probability that a popular occupation in one metropolitan area is also popular in at least one other region in the same census year is about 50 percent. Among the *"unskilled"* there appears to be less spatial variation in popular occupations with 61 percent chance that a given group developed large networks in the same occupation across at least two regions.

A second issue is the frequency at which immigrant groups share popular occupations within metropolitan areas. Around 56 percent of the popular occupations are unique to one group in a given metropolitan area. This is remarkable given that popular occupations include very broad categories. These two facts suggest that the occupational hierarchies arise from workers sorting into different occupations within regions and suggests that occupational networks might play a role in maintaining them. However, this evidence might conceal that the sorting of groups into occupations depends on others in the region.

To examine if each group's performance in the local labor market is related to the region's ethnic composition, we analyze the popular occupations for each pair of countries and summarize the findings by averaging over all possible pairs. We find that for the *"all"* category popular occupations among workers from both countries reveal substantial variation across such regions. On average, 82 percent of the popular occupations are unique to one group. For the *"unskilled"*, the polarization in occupational choice is stronger with 89 percent of the popular occupations being unique to one group suggesting that this is not simply a result of differences in educational attainment. It appears the choice of occupations depends on the presence of other groups in the region suggesting that the local labor market ethnic composition is important for the labor market outcomes.

3 Occupational Hierarchies Of Immigrant Workers

The evidence so far reveals a stable hierarchical pattern in immigrant workers occupational allocation which does not result from group specific skills. Moreover, a region's ethnic composition appears to matter for the location in the occupational distribution. To establish the existence of occupational hierarchies we focus on pairwise comparisons of countries.

Table 4 presents the empirical frequency of each country (row country) being ranked above every other country (column country) on the basis of average SEI score. The

comparisons are made on the basis of year and metropolitan area calculations and the table summarizes the results of all possible pairwise comparisons. The top panel considers *"all"* individuals and the bottom panel considers *"unskilled"* workers.

First consider *"all"* individuals. There are many columns with entries consistently high (or low) indicating that a specific group is consistently higher (lower) ranked than a number of the countries. Moreover, many entries are either close to 1 (or 0) indicating that every time immigrants from those particular two countries appear in the same area one is consistently achieving a superior (inferior) mean value of the SEI.

Consider some specific comparisons. Indians are almost always ranked first when they appear. Only in comparisons with Canada, England or China does this incidence fall below 90 percent. Mexicans are almost always found at the bottom of the occupational ladder. While India and Mexico represent extremes there are many pairwise comparisons in which a specific country dominates. Consider the following comparisons of countries with a long and widespread presence in the United States. Germans are ranked above Italian and Polish workers in 96 and 83 percent of cases respectively. However, when Germany is compared to Canada or England it is ranked first in only 14 and 13 percent of the cases respectively.

For many pairs of countries the patterns among *"all"* and *"unskilled"* workers are similar. Unskilled Mexican workers are ranked at the bottom whenever appear. Only when compared with workers from the Philippines, Cuba and Africa are they not ranked bottom. However, even in these instances the higher ranking is a rare occurrence. Among the commonly encountered groups, unskilled Germans are ranked above Italian and Polish workers in 93 and 75 percent of cases respectively while unskilled German workers are ranked above unskilled Canadian or English workers in only 8 and 14 percent of cases.

While all immigrants from India are generally collectively ranked very highly in many cases unskilled Indian immigrants are not. This is especially true when paired with Korea, England, Germany or Canada. Similarly, consider comparisons involving China with Korea, the Middle East or Russia. For the whole sample Korea is ranked above China only 23 percent of times while for unskilled workers Korea is ranked first 92 percent of times. Workers from the Middle East rank above China in only 38 percent of cases among the *"all"* but in 97 percent among the *"unskilled"*. Russian unskilled workers rank above Chinese workers in only 32 percent of cases in the *"all"* sample while this fraction is at 85 percent among the *"unskilled"*.

Comparisons based on average prestige scores do not capture regional differences in occupational composition nor the differences in the distribution of individual characteristics of workers in the region. We now turn to our preferred characterization based on the location in the empirical distribution of occupations. For simplicity we initially split the workers into two sectors, top and bottom, and base our comparisons on the shares in

the top sector. We first assign each occupation a score based on its place in the empirical distribution of the SEI. Individuals employed in occupations above the 70^{th} percentile of the empirical distribution are assigned to the "top" sector.

Recall the same occupation may fall into different sectors in different regions. For example, in 1990, plumbers in Baltimore and Seattle were in the bottom sector and in Los Angeles and Miami they were in the top sector. Similarly, in 2011 welders in Boston and Washington DC were in the bottom sector and in Austin and Atlanta they were in the top sector. These differences highlight the different regional occupational compositions.

Table 5 presents the empirical frequency of each country (row country) having a larger share of workers employed in the top sector than each of the other countries (column country). The comparisons are made on the basis of year and metropolitan area calculations and the table summarizes the results of all possible pairwise comparisons. The top panel considers *"all"* and the bottom panel considers the *"unskilled"*. The patterns confirm the consistent ranking of groups. Similar to comparisons based on average prestige scores there are many entries consistently high (or low) suggesting that some countries are relatively more likely to maintain large networks in occupations in the same part of occupational distributions over time.

Focus on some specific regions in which some groups have a long presence noting we restrict Table 6 to top sector shares for selected regions. The occupational compositions of the top sector vary across regions so we first briefly focus on this issue.

A striking feature of this table is the relatively stable position in terms of the empirical distribution of occupations among groups throughout the time period considered. Detroit presents a remarkable pattern. The share of Canadian workers employed in top sector varies between 35 and 45 percent. Thirty seven to 51 percent and 23 to 34 percent of English and Polish workers, respectively, had top sector jobs. Canadian and English immigrants maintained large networks in occupations such as *Managers and proprietors* and in sales while a large share of Polish immigrants worked as *Operative and kindred workers*. Similarly, among more recent migrants the share of workers in the top sector does not vary greatly across years. For example, 67-69 percent of Koreans and 56 percent of Filipino workers in Houston, 39-55 percent of African workers in Chicago and 44-52 percent of workers from the Middle East in San Francisco are employed in the top part of the empirical distribution of occupations.

Despite this persistence some groups improved their position substantially while others fell behind. For instance, in New York the share of Italian immigrants employed in the top sector increased form 20 to 40 percent between 1940 and 2011. They developed large networks in clerical and sales related occupations as well as insurance and real estate agents. Similarly, the proportion of Cubans in top sector jobs in New York increased from 13 percent in 1950 New York to 38 percent in 2011. In 1950 one in every five Cuban

workers in New York was employed as *Operative and kindred worker* while in 2011 one in every five workers was employed in sales in managerial occupations. However, the share of Cubans in top sector jobs in Riverside, CA decreased from 74 percent in 1960 to 55 percent in 2011 despite the fact that the actual choice of occupations did not appear to shift towards lower social status occupations.

Regardless of the direction in which the share moved it appears that the initial location in the distribution determines the outcome in later years. This is particularly the case for the least skilled migrants from Mexico and Vietnam. Between 1990 and 2011 the share of Vietnamese workers in the top sector in Oklahoma remained stable at about 50 percent while in Boston less than 20 percent enjoyed top sector jobs. In both metropolitan areas *Operative and kindred workers* are the most popular occupations. Similarly, the share of Mexican workers in the top part of the empirical distribution of occupations in Chicago and Los Angeles was below 15 percent throughout the time period considered while in newer destinations, such as Fresno, CA and Reno, NV the share exceeded 25 percent. In Fresno, one in every three Mexican immigrants works as a *Farm laborer* while in Reno as *Operative and kindred worker*. In Chicago and Los Angeles they seem to face better occupational prospects with a 65 percent chance of employment in occupations of higher status than *Operative and kindred worker*.

The above examples and the differences between the rankings based on average prestige scores and shares of workers in the top part of empirical distribution of occupations highlights the need for a more detailed labor market characterization and therefore we extend the analysis to four sectors. Individuals employed in occupations above the 90^{th} percentile of the empirical distribution are assigned to *Sector A* (top sector); those between the 70^{th} and the 90^{th} percentile are allocated into *Sector B;* those between the 40^{th} and 70^{th} percentiles are allocated into *Sector C*. The remaining workers are employed in *Sector D*.

Table 7 presents the shares of *"all"* and *"unskilled"* in the four sectors averaged over metropolitan areas.[4] First consider *"all"*. By 2011 Canadian, English, German, Chinese Korean, Indian and Middle Eastern workers have on average over 50 percent of individuals employed in occupations in either sector A or B. At least one in every five workers from these countries are employed in sector A compared to only 7 percent of Mexican or Polish workers. Poland, Vietnam and the Philippines have less than 15 percent of workers in the top part of the empirical distribution. Sector D is largely occupied by Mexican workers with 49 percent of all Mexican workers employed in this sector in 2011.

The distribution into sectors of *"unskilled"* shows similar patterns. However, the shares of *"unskilled"* from Canada, England, Germany and Italy in Sector A are higher than for all workers suggesting a more polarized division among unskilled workers. Chi-

[4]The sectors are defined for the population of interest, *"all"* or "*unskilled"*, meaning that the sectors are not the same for the two tables.

nese and Indian unskilled are less likely to be employed in the top sector occupations than their skilled counterparts and are more likely to locate in sectors C and D. This reflects that Chinese and Indian immigrants comprise either very skilled individuals or workers with very little formal skills. Among unskilled workers, Mexican, Cuban and African immigrants have the smallest shares of workers employed in the top sector and the highest shares of workers employed in the bottom sector.

These crude patterns suggest that some countries are relatively more likely to maintain large networks in occupations in the same region of the occupational distributions even when we consider a higher level of labor market disaggregation. It appears this is usually true for the more recent immigrant groups. The countries that most increased their shares in the top two sectors generally did so between 1940 and 1980. For the majority of the countries the recent changes in shares are relatively small. This is also suggestive of occupational hierarchies. The analysis of pairwise comparisons within sectors at this higher level of labor market disaggregation confirms this via the consistent rankings between many countries within sectors among "*all*" and "*unskilled*" reflected by the large numbers of entries close to 0 or 1 in Table 8 and Table 9.

4 Descriptive Regression Analysis

We now present a descriptive regression analysis of the co-variation between the observed hierarchies and some worker observable characteristics. As it appears that a determinant of location in the occupational distribution is the existence of networks we examine the occupational location of newly arrived immigrants. We examine the behavior of those who have arrived in the US within 10 years of each census year and examine the role of existing networks. We maintain our focus on regions where the same immigrant groups are observed with regularity and restrict our sample to metropolitan regions where there are at least 50 (individuals) established migrants from each of at least 2 of the fifteen large sending countries countries.[5] To account for the presence of all new immigrants we combine individuals born in all other regions into one category referred to as "Others".[6] As a likely explanator of occupational location is English proficiency we limit the empirical investigation to post 1980 as this variable is unavailable for earlier periods. These considerations produce a sample of 4 time periods and 80 metropolitan areas noting that not all regions contribute to each time period. The total number of time-region data points is 226 reflecting approximately 20 percent of all metropolitan areas in the 1980-2011 time period. The sample comprises 378283 individuals representing about 29 percent of the

[5]Established migrants are individuals who arrived in the US more than 10 years prior to each census year.

[6]Inclusion of this group into the estimation makes counterfactuals plausible. However, omitting this group from the model necessarily implies redistribution into a subsample of available occupations within particular region and dismisses a large group of available workers.

immigrant population of employed males in the respective age group between 1980 and 2011. Recent migrants originating in the fifteen large sending countries constitute about 70 percent of our sample.

The summary statistics presented in Table 10 suggest that individuals in the two top sectors differ to all other workers with respect to their age, education and English proficiency. Workers in sector A are on average 3 years older, have completed about 3.5 more years of education and have a higher share proficient in English than those in lower ranked sectors. A comparison of those in sector B with those in sectors C and D finds similar differences. The differences between those in sector C and sector D are smaller. To examine how individuals characteristics explain the location in the empirical distribution of occupations, for each sector $o = \{A, B, C\}$, we estimate the following linear probability model:

$$d_{io} = I(x_i \xi_o + \eta_{io} > 0)$$

where d_{io} is a binary variable that equals 1 if individual i is employed in sector o and x_i is a vector of the individual characteristics *age*, *education* and *English proficiency*; ξ_o is a vector of coefficients and η_{io} is an error term. We plot the relationship between the models' predicted and actual values for the top and two middle sectors in the left panels of Figure 1. These plots indicate that, especially for sectors A and B, the model does not predict well suggesting that the individual characteristics alone cannot explain the location in occupational distribution of immigrant workers.

Table 10 suggests the presence of networks and the worker group's history in the region may also be relevant. The variables capturing these factors are the *network size* in the relevant sector, the *length of stay* of the group in metropolitan area, and the *arrival year*. The *network size* is the share of immigrants from a given group employed in particular sector in a given year. The *arrival year* denotes the decade in which a group first appears in a region in large numbers. It takes integer values from 1 and 6 where 1 corresponds to arrival year between 1940 and 1950. The *length of stay* captures a group's tenure in the region and is measured in decades with 1 denoting the most recent arrival. Workers employed in occupations in sector A have 10% larger networks in sector A occupations compared to everybody else. Workers employed in sector B occupations have 8 percent larger networks in that sector than those in the bottom two sectors. The role of the network appears smaller in sector C. The tenure in the region and the arrival year also appear more important for the probability of employment in the top sectors (sector A and B). We include these factors and estimate the following linear probability models:

$$d_{ijo} = \begin{cases} I(x_{ij}\xi_{jo} + z_j\mu_{jo} + \eta_{ijo} > 0) & \text{for } j = 1, \ldots, J \\ I(x_{ij}\xi_{jo} + \eta_{ijo} > 0) & \text{for } j = 0 \end{cases} \tag{1}$$

where z_j is a vector of group level characteristics including *arrival year*, $(arrival\ year)^2$,

length of stay and *network size* in sector o and $j = 1, \ldots, J$ corresponds to the large fifteen groups considered while $j = 0$ denotes all other migrants in the region. Given the composition of the last group the construction of the group level variables is not plausible. The right panels of Figure 1 reveal a clear improvement of the accuracy of predicted shares in all three sectors highlighting the importance of group characteristics in determining an individual's location in the empirical distribution of occupations.

5 Structural Model of Occupational Hierarchies

5.1 Structural Model

The descriptive regression analysis suggests the hierarchical patterns are determined by both an individual's own characteristics and those of his country of origin. However that analysis cannot be interpreted as evidence of causal relationships due to endogeneity and reverse causality. We provide insight into these causal relationships by estimating a structural model which represents the data generating process. Our aim is to produce a characterization of the sorting process of immigrants into occupations which explains the observed ranking.

We assume that in each region there is an exogenous number of jobs for immigrants and an exogenous number of immigrants. Moreover, we assume that these jobs, as reflected by the occupation type, are exogenous. Given the existence of these jobs and immigrants the employers evaluate the productivity of each worker in each job and rank workers. They then allocate the workers into the various jobs. We continue to refer to a collection of jobs as a "sector". In each region the occupations are ranked according to the SEI index and aggregated into sectors.

Assume we divide each region into the four sectors described above with shares s_A, s_B, s_C and s_D respectively. We also assume that there are j immigrant groups with n_j workers each. If there are $N = \Sigma_{j=1}^{J} n_j$ workers the employers rank the workers on the basis of their productivity in sector A and assign the top $s_A * N$ workers to that sector. The employers then rank the remaining workers on the basis of their productivity in the second rank sector and assign the next $s_B * N$ workers to that sector. The remaining workers are then ranked on the basis of their productivity in the third rank sector and the employers assign the next $s_C * N$ workers to that sector. The remaining workers are allocated to sector D. As noted earlier we only consider employed individuals and while the model allows for unemployment we impose each individual is employed. The objective of the empirical work is to estimate the weights the employers put on worker characteristics in determining this allocation.[7]

[7]Extending the model beyond four sectors is trivial from simulation point of view. However it proved to be challenging from an estimation perspective. It would also require a larger data set in order to reliably compute the networks sizes in each sector.

We acknowledge that these various assumptions regarding exogeneity are questionable but endogenizing these aspects of the model is beyond the scope of this paper. Moreover, the assumptions are not entirely unrealistic. First consider the exogeneity assumption regarding the number of workers. Jasso and Rosenzweig (1986, 1995) document that the primary justification for immigration is family reunification.[8] Thus, it seems reasonable to assume that a sample of newly arrived migrants have located in a certain region for reasons unrelated to the distribution of occupations or relative wages. We also assume that the number of jobs is exogenous. This also does not seem unrealistic since the jobs we are considering are generally low skilled. The exogeneity of the number of jobs also assumes that the presence of immigrants is not changing the wage distribution in a manner which is affecting the distribution of jobs across sectors. This seems to be less important since we are focusing on rank in the occupational distribution rather than the demand for certain occupations.

We assume that the worker's objective is to be employed in the highest ranked occupation thereby excluding the possibility of sorting on the basis of comparative advantage. This does not appear to be unreasonable as the majority of the workers are unskilled and the evidence in Patel and Vella (2013) suggests that immigrants generally do not have occupation specific skills.

Each individual i from country j is characterized by a set of latent variables y_{ijo} which we define as a productivity in sectors A, B and C. Let:

$$y_{ijo} = \begin{cases} \exp(x_{ij}\gamma_{jo} + z_j\alpha_{jo} + u_{ijo}) & \text{for } j = 1, \ldots, J;\ o = A \\ \exp(x_{ij}\gamma_{jo} + z_j\alpha_{jo} + \zeta_o u_{ijo} + v_{ijo}) & \text{for } j = 1, \ldots, J;\ o = B, C \\ \exp(x_{ij}\gamma_{jo} + u_{ijo}) & \text{for } j = 0;\ o = A \\ \exp(x_{ij}\gamma_{jo} + \zeta_o u_{ijo} + v_{ijo}) & \text{for } j = 0;\ o = B, C \end{cases}$$

where $\{u_{ijo}\}_{i=1}^{N}$ and $\{v_{ijo}\}_{i=1}^{N}$ are $i.i.d$ sequences of $N(0, \sigma_{jo}^2)$ random variables.[9]

We do not observe a worker's productivity y_{ijo} but we observe the occupation in which he is employed. If d_{io} denote a set of binary variables indicating an individual i is employed in sector o then:

$$d_{io} = \begin{cases} 1 & \text{if} \quad y_{ijo} \geq s_o \quad \text{and} \quad d_{il} \neq 1 \quad \text{where} \quad l < o \\ 0 & \text{otherwise} \end{cases}$$

[8] Jasso and Rosenzweig (1986, 1995) document that immigrants who come for family reunification reasons constitute the largest group out of all immigrants and even the change in policy in 1990, which put a lower weight on family reunification, did not change this fact. As authors report, between 1969 and 1986, the share of adults who were spouses of US citizens and were granted permanent residence and increased form 17 to 40 percent. Similarly, in 1961, 60 percent of all non-refugee immigrants were either spouses, parents, children or siblings of US citizens.

[9] The choice of the functional form was driven by the performance of the estimator. It has no implications for identification.

where s_o denotes the minimum productivity such that an individual is employed in sector o. As $o = A$ corresponds to the sector comprising the highest ranked occupations $d_{io} = 1$ if individual's i productivity in sector o exceeds the threshold productivity s_o provided he is not employed in a higher ranked sector, $d_{il} \neq 1$. The vectors x and z are defined in the previous section and reflect the likely determinants of a worker's productivity and the importance of occupational networks. An individual's age is a measure of experience and *years of education* and *English proficiency* are the two available measures of skills. Evidence exists suggesting employers rely on observed characteristics they believe are correlated with unobserved attributes, such as worker's productivity, in absence of complete information about workers (Eriksson and Lagerström, 2007). Employers may also assess the productivity of workers based on the information about their group's productivity (Schwab, 1986). Additional uncertainty also arises from the difficulty in evaluating the measures of skills thus employers might rely on observable characteristics (Altonji and Pierret, 2001) such as the presence and strength of occupational networks and the group's history in the region.

The model's coefficients differ by sector and by country of origin allowing the determinants of productivity to be different across sectors and country of origin. We also allow for the error variance to differ across sectors noting that the correlation between the error terms in the three sectors accounts for the unobserved correlation between the unobserved productivity in the three sectors. We do not make any assumptions regarding worker's productivity in the fourth sector as this is the residual sector.

The coefficients vary by location in the occupational distribution and not necessarily by occupation. Within each region workers are ranked based on their productivity index and therefore their location in the occupational distribution depends on the distribution of productivities in the region. Identical individuals can therefore assume different positions in the occupational distribution across sectors depending on the "quality" of other workers and the job types in the region. This implies that the value that employers place on certain characteristics depends on the distribution of these characteristics in the local labor market. For instance, a college degree might be of much higher value in regions with a smaller fraction of individuals with a college degree. The implication of this allocation mechanism is that the weight of each characteristic in the productivity index is determined by the distribution of the characteristics of all workers and not by the characteristics of the occupations.

While the model has some attractive features it also has shortcomings. For example, in addition to the issues related to the exogeneity concerns discussed above it does not incorporate equilibrium behavior by workers and employers. Ideally the model would allow the number of workers and jobs to vary depending on the quality of the workers, wages and local demand conditions. The model might also allow the employers and

workers to move across regions. While these would be positive extensions, the results suggest that even when failing to allow for this behavior the model provides an insightful description of the data.

5.2 Estimation Procedure

The model's parameters are difficult to directly estimate due to the productivities being latent, the multiple outcomes of the model and the sequential nature of the allocation process. Even if we exploit the distributional assumptions to construct a likelihood function, the multiple integrals involved would make estimation challenging due to the correlation of the error terms across sectors. However, it is straightforward to simulate the data under our model assumptions. Thus we estimate the model via the indirect inference procedure (Gourieroux et al., 1993). We estimate an auxiliary model and then simulate data via the structural model for given values of the structural parameters. We choose structural parameters such that the corresponding parameters for the auxiliary model on the simulated data are "close" to the parameters for the auxiliary model for the true data.

Let β denote the structural parameters and k_1 and k_2 the number of individual and group variables in the productivity index. The β vector contains the parameters in the productivity index, $\{\gamma_{jo}\}_{j=0}^{J}, \{\alpha_{jo}\}_{j=1}^{J}$, $\{\sigma_{jo}^2\}_{j=0}^{J}$ and ζ_o in each sector o. Let $\hat{\theta}$ denote the estimates of the auxiliary model for the real data and $\tilde{\theta}^m(\beta)$ denote the corresponding estimates on the simulated data where $m = 1, ..., M$ denotes the number of simulations. The simulated data is generated using observed data on the exogenous variables and an assumed value of β. For each of the simulated data sets we estimate the auxiliary model and obtain $\tilde{\theta}^m(\beta)$. Let $\tilde{\theta}(\beta) = \frac{1}{M}\sum_{m=1}^{M}\tilde{\theta}^m(\beta)$ equal the average vector of the estimated parameters of the auxiliary model. We choose the values of β such that:

$$\hat{\beta} = \underset{\beta}{\operatorname{argmin}} \, (\hat{\theta} - \tilde{\theta}^m(\beta))' W (\hat{\theta} - \tilde{\theta}^m(\beta))$$

where W is a positive definite weighting matrix.[10]

An important feature of indirect inference is that the auxiliary model need not be "correctly specified" and the estimates of the auxiliary model's parameters do not need to have the usual desirable properties. While the choice of the moments to match between actual and simulated data is theoretically unimportant, subject to issues related to identification, the indirect inference procedure seems most attractive when the auxiliary model describes the primary features of interest of the data. Our choice of the moments is directly related to the features of the data which motivate our interest. Since we are interested in the shares of immigrant workers in each sector in each region we

[10]We use an identity matrix. Our auxiliary model includes additional moments and therefore we cannot apply the optimal weighting matrix as described in Gourieroux et al. (1993).

will focus on the parameters in a reduced form explanation of those shares. Accordingly we use the auxiliary model outlined in equation 1 that predicts the shares. This yields $3(k_1 + k_2 + 1) = 36$ parameters. To aid identification of the error variances and covariances we add the estimates of the covariance matrix of the residuals of the linear probability models and this yields 10 additional parameters. In sum, 46 parameters are being matched in the estimation process.

In estimating models with endogenous discrete variables using indirect inference (Keane and Smith, 2003) small changes in structural parameters can cause jumps in the simulated data which make the objective function change discretely. The objective function is thus not a smooth function of the structural parameters and it is not possible to use gradient based methods to estimate the model. To overcome this we follow Keane and Smith (2003) and substitute d^m_{ijo} with a continuous function of the latent productivity, $g(y^m_{ijo}(\beta); \lambda)$, such that:

$$g(y^m_{ijo}(\beta); \lambda) = \frac{\exp((y^m_{ijo}(\beta) - s_o)/\lambda)}{1 + \exp((y^m_{ijo}(\beta) - s_o)/\lambda)}$$

where λ is the smoothing parameter and s_o is the minimum productivity guaranteeing employment in sector o.[11] The choice of the smoothing parameters is important as larger values of λ result in a smoother objective function but may introduce a large bias. Based on the Monte Carlo simulations we use $\lambda = 0.05$ and set the number of simulations (M) equal to 10 noting that increasing the number of simulations appears to have little effect on the estimates while increasing the time burden significantly.[12]

5.3 Results

Within each sector we restrict the coefficients to be the same for the fifteen "Large" groups but allow them to differ for the category of "Others". Therefore, in each sector o, $\gamma_j = \gamma_1$ and $\alpha_j = \alpha_1$ for $j = 1, ..., J$ and $\gamma_j = \gamma_0$ and $\alpha_j = \alpha_0$ for $j = 0$.[13] For identification purposes we normalize the coefficient on education in all three sectors to 1 for the "Large" group. We also normalize the variances in sector A for the group of "Large" and "Others" to 1 leading to 33 structural parameters to be estimated. All explanatory variables are scaled to ensure that the entries in the Hessian are of the same order of magnitude to aid performance of the search algorithms. The covariance matrix is estimated following Gourieroux et al. (1993) and is explained in appendix A. However,

[11] We follow Smith and Keane (2003) in the choice of the $g(\cdot)$ function. Provided $g(y^m_{ijo}(\beta); \lambda)$ converges to $d^m_{ijo}(\beta)$ as λ goes to zero, any continuous function of the latent productivity produces consistent estimates of the structural parameters. This function was also used in Altonji et al. (2013).

[12] Implementation of this estimation strategy proved to be challenging. The objective function exhibits multiple local minima which makes the search for the global solution time intensive. We carefully examined the neighborhood of every parameter estimate to ensure that we have found a global minimum.

[13] Allowing the parameters of the productivity index to vary by groups proved to be not feasible due to the large number of resulting structural parameters.

since our auxiliary model consists of additional moments the estimated standard errors are underestimated.[14]

Before proceeding to the main results first consider the estimates from the auxiliary model. The right panels of Figure 1 illustrate the capacity of our auxiliary model to reproduce the shares of immigrant workers in each sector. The model performs very well. This is not surprising as the conditioning set of variables is rich and include the individual's age, educational attainment, English proficiency as well as characteristics of the group defined as country of origin of an individual, such as the *network size*, *arrival year*, *arrival year*^{2} and the *length of stay*.[15] Almost all regressors in the three sectors for the "Large" groups and the category of "Others" have a statistically significant role in predicting the shares. Time of arrival and group's tenure in the region do not play an important role in explaining the placement in sector C when immigrants from "Large" groups are considered.

Table 11 presents the structural parameter estimates. Recall that for the "Others" category we do not include the variables describing the characteristics of the country of origin. Due to the employed normalizations one cannot directly interpret the coefficients from an inspection of the coefficients. Below we examine the impact of changes in the values of the explanatory variables by simulating the model for different values of the explanatory variables. However, from a visual inspection of Table 11 we can directly interpret the sign of the change via the sign of the coefficient. This provides insight into what individual features positively affect employers' evaluation of productivity. Focus on the "Larger" groups first. Assuming that *education* positively affects the employers' assessment of worker's productivity most of the explanatory variables appear to have a positive effect on the evaluation of worker's productivity in all three sectors. Employers value experienced workers, those with a better knowledge of English, and those with established networks in the relevant part of the distribution. With the exception of sector C, employers positively value group's tenure in the region, workers of origins with longer histories are valued more. English proficiency, relative to years of education, plays a smaller role in the top two sectors than in sector C. This suggests that in more skilled jobs which are more likely to be located in the top part of the empirical distribution, formal skills are essential, whereas in occupations requiring less formal skills, language skills can be seen more of a substitute for schooling. The importance of networks relative to education is largest in sector B suggesting that employers in this region of the empirical distribution more highly value the information derived from the appropriate networks.

[14] As the analytic standard errors rely on numerical derivatives, and therefore allow us to manipulate its magnitude, the value added from the derivation of asymptotic covariance matrix in this setting seems low. Therefore we report the analytic standard errors noting that they are underestimated and also that their magnitude varies with the choice of the delta in the numerical derivatives.

[15] We highlight that the moments we are matching in the estimation of the structural model are the auxiliary model coefficients estimates.

When evaluating productivity of workers with no "Large" group affiliation all the individual characteristics have positive weights in all three sectors with the exception of age in sector C. As for workers from "Larger" groups, English proficiency plays a smaller role in sector A, while the weight on years of education is the biggest in this sector in comparison to the two sectors comprising occupations in the middle part of the empirical distribution.

Contrasting the relative magnitudes of the estimated parameters for both groups, "Large" and "Others", within sectors delivers additional evidence. The weights that employers put on educational attainment are substantially higher in all three sectors for workers without a "Large" group affiliation. The same is true for the weights on English proficiency in sectors B and C. Both results suggest that workers without "Large" group affiliation need to demonstrate significantly higher skills to compensate for the lack of the network.

5.4 Model Fit

We evaluate the model's within sample predictive performance on the basis of 100 simulations. For each simulation we calculate the shares of workers from each origin in each region in each sector.[16] We then compute the occupational distribution based on the averaged shares for each of the group and rank countries within each region based on the average fraction of workers employed in each sector. Table 12 provides the fraction of rankings in the four sectors for every pair of countries across regions that is predicted correctly.[17]

The model correctly predicts the pairwise ranking of countries in 80 percent of the comparisons. Two factors appear to influence the model's predictive capacity. The first issue is related to the relative magnitude of the shares of workers employed in a sector. When both groups have roughly equal shares the model does not predict the pairwise ranking well. The second issue is sample size. If we only observe a pair of countries in a small number of regions the average performance of the model is relatively low. For example, there are only 6 regions with large groups of new Cuban and Vietnamese workers and in 3 of these regions the shares of each group in sector C are almost the same. Thus, the model predicts correctly only 50 percent of the rankings between Cubans and Vietnamese workers. Alternatively, when Indian workers are compared to Koreans 74 percent of the rankings in sector B in 47 regions are predicted correctly.

The predictions are generally more accurate in sectors A and D with an average of 84 percent of correctly predicted pairings. Eighty percent of the parings in sector B are correctly predicted while in sector C the average is 75 percent. The loss in average

[16] Region denotes metropolitan area-year combinations.

[17] When computing predicted shares, we limit the sample to metropolitan areas with at least 30 new migrants in each group to avoid taking averages over small cells.

performance is driven by the decline in the accuracy of predicting the shares in regions with relatively small numbers of new migrants from a given group. Overall, the model's predictive capacity suggests it performs well.

To examine the model's capacity to predict pairwise rankings out of sample we estimate the model omitting selected regions. We perform two exercises. First we omit three metropolitan areas (Atlanta, Boston and Sacramento) in all time periods. This results in a 5 percent decrease in sample size. In the second we exclude New York in all years resulting in a 12 percent smaller sample. Using the estimated coefficients and observed data we compute the occupational distribution of workers in each of the omitted regions. The computations are based on 100 simulations and the results are summarized in Table 13. In both instances the model's out of sample performance appears satisfactory. In the first case 66, 75, 69 and 76 percent of pairwise rankings in Atlanta, Boston and Sacramento in sectors A, B, C and D respectively are predicted correctly. In New York the fraction of correctly predicted rankings in sectors A, B, C and D are 0.69, 0.84, 0.74 and 0.83 respectively.

6 Quantitative Impact of Conditioning Variables

To assess the quantitative impact of the exogenous variables in the model we perturb each in isolation for each group and evaluate the consequences for the rankings. As we take averages over individuals within regions we limit the sample to regions with large groups of new migrants. We first simulate the outcomes using the structural parameter estimates and the actual values for the conditioning variables. We then change the value of a specific characteristic for all individuals from a specific origin and repeat the simulations to generate a new allocation of workers.[18] We report the frequency of changes in rankings by every pair of countries. These are based on average sector shares and country A is considered ranked above country B in sector o if its share of workers in sector o is higher than those from country B.

Table 14 reports the changes from an one year increase in schooling. Table 15 reports the changes corresponding to increasing English proficiency[19] and Table 16 summarizes the changes from a ten year earlier group arrival and, simultaneously, a ten year longer tenure in a region. Table 17, Table 18 and Table 19 present the results from a 10 percent increase in the share of established migrants in sectors A, B and C respectively. In each table we alter the characteristic for one country at a time (row country) and follow the changes in pairwise rankings between the row country and every other country (column country) in all four sectors.

[18]For all experiments we simulate the model 100 times.

[19]Since *English proficiency* is measured with an indicator that an individual speaks English well, the experiment we consider is making everyone proficient in English. England and Canada are omitted from the tables.

When the conditioning variable of focus has an unambiguously positive (negative) effect on productivity in a given sector a ranking change can only occur if there are instances where the row country was initially ranked below (above) the column country. Therefore, each entry in Table 14 through Table 19 represents the fraction of such eligible regions in which the ordering between the two countries has changed. The positive (negative) entry implies that the row country is ranked above the column country more (less) often after the change. As reasonable changes in the individuals' ages did not result in meaningful changes we exclude it from the tables and conclude it is not an important determinant of rankings.

For sector A the direction of the change is always the same as the sign of the variable's coefficient. Since the covariates all have a positive effect on the "Larger" group's productivity in sector A the change in ordering in this sector always favors the group whose characteristics are "enhanced".[20] For the two middle sectors B and C, however, the change operates through two channels. The first is a direct effect through the productivity index. The second is an indirect effect through the composition of individuals who do not find employment in a higher ranked sector. Therefore, it is not straightforward to assess the direction of the overall change.

We first consider the role of the individual characteristics. An extra year of schooling to all individuals from given country reverses 14,1,6 and 2 percent of pairwise comparisons in sectors A, B, C and D respectively. German, Chinese, Filipino and African workers appear to most benefit from higher educational attainment in the top sector as it would affect on average more than 20 percent of rankings with other countries. The role of educational attainment in sectors B and D appears generally much smaller than for sectors A and C. For some countries, such as China for example, it plays an important role in all sectors. English proficiency has a large and consistent effect across the four sectors affecting on average 9, 8, 9 and 5 percent of all rankings in the sectors A, B, C and D respectively. It is especially important for Chinese, Korean and Vietnamese workers. For example, if all Chinese workers spoke English well, in regions in which they appear with Indian workers the ranking would be reversed for 95, 71, 23 and 10 percent of cases in sectors A, B, C and D respectively. Similarly, if all Korean workers spoke English well, in regions where they appear together with African workers the ranking would change favorably in 12, 59, 59 and 24 percent of cases respectively. Mexican, Cuban and Polish workers would also improve their positions in sector C as a result of better command of English. These results suggest that differences in human capital accumulation play an important role in generating the rankings. Even though the results are not surprising their magnitude has non trivial policy implications as it appears that promoting the mastering of English skills among disadvantaged immigrant worker groups can generate

[20]The effect of arrival year is positive in its domain as it takes values between 0.1 and 0.6 where 0.1 corresponds to a group arrival prior to 1940 and 0.6 corresponds to arrival between 1990 and 2000.

a long term positive effect on their performance in the labor market.

Now consider the "country of origin" characteristics. Earlier arrival and longer tenure in the region appear to have a large effect on the rankings in sector A and C. Only Mexican, Cuban, German and African workers do not notably benefit from earlier arrival and longer tenure. In sector B arrival year and tenure in the region generally appear to have no effect on rankings with the exception of a few pairings. Similar patterns with smaller magnitudes occur in sector D.

Finally, consider the placement of established workers in the occupational distribution. On average, a 10 percent increase in the share of established migrants in respective sectors leads to a 12, 14 and 13 percent of rankings reversed in sectors A, B and C respectively. With the exception of the increased size of the network in sector B the spillover effects to other sectors are on average of a smaller magnitude. Increases in the share of established workers in sector A leads to a reversed ranking in 2, 6 and 5 percent of regions in sectors B, C and D respectively. A 10 percent increase in the share of workers employed in sector B affects rankings in 11 and 13 percent of regions in sectors C and D. The same increase in the share of workers in sector C occupations affects rankings in only 1 percent of the regions in sector D.

The impact on the hierarchies varies greatly by characteristic. There is also notable variation in the magnitude of the effects of each of the characteristics across countries of origin. However, the results suggest that the characteristics considered play an important role in generating the hierarchies. It is also the case though that for some countries reasonable changes in the characteristics do not have any effect on rankings. For example, improving the position of Mexican workers in the occupational distribution proved to be difficult. On average, five extra years of education for all Mexican workers is needed to achieve an effect of a similar magnitude as with one year increase of schooling of Italian or Chinese workers in sector A and B respectively. Moreover, such a large increase in schooling of Mexican workers would affect comparisons with only 4 and 5 out of 14 large countries in sectors A and B respectively. Similarly, a 20 percentage points increase in the share of established migrants employed in sector A in all regions still leaves all of the rankings with 14 large countries unaffected in sector A. These results suggest that a group's position in the distribution of occupations in local labor markets largely depends on the group's historical position in the empirical distribution of occupations and for the most disadvantaged workers the ranking appears resilient to change.

Since there is no obvious metric to compare the magnitude of these effects we examine what changes in characteristics would result in similar changes in rankings. For the sake of brevity we focus on the top two sectors only. Table 20 and Table 21 present the results for two of the countries with a large presence in the US. These are China and Korea. We consider what type of changes in educational attainment and the shares of established

migrants in the relevant part of empirical distribution of occupations would induce similar changes in the rankings as increasing English proficiency of all individuals from a specific country of origin.

If all Chinese workers were made proficient in English between 10 to 100 percent of pairwise comparisons with other countries would be affected. An extra year of schooling for all workers or an extra one to two years for schooling to individuals with less than high school degree are required to induce a change of similar magnitude. The same level of change is induced by increasing the network size in the top sector by 10 to 15 percent. This corresponds to 2 to 3 percent average increase in the share of workers employed in the top part of occupational distribution. This suggests relatively small changes in the network size in the top sector result in changes of similar magnitude as large increases in schooling level.

Table 21 reveals similar patterns among Korean workers in sector B. If all Korean workers were proficient in English, 13 to 43 percent of pairwise comparisons would be affected in sector B. A change of a similar magnitude is induced by an extra year of schooling for all workers or extra 2 to 5 years of schooling for workers with less then high school. A 5 percent increase in the network size in sector B when Korean workers are compared to African, Cuban or English workers has a similar effect on rankings. Fifteen percent increase in the network size is needed to affect the same share of rankings with India, China or Germany.

6.1 Occupational Distribution Allocation of New Arrivals

We now use the model to allocate new migrants from each of the large sending countries. We place 30 new migrants from a specific origin in each region in which it has an established presence in 2011. We consider each country separately. The individual characteristics of these new migrants reflect the distribution of the individual characteristics for the whole sample in 2011 and is kept constant for all experiments. The "extra" workers are between 30 and 45 years old, ranging from no high school degree to some college and 65 percent of them speak English well.[21] The network size in the three sectors, arrival year and tenure in the region are set to the actual characteristics of given group in a region. We evaluate how these new immigrants would sort into the occupational distribution within regions. Since the individual characteristics are kept constant across groups and across regions within groups, the differences between the resulting location into occupational distribution highlights the role of the group characteristics in determining the success of a new cohort. Table 22 summarizes the results in terms of the shares of "extra" workers in sector A, B and C in selected regions.

[21]Since our focus is on low skilled workers, the education composition is biased towards individuals with at most high school degree. For English and Canadian workers we assume that all "extra" workers speak English well.

The results suggest substantial variation in the shares of workers that would be allocated in all sectors. The shares in sector A and B vary between 3-28 and 2-39 percent respectively while in sector C the majority of the shares fall between 15 and 25 percent interval. Groups also exhibit a large variation within sectors and across regions. For example, in Los Angeles 30 percent of the "extra" Chinese workers would find employment in sector B while only 3 percent would be employed in the top part of the occupational distribution in Las Vegas.

Examining each region separately reveals that within the same region workers assume a different position in the occupational distribution depending on their origin. For instance, in San Antonio, 18 percent of the "extra" workers of Indian origin would find sector A jobs while only 5 percent of Korean and 8 percent of Vietnamese workers would do so. In the same region 36 percent of Indian workers would find sector B jobs compared to 20 percent of Chinese and 18 percent of Korean workers. In Boston 8 percent of Canadian, 17 percent of Chinese and 16 percent of Indian workers from the "extra" cohort would find jobs in sector C jobs. Given that individual characteristics are held constant across groups these results highlight the role of the group's history in the local labor market.

Now consider the resulting ranking if each of these groups simultaneously arrived in the same region. For each region for which all of the groups have an established presence in 2011 we place 30 new migrants. The distribution of individual characteristics is the same across groups and the country of origin characteristics are predetermined. The rankings are based on average sector shares. Table 23 presents the allocation of these "extra" workers into sectors A, B, C and D for selected regions and compares it to the actual shares. There appears to be a substantial variation in the group's allocation to sector A despite the distribution of individual characteristics not differing across countries. Moreover, the relative magnitudes of the predicted and actual shares are similar.

For example, in Houston the model allocates at most 7 percent of Filipino, Vietnamese and Mexican workers in the top part of the empirical distribution, whereas the actual shares among workers of above origins in sector A do not exceed 18 percent. Similarly, in Orange County, more Indian than Mexican workers are employed in the top sector. The model allocates Indian and Mexican workers accordingly.

The model allocates very few workers to sector B due to the relatively large coefficient on education for the category of *"Others"* for this sector. In sectors C and D the allocation of the "extra" workers also mimics the observed distribution. For example, in Houston, both Filipino and Vietnamese workers have a relatively high fraction of workers employed in sector C and a relatively high fraction of the "extra" workers are allocated here. Relatively few Canadian and English migrants are employed in sector C and therefore a small fraction of the "extra" workers is allocated to this sector.

These results suggest that the relative placement in the occupational distribution of future cohorts greatly resembles the allocation of the established migrants irrespective of the individual characteristics and stresses the role of the predetermined group's characteristics. They further highlight the significance of the starting point for labor market outcomes of new cohorts of immigrant workers.

7 Conclusions

This paper provides clear evidence of a persistent hierarchical structure among immigrant labor groups in the United States as measured by their location in the occupational distribution. The evidence suggests the hierarchies do not result from specific immigrant group skills. Rather, our empirical results suggest that employers in labor markets at the metropolitan region level rank the workers partially on the basis of which immigrant group they belong. The evidence from estimation of a structural model in which employers rank workers according to their perceived productivity suggests the effect of membership of a particular immigrant group operates through immigrant networks. Moreover, the presence of these network effects is largely responsible for the hierarchy persisting across regions and time.

Our empirical evidence is valuable not only because it is the first to document the existence of a persistent hierarchical structure among immigrant labor. It is also important because it highlights that the persistence reflects network effects. This has implications for future generations of immigrants as the evidence suggests that those from specific countries will be disadvantaged in the United States labor market. Moreover, given the recent evidence documenting the lack of intergenerational mobility in the income distribution (Chetty et al., 2014) it is clear that the starting point for new immigrants has implications for their offspring and beyond.

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Appendix A. Estimation of the covariance matrix

The following appendix describes the estimation of the covariance matrix of the indirect inference estimator as explained in Appendices 1 and 2 of Gourieroux et al. (1993).

From Proposition 3 in Gourieroux et al. (1993) it follows that:

$$\sqrt{N}(\hat{\beta_{MN}}(\Omega) - \beta_0) \xrightarrow{d} \mathcal{N}(0, W(M, \Omega))$$

where N denotes the sample size, M denotes the number of simulations, Ω denotes the weighting matrix and:

$$\begin{aligned} W(S,\Omega) &= (1+\frac{1}{S})\left[\frac{\partial b'}{\partial \beta}(\beta_0)\Omega\frac{\partial b}{\partial \beta'}(\beta_0)\right]^{-1}\frac{\partial b'}{\partial \beta}(\beta_0) \\ &\times \Omega\Omega^{*-1}\Omega\frac{\partial b}{\partial \beta'}(\beta_0)\left[\frac{\partial b'}{\partial \beta}(\beta_0)\Omega\frac{\partial b}{\partial \beta'}(\beta_0)\right]^{-1} \end{aligned}$$

where $b(\beta)$ denotes the binding function, β_0 denotes the true parameter values and $\Omega^* = J_0 I_0^{-1} J_0$ is the optimal weighting matrix.

To proceed with the estimation of the covariance matrix, we need to introduce some more notation. Let Q_N denote the objective function of the auxiliary model and:

$$\tilde{\theta} = \underset{\theta\in\Theta}{\operatorname{argmax}}\, Q_N(y, x, \beta)$$

Let $\hat{\theta}$ denote the estimates of the auxiliary model on the actual data. In our model Q_N is a block diagonal matrix, with diagonal elements equal to $-e'_{oj}e_{oj}$, where e_{oj} denotes the residuals from an OLS regression corresponding to j^{th} group in o^{th} sector [22].

As stated in Appendix 2 of Gourieroux et al. (1993) J_0 can be consistently estimated by:

$$-\frac{\partial^2 Q_N}{\partial\theta\partial\theta'}(y, x, \hat{\theta})$$

In our model, the above approximation becomes a block diagonal matrix with diagonal elements equal to $2x'_{jo}x_{jo}$. The middle term in the expression of Ω^*, $(I_0 - K_0)^{-1}$, can be consistently estimated by:

$$\frac{N}{S}\sum_{s=1}^{S}(W_s - \bar{W})(W_s - \bar{W})'$$

Where:

$$\begin{aligned} W_s &= \frac{\partial Q_N}{\partial\theta}(y^s(\tilde{\beta}), x, \hat{\theta}) \\ \bar{W} &= \frac{1}{S}\sum_{s=1}^{S} W_s \end{aligned}$$

[22] The negative sign follows from the fact that OLS minimizes the sum of squared residuals.

and $\tilde{\beta}$ denotes a consistent estimator of β. S denotes the number of simulations in the estimation of $\tilde{\beta}$. Notice, that the optimal indirect inference estimator requires that we can get a preliminary consistent estimator of in order to get a preliminary estimate of the optimal weighting matrix. We can obtain these estimates using identity matrix as a weighting matrix.

In our model, W_s can be expressed as block diagonal matrix, with diagonal elements equal to $2x'_{jo}y_{jo}(\tilde{\beta}) - 2x'_{jo}x_{jo}\hat{\theta}$. In practice, we first estimate the model using identity matrix as weighting matrix and obtain $\tilde{\beta}$. Using $\tilde{\beta}$ we compute $y^s(\tilde{\beta})$ and obtain the matrix of first derivatives of the auxiliary model criterion function w.r.t. θ, so the parameters of auxiliary model.

The last element in the expression of the covariance matrix contains the derivatives of the binding function at the true value. It can be consistently estimated with:

$$\frac{\partial b}{\partial \beta}(\beta_0) = J_0^{-1}\frac{\partial^2 Q_\infty}{\partial \theta \partial \beta'}$$

which can be obtained by numerical derivation of $\frac{\partial Q_N}{\partial \theta'}[y(\beta), x, \hat{\theta}]$ w.r.t. β and evaluated at the $\hat{\beta}$.

Appendix B. Tables and Figures

For the sake of space in all tables we use the 3-letters country codes: CAN (Canada), MEX (Mexico), CUB (Cuba), ENG (England), ITA (Italy), DEU (Germany), POL (Poland), RUS (Russia), CHN (China), KOR (Korea), PHL (Philippines), VNM (Vietnam). AFR refers to Africa and ME to Middle East.

Table 1: Sample composition 1940-2011 (percentages)

	1940	1950	1960	1970	1980	1990	2000	2011
All workers								
CAN	11.23	11.5	12.67	13.79	7.21	3.34	2.6	2.5
MEX	1.36	3.55	7.02	14.75	31.48	40.74	45.59	43.49
CUB		0.47	1.74	5.96	10.74	7.06	3.82	3.45
ENG	6.45	4.57	5.98	5.26	2.97	2.1	1.59	1.09
ITA	29.15	32.26	23.84	20.25	9.32	3.8	1.69	0.96
DEU	15.01	12.19	15.01	12.55	7.61	4.84	3.33	2.88
POL	16.02	16.71	14.2	10.17	3.94	1.89	1.7	1.37
RUS	19.01	15.83	12.74	6.12	0.48	1.08	2.53	2.66
CHN	0.87	1.1	2.5	4.94	6.64	7.47	7.3	8
KOR					2.47	3.9	3.4	3.17
PHL		0.34	2.74	3.23	6.26	7.91	6.25	6.55
VNM					1.36	3.85	4.74	4.75
IND				0.68	4.13	5.76	8.6	11
AFR			0.32	0.87	1.99	2.94	3.88	5.27
ME	0.89	1.48	1.23	1.43	3.38	3.33	2.96	2.86
Unskilled workers								
CAN	10.76	10.97	11.56	12.46	5.4	1.26	0.53	0.24
MEX	1.39	3.64	7.97	17.1	49.24	62.59	72.13	73.13
CUB		0.46	1.76	6.83	4.91	8.58	4.21	4.01
ENG	6.07	4.44	4.89	2.47	1.17	0.35	0.12	0.04
ITA	30.43	33.26	27.65	26.58	13.7	4.82	1.79	0.93
DEU	14.74	12.11	14.32	12.04	5.6	1.44	0.58	0.41
POL	16.56	16.97	14.75	10.9	5.21	1.98	1.77	1.27
RUS	18.31	15.52	12.04	5.1	0.67	0.58	1.17	1.08
CHN	0.9	1.12	2.2	4.12	5.25	4.92	3.99	4.54
KOR					1	2	1.41	0.91
PHL			1.66	1.61	3.04	3.8	2.48	2.5
VNM					0.68	3.02	4.12	4.34
IND					0.7	1.78	2.76	2.93
AFR				0.18	0.51	0.64	1.18	2.1
ME	0.84	1.49	1.02	0.79	2.92	2.22	1.76	1.57

Table 2: Summary statistics by country of origin 1940-2011

	Age	Edu	Eng	SEI	Age	Edu	Eng	SEI	Age	Edu	Eng	SEI
		Canada				**Germany**				**Italy**		
1940	42.90	9.52		34.04	45.35	9.17		32.74	46.14	7.18		25.23
	(12.83)	(2.71)		(21.54)	(12.15)	(2.60)		(20.69)	(10.13)	(2.40)		(20.09)
1950	44.58	10.50		37.52	48.49	10.19		37.48	50.91	7.52		27.55
	(11.68)	(2.97)		(22.67)	(11.05)	(2.81)		(21.58)	(10.71)	(1.61)		(20.47)
1960	46.29	10.92		42.53	48.54	10.79		39.69	50.93	8.26		28.49
	(11.80)	(2.96)		(23.57)	(12.70)	(2.98)		(22.79)	(12.87)	(2.79)		(20.46)
1970	45.78	11.41		43.65	45.35	11.44		43.33	45.59	9.24		29.36
	(13.54)	(3.00)		(24.02)	(14.98)	(3.09)		(23.46)	(14.08)	(2.96)		(20.66)
1980	43.68	12.65	0.99	48.39	39.99	12.75	0.99	47.39	43.49	10.37	0.84	33.68
	(14.52)	(3.13)	(0.08)	(24.84)	(13.67)	(3.19)	(0.09)	(24.69)	(12.69)	(3.21)	(0.36)	(22.90)
1990	42.07	13.84	0.99	52.00	40.65	13.77	0.99	48.80	46.00	11.37	0.89	37.94
	(13.12)	(2.35)	(0.08)	(24.34)	(13.20)	(2.30)	(0.08)	(24.83)	(12.20)	(3.15)	(0.31)	(24.53)
2000	41.69	14.42	0.99	56.08	40.68	14.11	0.99	50.58	48.19	12.31	0.93	41.32
	(11.82)	(2.26)	(0.08)	(22.88)	(12.01)	(2.24)	(0.09)	(24.24)	(11.16)	(2.95)	(0.25)	(24.84)
2011	44.46	14.90	0.99	59.97	43.31	14.47	0.99	53.30	51.07	12.97	0.95	45.64
	(11.95)	(2.09)	(0.10)	(22.33)	(12.47)	(2.17)	(0.08)	(24.29)	(11.20)	(2.82)	(0.22)	(25.81)
		Mexico				**Poland**				**Korea**		
1940	38.71	7.70		18.15	47.53	7.28		28.29				
	(10.16)	(2.81)		(16.47)	(9.91)	(2.54)		(21.00)				
1950	44.15	7.64		20.31	52.48	8.13		31.25				
	(10.42)	(1.80)		(16.81)	(10.39)	(2.13)		(22.14)				
1960	41.53	7.46		19.34	51.09	9.43		36.36				
	(13.43)	(2.82)		(17.37)	(11.39)	(3.33)		(22.80)				
1970	36.80	8.58		22.10	51.34	10.26		39.40				
	(12.98)	(2.83)		(16.36)	(11.58)	(3.25)		(23.20)				
1980	32.71	8.76	0.48	22.50	49.09	11.21	0.84	39.21	37.59	13.65	0.69	46.33
	(11.49)	(2.93)	(0.50)	(16.93)	(13.43)	(3.33)	(0.37)	(24.08)	(10.05)	(3.45)	(0.46)	(25.46)
1990	32.40	9.35	0.52	22.27	43.84	12.62	0.76	36.80	39.23	13.95	0.70	48.53
	(10.72)	(3.05)	(0.50)	(17.39)	(13.01)	(2.78)	(0.43)	(24.56)	(11.65)	(2.50)	(0.46)	(24.48)
2000	33.68	9.79	0.50	22.89	41.39	12.96	0.74	34.91	41.24	14.39	0.72	51.65
	(10.86)	(2.86)	(0.50)	(17.57)	(12.22)	(2.40)	(0.44)	(23.11)	(11.90)	(2.35)	(0.45)	(23.91)
2011	38.32	10.25	0.52	24.10	43.61	13.40	0.78	37.61	44.12	14.93	0.76	55.80
	(11.37)	(2.89)	(0.50)	(19.43)	(12.53)	(2.28)	(0.41)	(24.67)	(11.56)	(2.12)	(0.42)	(23.44)
		Cuba				**Russia**				**Philippines**		
1940					47.41	8.25		42.00				
					(9.96)	(3.09)		(24.34)				
1950	36.00	9.83		25.79	52.38	8.98		43.59	43.44	8.98		19.82
	(10.40)	(2.62)		(18.35)	(9.27)	(2.53)		(24.94)	(10.55)	(2.93)		(20.18)
1960	38.01	9.81		27.66	55.44	9.92		43.45	47.06	9.06		21.54
	(11.20)	(2.75)		(19.68)	(9.73)	(3.64)		(24.67)	(11.55)	(3.52)		(18.34)
1970	40.01	10.28		32.50	56.70	10.67		44.95	39.56	12.35		37.40
	(12.00)	(3.24)		(22.09)	(10.61)	(3.62)		(24.26)	(14.19)	(3.36)		(25.96)
1980	42.07	11.32	0.67	38.50	46.93	11.22	0.85	37.18	37.67	13.03	0.96	39.14
	(13.89)	(3.42)	(0.47)	(24.38)	(14.22)	(3.59)	(0.36)	(24.45)	(12.08)	(3.63)	(0.20)	(25.29)
1990	44.08	11.89	0.69	39.19	42.17	13.77	0.83	46.17	38.92	13.82	0.96	40.67
	(13.40)	(3.05)	(0.46)	(24.83)	(13.08)	(2.94)	(0.38)	(25.36)	(12.23)	(2.31)	(0.19)	(24.62)
2000	44.40	12.59	0.70	39.99	39.34	14.45	0.82	46.72	41.33	14.01	0.96	42.22
	(12.23)	(2.73)	(0.46)	(24.54)	(12.12)	(2.41)	(0.39)	(25.21)	(12.30)	(2.20)	(0.20)	(24.16)
2011	46.71	13.00	0.66	38.96	41.62	14.66	0.84	47.63	44.47	14.26	0.96	43.37
	(11.88)	(2.53)	(0.47)	(25.05)	(12.89)	(2.30)	(0.37)	(26.21)	(12.40)	(2.07)	(0.21)	(24.18)
		England				**China**				**Africa**		
1940	45.91	9.79		37.43	40.82	7.44		26.22				
	(11.72)	(2.73)		(21.86)	(10.87)	(2.64)		(22.04)				
1950	49.20	10.32		41.16	42.01	8.00		31.93				
	(10.92)	(2.87)		(23.12)	(11.35)	(2.29)		(24.03)				
1960	49.55	11.22		44.98	43.59	9.40		34.63	40.49	12.10		46.01
	(12.19)	(2.97)		(23.21)	(12.46)	(4.08)		(24.95)	(12.80)	(3.50)		(25.79)
1970	45.21	12.02		49.12	42.36	11.15		38.51	37.81	13.05		54.23
	(14.22)	(3.18)		(24.22)	(12.68)	(4.02)		(27.25)	(11.62)	(3.48)		(23.64)
1980	40.60	13.20	1.00	53.00	39.83	12.55	0.72	45.55	36.63	13.83	0.97	51.44
	(13.45)	(3.32)	(0.05)	(24.57)	(12.38)	(4.03)	(0.45)	(27.92)	(10.60)	(3.69)	(0.17)	(26.47)
1990	40.08	14.10	1.00	53.84	40.37	13.69	0.74	49.37	37.02	14.68	0.97	49.92
	(12.46)	(2.14)	(0.07)	(23.84)	(11.58)	(3.35)	(0.44)	(27.01)	(9.99)	(2.36)	(0.16)	(26.76)
2000	41.91	14.48	0.99	55.85	41.26	14.22	0.76	52.87	39.41	14.51	0.97	47.54
	(11.61)	(2.13)	(0.07)	(22.64)	(11.27)	(3.19)	(0.43)	(25.96)	(10.46)	(2.31)	(0.17)	(26.10)
2011	45.40	14.59	1.00	57.52	44.03	14.57	0.77	55.09	42.41	14.42	0.96	45.92

	Age	Edu	Eng	SEI	Age	Edu	Eng	SEI	Age	Edu	Eng	SEI
	(11.73)	(2.09)	(0.06)	(22.56)	(11.47)	(3.07)	(0.42)	(26.12)	(11.45)	(2.42)	(0.20)	(26.52)
	Vietnam				**Middle East**				**India**			
1940					42.14	9.03		38.51				
					(9.70)	(3.30)		(23.91)				
1950					50.72	9.31		41.11				
					(9.40)	(2.38)		(24.74)				
1960					49.78	10.61		43.84				
					(14.13)	(3.83)		(25.25)				
1970					42.55	12.18		49.00	32.71	15.54		69.99
					(14.98)	(3.73)		(24.59)	(6.84)	(2.97)		(21.76)
1980	32.14	12.18	0.73	39.15	36.08	12.39	0.91	47.99	35.80	14.93	0.97	61.20
	(10.67)	(3.25)	(0.45)	(23.98)	(11.81)	(3.62)	(0.29)	(25.62)	(8.67)	(3.33)	(0.18)	(25.23)
1990	34.18	12.69	0.77	39.91	37.95	13.46	0.95	50.26	38.09	14.94	0.95	55.87
	(10.54)	(2.76)	(0.42)	(24.40)	(11.41)	(2.89)	(0.22)	(24.91)	(10.53)	(2.52)	(0.21)	(25.35)
2000	38.23	12.75	0.73	40.32	39.50	13.75	0.94	51.29	38.53	15.13	0.95	57.17
	(11.19)	(2.86)	(0.44)	(24.83)	(11.12)	(2.75)	(0.24)	(24.62)	(11.36)	(2.44)	(0.21)	(23.47)
2011	43.77	12.98	0.73	42.60	43.02	14.14	0.95	54.20	41.15	15.45	0.95	59.71
	(10.92)	(3.05)	(0.45)	(25.55)	(11.62)	(2.67)	(0.22)	(24.35)	(11.67)	(2.26)	(0.21)	(22.19)

Notes: Standard deviations in brackets

Table 3: Share of workers in the top sector by origin 1940-2011

	All workers								**Unskilled workers**							
	1940	1950	1960	1970	1980	1990	2000	2011	1940	1950	1960	1970	1980	1990	2000	2011
CAN	0.65	0.68	0.67	0.68	0.71	0.77	0.81	0.83	0.65	0.67	0.68	0.71	0.73	0.76	0.73	0.81
MEX	0.2	0.25	0.3	0.32	0.38	0.42	0.41	0.38	0.23	0.24	0.54	0.57	0.61	0.55	0.54	0.52
CUB		0.26	0.4	0.56	0.52	0.53	0.52	0.5		0.25	0.41	0.61	0.57	0.58	0.6	0.58
ENG	0.66	0.67	0.7	0.74	0.76	0.79	0.8	0.79	0.65	0.66	0.7	0.8	0.76	0.8	0.8	0.9
ITA	0.41	0.42	0.39	0.38	0.41	0.44	0.52	0.55	0.41	0.43	0.45	0.47	0.53	0.61	0.64	0.68
DEU	0.6	0.66	0.61	0.63	0.69	0.72	0.75	0.76	0.61	0.66	0.61	0.69	0.74	0.74	0.75	0.74
POL	0.47	0.5	0.54	0.56	0.55	0.49	0.52	0.46	0.48	0.5	0.55	0.61	0.7	0.68	0.68	0.67
RUS	0.68	0.64	0.63	0.67	0.56	0.65	0.65	0.64	0.66	0.63	0.63	0.68	0.68	0.71	0.7	0.68
CHN	0.28	0.42	0.5	0.49	0.62	0.69	0.73	0.73	0.28	0.4	0.4	0.39	0.43	0.58	0.55	0.55
KOR					0.69	0.73	0.75	0.77					0.68	0.7	0.73	0.73
PHL		0.24	0.46	0.64	0.67	0.7	0.67	0.65			0.41	0.54	0.62	0.7	0.68	0.65
VNM					0.58	0.69	0.6	0.57					0.85	0.73	0.73	0.73
IND				0.9	0.82	0.76	0.8	0.82					0.7	0.67	0.68	0.69
AFR			0.66	0.83	0.72	0.68	0.65	0.6			0.52		0.73	0.65	0.64	0.57
ME	0.64	0.58	0.62	0.73	0.68	0.73	0.72	0.73	0.59	0.57	0.57	0.58	0.7	0.75	0.74	0.77

Table 4: Pairwise comparisons based on SEI score

	AFR	IND	VNM	PHL	KOR	CHN	RUS	POL	DEU	ITA	ENG	CUB	MEX	CAN
All workers														
ME	0.61	0.11	1.00	0.85	0.54	0.38	0.63	0.89	0.59	0.95	0.33	0.94	1.00	0.31
AFR		0.06	0.93	0.66	0.33	0.25	0.58	0.90	0.35	0.83	0.30	0.84	1.00	0.30
IND			0.99	0.96	0.90	0.70	0.92	0.94	0.92	0.98	0.78	0.98	1.00	0.69
VNM				0.24	0.00	0.04	0.16	0.30	0.01	0.21	0.00	0.24	1.00	0.00
PHL					0.16	0.09	0.44	0.78	0.17	0.68	0.08	0.75	0.98	0.09
KOR						0.23	0.84	0.89	0.41	0.92	0.20	0.83	1.00	0.13
CHN							0.68	0.79	0.71	0.94	0.51	0.89	0.99	0.44
RUS								0.82	0.45	0.91	0.31	0.92	1.00	0.23
POL									0.17	0.69	0.07	0.55	1.00	0.12
DEU										0.96	0.13	0.92	1.00	0.14
ITA											0.01	0.45	0.99	0.01
ENG												0.97	1.00	0.43
CUB													0.99	0.03
MEX														0.00
Unskilled workers														
ME	0.88	0.77	1.00	1.00	0.52	0.97	0.60	0.84	0.55	0.97	0.26	0.94	1.00	0.46
AFR		0.12	0.88	0.47	0.11	0.70	0.50	0.56	0.25	0.53	0.11	0.82	0.97	0.27
IND			0.94	0.78	0.28	0.86	0.79	0.94	0.29	0.71	0.11	0.87	1.00	0.09
VNM				0.39	0.00	0.41	0.06	0.50	0.00	0.07	0.00	0.27	1.00	0.00
PHL					0.05	0.49	0.22	0.42	0.00	0.29	0.00	0.57	0.98	0.00
KOR						0.92	0.87	0.82	0.52	0.78	0.11	0.92	1.00	0.00
CHN							0.15	0.30	0.03	0.30	0.00	0.56	1.00	0.04
RUS								0.86	0.63	0.83	0.41	0.88	1.00	0.40
POL									0.25	0.61	0.03	0.68	1.00	0.14
DEU										0.93	0.14	0.96	1.00	0.08
ITA											0.00	0.57	1.00	0.05
ENG												1.00	1.00	0.57
CUB													0.95	0.00
MEX														0.00

Comparisons are made based on the average SEI score in each region in each year. Each entry represents the incidence of a row country being ranked above the column country.

Table 5: Pairwise comparisons based on the share of workers in the "top" sector

	AFR	IND	VNM	PHL	KOR	CHN	RUS	POL	DEU	ITA	ENG	CUB	MEX	CAN
All workers														
ME	0.61	0.27	1.00	0.90	0.57	0.45	0.73	0.94	0.63	0.91	0.37	0.90	1.00	0.38
AFR		0.12	0.94	0.78	0.27	0.22	0.59	0.90	0.34	0.81	0.26	0.82	1.00	0.27
IND			0.99	0.95	0.71	0.65	0.90	0.96	0.86	0.94	0.65	0.94	1.00	0.65
VNM				0.35	0.01	0.04	0.12	0.30	0.02	0.18	0.00	0.17	0.98	0.00
PHL					0.08	0.10	0.30	0.65	0.14	0.43	0.05	0.59	0.95	0.05
KOR						0.35	0.85	0.89	0.46	0.90	0.23	0.85	1.00	0.16
CHN							0.70	0.77	0.70	0.89	0.44	0.90	0.99	0.45
RUS								0.76	0.42	0.79	0.26	0.67	1.00	0.28
POL									0.15	0.58	0.06	0.55	1.00	0.11
DEU										0.91	0.17	0.88	1.00	0.17
ITA											0.04	0.55	0.99	0.04
ENG												0.95	1.00	0.42
CUB													0.97	0.06
MEX														0.00
Unskilled workers														
ME	0.75	0.65	1.00	0.95	0.62	0.97	0.60	0.84	0.52	0.94	0.26	0.94	1.00	0.38
AFR		0.12	0.88	0.33	0.11	0.91	0.50	0.33	0.19	0.60	0.11	0.82	0.97	0.36
IND			0.91	0.67	0.32	0.86	0.64	0.88	0.38	0.79	0.22	0.87	1.00	0.27
VNM				0.26	0.00	0.59	0.06	0.33	0.00	0.07	0.00	0.45	0.97	0.00
PHL					0.09	0.63	0.22	0.25	0.05	0.29	0.08	0.50	0.96	0.00
KOR						0.96	0.67	0.82	0.48	0.78	0.11	0.83	1.00	0.08
CHN							0.04	0.20	0.07	0.42	0.00	0.44	0.94	0.00
RUS								0.81	0.70	0.83	0.44	0.88	1.00	0.40
POL									0.21	0.59	0.06	0.68	1.00	0.14
DEU										0.96	0.22	0.96	1.00	0.18
ITA											0.00	0.61	1.00	0.05
ENG												1.00	1.00	0.54
CUB													0.92	0.00
MEX														0.00

Comparisons are made based on the share of workers in the top sector in each region in each year. Each entry represents the incidence of a row country being ranked above the column country.

Table 6: Shares in the "top" sector in selected regions 1940-2011

	1940	1950	1960	1970	1980	1990	2000	2011
Canada								
Boston, MA	0.27	0.27	0.30	0.27	0.26	0.36	0.45	0.60
Chicago-Gary-Lake, IL	0.51	0.55	0.61	0.52	0.58	0.70	0.79	0.72
Detroit, MI	0.35	0.38	0.38	0.36	0.31	0.32	0.42	0.45
New York-Northeastern NJ	0.43	0.33	0.45	0.47	0.45	0.52	0.62	0.69
England								
Boston, MA	0.36	0.52	0.54	0.65	0.45	0.55	0.51	0.52
Chicago-Gary-Lake, IL	0.53	0.49	0.55	0.57	0.63	0.68	0.69	0.61
Detroit, MI	0.37	0.32	0.36	0.42	0.37	0.50	0.44	0.51
New York-Northeastern NJ	0.38	0.43	0.43	0.48	0.45	0.51	0.57	0.63
Germany								
Chicago-Gary-Lake, IL	0.28	0.38	0.40	0.38	0.49	0.52	0.62	0.58
Cleveland, OH	0.43	0.43	0.33	0.35	0.32	0.32	0.26	0.29
Detroit, MI	0.33	0.40	0.41	0.39	0.27	0.33	0.35	0.53
New York-Northeastern NJ	0.30	0.32	0.33	0.38	0.44	0.49	0.65	0.66
Italy								
Chicago-Gary-Lake, IL	0.22	0.27	0.21	0.21	0.26	0.33	0.44	0.39
Cleveland, OH	0.16	0.22	0.18	0.27	0.17	0.29	0.26	0.32
Detroit, MI	0.15	0.20	0.19	0.18	0.18	0.24	0.24	0.42
New York-Northeastern NJ	0.20	0.20	0.18	0.14	0.17	0.24	0.30	0.41
Poland								
Detroit, MI	0.23	0.20	0.24	0.27	0.23	0.18	0.26	0.34
New York-Northeastern NJ	0.29	0.32	0.35	0.33	0.30	0.26	0.19	0.26
Philadelphia, PA/NJ	0.25	0.19	0.30	0.25	0.23	0.34	0.28	0.36
Russia								
Chicago-Gary-Lake, IL	0.50	0.54	0.48	0.53	0.32	0.60	0.56	0.55
Los Angeles-Long Beach, CA	0.58	0.47	0.41	0.54	0.51	0.48	0.50	0.45
New York-Northeastern NJ	0.48	0.43	0.39	0.40	0.21	0.33	0.42	0.42
Philadelphia, PA/NJ	0.56	0.57	0.55	0.37	0.14	0.33	0.25	0.32
Mexico								
Chicago-Gary-Lake, IL		0.09	0.09	0.10	0.09	0.12	0.13	0.10
Fresno, CA							0.36	0.27
Los Angeles-Long Beach, CA	0.10	0.07	0.09	0.11	0.15	0.15	0.16	0.15
Reno, NV							0.28	0.25
Cuba								
Fort Lauderdale-Hollywood-Pompano Beach, FL					0.35	0.29	0.30	0.32
New York-Northeastern NJ		0.13	0.14	0.26	0.24	0.25	0.31	0.38
Riverside-San Bernardino,CA						0.74	0.60	0.55
China								
Chicago-Gary-Lake, IL			0.40	0.50	0.58	0.58	0.71	0.65
Nassau Co, NY					0.57	0.56	0.48	0.53
San Francisco-Oakland-Vallejo, CA	0.28	0.33	0.33	0.30	0.33	0.34	0.39	0.40
India								
Baltimore, MD					0.62	0.56	0.51	0.46
Boston, MA					0.61	0.50	0.38	0.50
Fort Lauderdale-Hollywood-Pompano Beach, FL						0.52	0.43	0.48
Washington, DC/MD/VA					0.44	0.43	0.37	0.44
Korea								
Honolulu, HI					0.44	0.45	0.56	0.52
Houston-Brazoria, TX						0.67	0.69	0.69
Nassau Co, NY						0.51	0.58	0.56
Washington, DC/MD/VA					0.31	0.34	0.33	0.46
Philippines								
Chicago-Gary-Lake, IL			0.24	0.67	0.53	0.51	0.47	0.37
Houston-Brazoria, TX					0.56	0.55	0.57	0.52
San Diego, CA			0.08	0.06	0.45	0.39	0.36	0.26

	1940	1950	1960	1970	1980	1990	2000	2011
San Francisco-Oakland-Vallejo, CA		0.10	0.13	0.25	0.25	0.27	0.27	0.27
Vietnam								
Boston, MA						0.09	0.14	0.20
Houston-Brazoria, TX					0.28	0.42	0.42	0.39
New York-Northeastern NJ						0.15	0.31	0.33
Oklahoma City, OK						0.49	0.49	0.54
Orlando, FL						0.32	0.28	0.24
Africa								
Boston, MA					0.42	0.41	0.30	0.29
Chicago-Gary-Lake, IL					0.47	0.52	0.55	0.39
Dallas-Fort Worth, TX						0.64	0.65	0.46
Los Angeles-Long Beach, CA			0.50	0.61	0.70	0.68	0.64	0.58
Middle East								
Los Angeles-Long Beach, CA			0.49	0.66	0.64	0.58	0.66	0.61
New York-Northeastern NJ	0.41	0.43	0.43	0.41	0.37	0.42	0.46	0.46
Bergen-Passaic, NJ					0.42	0.36	0.33	0.47
San Francisco-Oakland-Vallejo, CA					0.52	0.44	0.52	0.51

Table 7: Shares of workers in the four sectors by origin

	All workers								Unskilled workers							
	1940	1950	1960	1970	1980	1990	2000	2011	1940	1950	1960	1970	1980	1990	2000	2011
Sector A																
	1940	1950	1960	1970	1980	1990	2000	2011	1940	1950	1960	1970	1980	1990	2000	2011
CAN	0.14	0.19	0.22	0.16	0.19	0.25	0.29	0.28	0.1	0.17	0.16	0.18	0.25	0.25	0.27	0.32
MEX	0.07	0.08	0.07	0.05	0.05	0.06	0.06	0.07	0.03	0.05	0.04	0.04	0.08	0.09	0.09	0.09
CUB		0.07	0.1	0.12	0.18	0.2	0.12	0.19		0.08	0.07	0.08	0.13	0.13	0.12	0.14
ENG	0.16	0.23	0.24	0.21	0.23	0.27	0.27	0.24	0.12	0.21	0.17	0.22	0.29	0.28	0.37	0.27
ITA	0.12	0.13	0.11	0.07	0.06	0.09	0.11	0.11	0.11	0.13	0.09	0.08	0.12	0.16	0.14	0.22
DEU	0.13	0.2	0.2	0.16	0.16	0.2	0.23	0.22	0.1	0.19	0.12	0.17	0.23	0.18	0.27	0.22
POL	0.14	0.18	0.2	0.12	0.1	0.12	0.1	0.07	0.13	0.18	0.15	0.16	0.15	0.14	0.12	0.13
RUS	0.33	0.36	0.3	0.18	0.11	0.18	0.16	0.16	0.3	0.36	0.24	0.18	0.12	0.16	0.2	0.16
CHN	0.17	0.23	0.23	0.14	0.21	0.26	0.26	0.26	0.15	0.22	0.15	0.12	0.13	0.15	0.15	0.13
KOR					0.21	0.24	0.27	0.26					0.2	0.27	0.3	0.31
PHL		0.06	0.08	0.13	0.17	0.16	0.15	0.14			0.04	0.05	0.11	0.12	0.15	0.15
VNM					0.1	0.14	0.15	0.15					0.2	0.15	0.16	0.15
IND				0.61	0.39	0.29	0.25	0.22					0.19	0.17	0.2	0.2
AFR			0.3	0.28	0.25	0.23	0.21	0.15			0.15		0.25	0.18	0.18	0.11
ME	0.27	0.31	0.31	0.19	0.18	0.24	0.24	0.22	0.23	0.3	0.22	0.07	0.25	0.27	0.26	0.27
Sector B																
CAN	0.22	0.19	0.2	0.27	0.27	0.28	0.32	0.36	0.27	0.21	0.27	0.29	0.27	0.3	0.25	0.34
MEX	0.14	0.09	0.19	0.13	0.13	0.11	0.12	0.1	0.06	0.05	0.1	0.12	0.19	0.2	0.2	0.2
CUB		0.06	0.05	0.17	0.13	0.11	0.18	0.1		0.06	0.07	0.2	0.21	0.2	0.2	0.2
ENG	0.24	0.19	0.21	0.3	0.33	0.31	0.34	0.36	0.3	0.23	0.3	0.35	0.32	0.3	0.28	0.41
ITA	0.1	0.1	0.09	0.13	0.15	0.2	0.21	0.28	0.11	0.11	0.12	0.15	0.17	0.16	0.22	0.2
DEU	0.18	0.15	0.17	0.24	0.27	0.26	0.3	0.32	0.21	0.2	0.22	0.28	0.29	0.3	0.29	0.33
POL	0.12	0.09	0.11	0.22	0.19	0.16	0.15	0.18	0.12	0.11	0.18	0.24	0.25	0.22	0.28	0.23
RUS	0.16	0.1	0.14	0.25	0.19	0.23	0.27	0.26	0.18	0.15	0.23	0.32	0.23	0.28	0.3	0.31
CHN	0.07	0.08	0.11	0.22	0.22	0.24	0.29	0.28	0.08	0.11	0.11	0.14	0.16	0.17	0.2	0.21
KOR					0.28	0.27	0.29	0.31					0.23	0.26	0.24	0.29
PHL		0.04	0.15	0.2	0.24	0.23	0.23	0.21			0.09	0.11	0.25	0.3	0.29	0.29
VNM					0.26	0.2	0.21	0.19					0.27	0.29	0.26	0.27
IND				0.24	0.25	0.25	0.34	0.37					0.33	0.29	0.27	0.29
AFR			0.17	0.28	0.24	0.25	0.23	0.23			0.22		0.33	0.26	0.26	0.28
ME	0.14	0.13	0.13	0.31	0.29	0.26	0.28	0.31	0.14	0.18	0.18	0.34	0.22	0.26	0.31	0.31
Sector C																
CAN	0.41	0.4	0.34	0.32	0.3	0.28	0.24	0.23	0.39	0.41	0.38	0.32	0.27	0.26	0.31	0.17
MEX	0.31	0.32	0.3	0.42	0.45	0.4	0.37	0.34	0.33	0.39	0.45	0.47	0.36	0.31	0.34	0.35
CUB		0.44	0.36	0.36	0.3	0.3	0.32	0.32		0.43	0.44	0.38	0.36	0.34	0.36	0.32
ENG	0.38	0.38	0.33	0.33	0.27	0.26	0.24	0.25	0.35	0.36	0.36	0.25	0.19	0.25	0.19	0.24
ITA	0.36	0.41	0.32	0.33	0.29	0.23	0.24	0.22	0.34	0.39	0.42	0.36	0.36	0.36	0.38	0.33
DEU	0.45	0.46	0.37	0.35	0.33	0.31	0.28	0.27	0.44	0.43	0.45	0.34	0.3	0.29	0.25	0.26
POL	0.45	0.44	0.32	0.33	0.41	0.34	0.34	0.35	0.45	0.43	0.46	0.35	0.4	0.36	0.34	0.36
RUS	0.35	0.37	0.27	0.34	0.37	0.33	0.31	0.3	0.36	0.34	0.34	0.24	0.34	0.28	0.26	0.27
CHN	0.07	0.14	0.16	0.17	0.2	0.22	0.21	0.22	0.08	0.11	0.14	0.1	0.16	0.27	0.42	0.44
KOR					0.29	0.27	0.24	0.25					0.31	0.21	0.28	0.26
PHL		0.28	0.31	0.36	0.33	0.38	0.37	0.36			0.38	0.42	0.32	0.29	0.32	0.27
VNM					0.4	0.4	0.37	0.33					0.38	0.33	0.38	0.42
IND				0.08	0.24	0.27	0.25	0.27					0.24	0.27	0.28	0.27
AFR			0.25	0.34	0.28	0.25	0.28	0.26			0.31		0.23	0.24	0.27	0.24
ME	0.36	0.33	0.24	0.29	0.28	0.28	0.25	0.24	0.37	0.29	0.31	0.29	0.25	0.27	0.23	0.25
Sector D																
CAN	0.23	0.22	0.24	0.25	0.23	0.18	0.14	0.13	0.23	0.21	0.19	0.22	0.21	0.19	0.17	0.16
MEX	0.48	0.52	0.44	0.4	0.38	0.43	0.45	0.49	0.58	0.51	0.41	0.37	0.37	0.4	0.36	0.36
CUB		0.43	0.49	0.35	0.39	0.38	0.38	0.39		0.43	0.42	0.34	0.3	0.33	0.31	0.35
ENG	0.22	0.2	0.21	0.16	0.17	0.17	0.15	0.15	0.24	0.19	0.18	0.17	0.2	0.17	0.16	0.08
ITA	0.43	0.37	0.47	0.47	0.49	0.48	0.43	0.39	0.44	0.37	0.37	0.41	0.35	0.31	0.26	0.25
DEU	0.23	0.18	0.26	0.26	0.24	0.23	0.19	0.19	0.24	0.18	0.2	0.22	0.19	0.23	0.19	0.19
POL	0.29	0.29	0.36	0.33	0.3	0.37	0.41	0.4	0.3	0.28	0.21	0.25	0.2	0.28	0.26	0.29
RUS	0.16	0.16	0.29	0.24	0.33	0.27	0.27	0.29	0.16	0.16	0.2	0.26	0.31	0.27	0.24	0.26
CHN	0.69	0.54	0.5	0.48	0.36	0.28	0.25	0.24	0.69	0.55	0.61	0.64	0.56	0.4	0.24	0.21
KOR					0.23	0.22	0.19	0.18					0.25	0.27	0.18	0.15
PHL		0.62	0.46	0.32	0.26	0.23	0.25	0.28			0.49	0.43	0.33	0.29	0.24	0.29
VNM					0.23	0.26	0.27	0.33					0.15	0.22	0.2	0.16
IND				0.08	0.13	0.18	0.16	0.15					0.24	0.27	0.25	0.24
AFR			0.28	0.1	0.23	0.28	0.29	0.36			0.31		0.19	0.32	0.3	0.36
ME	0.23	0.23	0.32	0.21	0.25	0.22	0.22	0.23	0.26	0.23	0.28	0.3	0.27	0.21	0.2	0.17

Table 8: Pairwise comparisons based on the share of workers in the four sectors

	AFR	IND	VNM	PHL	KOR	CHN	RUS	POL	DEU	ITA	ENG	CUB	MEX	CAN
Sector A														
ME	0.55	0.00	1.00	1.00	0.92	0.15	0.86	1.00	1.00	1.00	0.46	1.00	1.00	0.38
AFR		0.00	1.00	1.00	0.60	0.44	1.00	1.00	0.72	1.00	0.47	1.00	1.00	0.45
IND			1.00	1.00	1.00	0.45	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.73
VNM				0.35	0.00	0.00	0.00	0.66	0.00	0.66	0.00	0.29	1.00	0.00
PHL					0.17	0.00	0.11	0.88	0.17	0.65	0.00	0.96	1.00	0.17
KOR						0.07	0.85	1.00	0.55	1.00	0.38	1.00	1.00	0.08
CHN							0.81	1.00	1.00	1.00	1.00	1.00	1.00	1.00
RUS								1.00	0.49	1.00	0.33	1.00	1.00	0.38
POL									0.06	0.67	0.00	0.60	1.00	0.00
DEU										1.00	0.00	1.00	1.00	0.11
ITA											0.00	0.30	1.00	0.00
ENG												1.00	1.00	0.60
CUB													1.00	0.00
MEX														0.00
Sector B														
ME	0.92	0.70	1.00	1.00	0.16	1.00	0.84	1.00	0.88	1.00	0.06	1.00	1.00	0.37
AFR		0.39	1.00	1.00	0.03	0.43	0.72	1.00	0.09	0.47	0.04	1.00	1.00	0.09
IND			1.00	1.00	0.00	0.65	0.96	1.00	0.29	0.73	0.00	1.00	1.00	0.00
VNM				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
PHL					0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00
KOR						1.00	1.00	1.00	1.00	1.00	0.31	1.00	1.00	0.53
CHN							0.81	0.90	0.00	0.73	0.00	1.00	0.99	0.00
RUS								0.92	0.00	0.60	0.00	0.87	1.00	0.00
POL									0.00	0.50	0.00	0.14	1.00	0.00
DEU										0.81	0.00	1.00	1.00	0.00
ITA											0.00	0.74	0.97	0.00
ENG												1.00	1.00	0.79
CUB													1.00	0.00
MEX														0.00
Sector C														
ME	0.21	0.19	0.62	0.02	0.03	1.00	0.05	0.61	0.00	0.81	0.00	0.28	0.94	0.00
AFR		0.18	0.63	0.00	0.17	1.00	0.18	0.94	0.00	0.95	0.00	0.32	0.97	0.00
IND			0.64	0.35	0.63	0.97	0.63	0.77	0.30	0.92	0.56	0.78	0.96	0.56
VNM				0.00	0.35	0.65	0.32	1.00	0.25	1.00	0.25	0.71	1.00	0.25
PHL					1.00	0.99	0.95	0.97	0.91	0.89	0.87	0.94	0.92	0.85
KOR						0.99	0.41	0.80	0.00	0.96	0.27	0.80	0.97	0.27
CHN							0.00	0.69	0.00	0.68	0.00	0.27	0.87	0.00
RUS								0.56	0.43	0.68	0.52	0.80	0.89	0.33
POL									0.00	0.69	0.00	0.10	0.89	0.00
DEU										1.00	0.73	1.00	1.00	0.72
ITA											0.00	0.07	0.90	0.00
ENG												0.78	0.92	0.19
CUB													0.95	0.00
MEX														0.00
Sector D														
ME	0.23	1.00	0.00	0.00	0.60	0.00	0.22	0.00	0.17	0.00	1.00	0.00	0.00	0.95
AFR		1.00	0.00	0.34	0.83	0.58	0.37	0.00	0.76	0.27	0.96	0.00	0.00	0.80
IND			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VNM				1.00	1.00	1.00	1.00	0.19	1.00	0.57	1.00	1.00	0.00	1.00
PHL					1.00	1.00	0.58	0.20	1.00	0.15	1.00	0.05	0.04	1.00
KOR						0.00	0.00	0.00	0.18	0.00	0.98	0.00	0.00	0.96
CHN							0.20	0.22	0.75	0.03	1.00	0.00	0.00	1.00
RUS								0.12	0.80	0.00	0.93	0.16	0.00	0.92
POL									1.00	0.47	1.00	0.83	0.00	1.00
DEU										0.00	1.00	0.00	0.00	1.00
ITA											1.00	0.70	0.00	1.00
ENG												0.00	0.00	0.46
CUB													0.00	1.00
MEX														1.00

Comparisons are made based on the share of workers in each sector in each region in each year. Each entry represents the incidence of a row country being ranked above the column country.

Table 9: Pairwise comparisons based on the share of workers in the four sectors: unskilled workers

	AFR	IND	VNM	PHL	KOR	CHN	RUS	POL	DEU	ITA	ENG	CUB	MEX	CAN
Sector A														
ME	1.00	1.00	1.00	1.00	0.34	1.00	0.76	1.00	1.00	1.00	0.42	1.00	1.00	0.58
AFR		0.29	1.00	1.00	0.10	0.62	0.24	0.65	0.38	0.44	0.00	0.72	1.00	0.15
IND			1.00	1.00	0.07	1.00	1.00	1.00	0.00	0.68	0.00	1.00	1.00	0.00
VNM				0.69	0.00	0.00	0.00	0.35	0.00	0.00	0.00	0.33	1.00	0.00
PHL					0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.28	0.83	0.00
KOR						1.00	1.00	1.00	0.88	1.00	0.00	1.00	1.00	0.00
CHN							0.17	1.00	0.20	0.41	0.08	1.00	1.00	0.22
RUS								0.95	0.54	0.75	0.49	0.87	1.00	0.58
POL									0.38	0.65	0.11	1.00	1.00	0.10
DEU										0.76	0.00	1.00	1.00	0.07
ITA											0.00	0.81	1.00	0.00
ENG												1.00	1.00	1.00
CUB													1.00	0.00
MEX														0.00
Sector B														
ME	0.79	0.67	0.88	1.00	1.00	1.00	0.57	0.79	0.00	0.96	0.21	1.00	1.00	0.42
AFR		0.00	1.00	0.19	0.65	1.00	0.24	0.84	0.10	1.00	0.06	1.00	1.00	0.11
IND			1.00	1.00	1.00	1.00	0.52	1.00	0.31	1.00	0.00	1.00	1.00	0.44
VNM				0.12	0.13	1.00	0.12	0.22	0.00	1.00	0.00	1.00	1.00	0.00
PHL					1.00	0.89	0.41	0.67	0.00	0.83	0.00	0.95	0.92	0.00
KOR						1.00	0.12	0.81	0.00	1.00	0.00	1.00	1.00	0.00
CHN							0.00	0.04	0.00	0.03	0.00	0.05	0.11	0.00
RUS								0.90	0.21	1.00	0.26	0.87	1.00	0.36
POL									0.00	1.00	0.00	0.98	1.00	0.00
DEU										1.00	0.34	1.00	1.00	0.33
ITA											0.00	0.52	1.00	0.00
ENG												1.00	1.00	1.00
CUB													0.97	0.00
MEX														0.00
Sector C														
ME	0.33	0.13	0.00	0.04	0.24	0.41	0.24	0.00	0.00	0.00	0.32	0.00	0.06	0.51
AFR		0.68	0.00	0.00	0.82	0.36	0.31	0.00	0.56	0.00	0.58	0.00	0.00	0.52
IND			0.00	0.00	0.87	0.28	0.16	0.00	0.00	0.00	1.00	0.00	0.00	0.86
VNM				0.87	1.00	0.58	0.87	0.53	1.00	1.00	1.00	1.00	1.00	1.00
PHL					1.00	0.72	0.80	0.00	0.81	0.33	0.85	0.66	0.13	0.77
KOR						0.16	0.00	0.00	0.22	0.00	0.75	0.21	0.00	0.47
CHN							0.56	0.25	0.54	0.26	0.50	0.33	0.34	0.51
RUS								0.00	0.30	0.13	0.48	0.18	0.16	0.42
POL									0.70	1.00	0.89	1.00	0.76	0.90
DEU										0.43	1.00	0.17	0.06	0.93
ITA											0.81	0.55	0.08	0.83
ENG												0.02	0.06	0.13
CUB													0.25	0.98
MEX														0.94
Sector D														
ME	0.08	0.00	0.00	0.00	0.27	0.00	0.41	0.39	0.67	0.00	1.00	0.00	0.00	0.83
AFR		1.00	0.87	0.60	0.83	0.32	0.81	0.95	0.97	0.51	0.96	0.00	0.00	0.96
IND			0.89	0.00	0.63	0.33	0.00	0.18	1.00	0.31	1.00	0.00	0.00	1.00
VNM				0.00	0.73	0.00	0.00	0.24	0.71	0.00	1.00	0.00	0.00	0.72
PHL					1.00	0.31	0.76	1.00	1.00	0.70	1.00	0.31	0.20	1.00
KOR						0.00	0.00	0.52	0.76	0.00	1.00	0.00	0.00	0.71
CHN							0.77	0.83	1.00	0.80	1.00	0.74	0.45	1.00
RUS								0.45	0.72	0.24	0.88	0.18	0.00	0.91
POL									0.83	0.09	1.00	0.00	0.00	1.00
DEU										0.00	1.00	0.00	0.00	1.00
ITA											1.00	0.31	0.00	1.00
ENG												0.00	0.00	0.09
CUB													0.00	1.00
MEX														1.00

Comparisons are made for workers with less than a high school degree based on the share of workers in each sector in each region in each year. Each entry represents the incidence of a row country being ranked above the column country.

Table 10: Individual characteristic by sector 1980-2011

	Sector A	Others	Sector B	Others	Sector C	Sector D
Age	36.00	33.00	35.00	32.00	32.00	32.00
Education	15.30	11.50	14.40	10.90	11.60	10.40
English	0.89	0.58	0.87	0.52	0.60	0.45
Arrival year	2.90	2.76	3.12	2.70	2.60	2.70
Tenure	32.00	35.00	31.00	36.00	36.00	36.00
Network in sector A	0.24	0.14	0.19	0.13	0.15	0.11
Network in sector B	0.23	0.19	0.26	0.18	0.18	0.17
Network in sector C	0.30	0.34	0.30	0.35	0.36	0.33

Columns 2 and 3 compare workers in sector A with all other workers. Columns 4 and 5 compare workers in sector B with workers in sector C and D. Columns 6 and 7 compare workers in sector C to workers in sector D.

Figure 1: Predicted shares from the linear probability models in the top three sectors

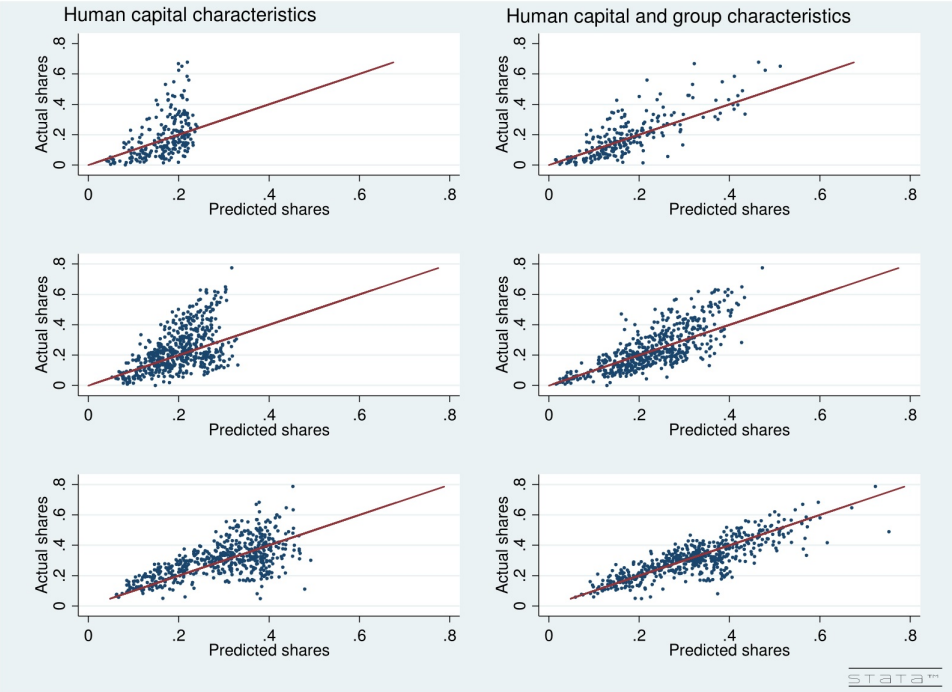

Table 11: Structural parameters estimates

Sector A		
Large groups		
Age	0.758	(0.287)
English proficiency	0.240	(0.542)
Arrival	-0.803	(10.265)
Arrival square	1.172	(1.687)
Length of stay	0.044	(0.821)
Size of the network in sector A	1.871	(0.387)
Others		
Age	0.559	(1.859)
Education	1.647	(4.494)
English proficiency	0.179	(1.111)
Sector B		
Large groups		
Age	0.069	(2.594)
English proficiency	0.288	(1.881)
Arrival	0.265	(1.162)
Arrival square	0.051	(0.596)
Length of stay	0.254	(1.302)
Size of the network in sector B	3.076	(0.248)
Others		
Age	0.720	(3.502)
Education	1.471	(0.341)
English proficiency	0.424	(3.241)
Sector C		
Large groups		
Age	0.428	(1.914)
English proficiency	0.372	(1.341)
Arrival	-0.216	(0.962)
Arrival square	0.502	(0.342)
Length of stay	-1.267	(2.104)
Size of the network in sector C	1.509	(0.187)
Others		
Age	-0.185	(2.786)
Education	1.474	(0.421)
English proficiency	0.471	(2.549)
$\sigma^2_{large,sectorB}$	0.471	(0.667)
$\sigma^2_{others,sectorB}$	0.630	(0.795)
$\zeta_{sectorA-sectorB}$	1.684	(0.476)
$\sigma^2_{large,sectorC}$	1.432	(0.759)
$\sigma^2_{others,sectorC}$	1.107	(0.981)
$\zeta_{sectorA-sectorC}$	2.665	(0.579)

Standard errors in parenthesis.

Table 12: Model fit

	AFR	IND	VNM	PHL	KOR	CHN	RUS	POL	DEU	ITA	ENG	CUB	MEX	CAN
Sector A														
ME	0.75	0.57	0.91	0.71	0.83	0.77	0.50	0.86	0.87	0.75	0.78	1.00	1.00	0.85
AFR		0.82	0.94	0.72	0.76	0.84	0.89	1.00	0.67	0.80	0.75	1.00	1.00	0.85
IND			0.96	0.97	0.61	0.48	0.58	1.00	0.65	0.67	0.63	0.83	1.00	0.70
VNM				0.59	1.00	0.96	0.83	n/a	1.00	1.00	1.00	n/a	0.95	1.00
PHL					0.68	0.82	0.70	1.00	0.94	0.75	0.89	0.83	0.96	0.89
KOR						0.95	0.50	0.83	1.00	0.67	1.00	1.00	1.00	0.89
CHN							0.67	0.75	0.63	0.63	0.80	1.00	1.00	0.65
RUS								1.00	0.80	0.60	0.86	1.00	1.00	1.00
POL									1.00	0.83	1.00	1.00	1.00	1.00
DEU										0.86	0.44	1.00	1.00	0.68
ITA											0.67	0.75	1.00	1.00
ENG												1.00	1.00	0.70
CUB													1.00	1.00
MEX														1.00
Sector B														
ME	0.81	0.70	0.82	0.76	0.78	0.86	0.80	1.00	0.80	0.50	1.00	0.60	1.00	0.85
AFR		0.82	0.81	0.72	0.76	0.76	0.89	1.00	0.73	0.60	0.63	0.60	1.00	0.65
IND			0.92	0.81	0.74	0.74	0.67	1.00	0.59	0.50	0.75	1.00	1.00	0.67
VNM				0.64	0.93	0.92	0.83	n/a	0.89	0.50	0.80	1.00	0.95	0.93
PHL					0.74	0.84	0.60	1.00	0.75	0.63	0.56	1.00	1.00	0.89
KOR						0.57	0.50	1.00	0.92	0.50	0.57	0.67	1.00	0.78
CHN							0.58	0.75	0.74	0.75	0.90	1.00	1.00	0.71
RUS								1.00	0.80	0.40	0.71	1.00	1.00	0.80
POL									1.00	0.67	1.00	0.50	1.00	1.00
DEU										0.86	0.44	0.80	1.00	0.53
ITA											0.83	1.00	1.00	0.88
ENG												1.00	1.00	0.30
CUB													1.00	0.86
MEX														0.79
Sector C														
ME	0.56	0.74	0.91	0.82	0.44	0.68	0.50	0.43	0.67	0.25	0.78	0.80	0.75	0.75
AFR		0.71	0.88	0.83	0.53	0.88	0.56	n/a	0.73	0.40	0.88	0.60	0.85	0.85
IND			0.92	0.88	0.52	0.76	0.67	0.50	0.71	0.33	0.75	0.83	0.94	0.81
VNM				0.73	0.87	0.92	0.83	1.00	0.78	1.00	1.00	0.50	0.74	1.00
PHL					0.79	0.92	0.80	0.50	0.88	0.63	0.89	0.50	0.75	0.89
KOR						0.81	0.60	0.83	0.83	0.50	0.86	0.67	0.92	0.89
CHN							0.58	1.00	0.79	0.50	0.80	1.00	0.95	0.65
RUS								1.00	0.70	0.20	0.86	0.33	0.50	0.80
POL									1.00	0.33	1.00	0.50	0.80	1.00
DEU										0.86	0.44	1.00	1.00	0.63
ITA											0.67	1.00	0.80	0.75
ENG												1.00	1.00	0.80
CUB													0.67	1.00
MEX														0.86
Sector D														
ME	0.56	0.74	0.82	0.53	0.56	0.73	0.70	0.86	0.80	0.63	0.78	0.60	1.00	0.85
AFR		0.86	0.88	0.78	0.82	0.80	0.78	0.80	0.80	0.80	0.75	1.00	1.00	0.70
IND			0.96	0.88	1.00	0.86	0.83	1.00	0.47	0.83	0.75	1.00	1.00	0.67
VNM				0.77	0.80	0.96	0.50	1.00	1.00	1.00	1.00	0.50	1.00	1.00
PHL					0.74	0.97	0.90	1.00	0.63	0.75	0.44	0.83	1.00	0.79
KOR						0.71	0.70	1.00	0.83	0.67	0.71	1.00	1.00	0.89
CHN							0.75	0.75	0.95	0.75	1.00	0.60	1.00	0.90
RUS								1.00	0.90	0.40	0.86	1.00	1.00	1.00
POL									1.00	0.83	1.00	1.00	1.00	1.00
DEU										1.00	0.22	1.00	1.00	0.47
ITA											1.00	0.75	0.80	1.00
ENG												1.00	1.00	0.80
CUB													1.00	1.00
MEX														1.00

Comparisons are made based on the predicted shares. Each entry represents the share of correctly predicted rankings between each pair of countries.

Table 13: Out of sample predictions

Omitted regions	Sector A	Sector B	Sector C	Sector D
Atlanta, Boston, Sacramento	0.69	0.90	0.74	0.83
New York	0.66	0.75	0.69	0.76

Table 14: The effect of 1 year increase in the educational attainment by sector and group

	ME	AFR	IND	VNM	PHL	KOR	CHN	RUS	POL	DEU	ITA	ENG	CUB	MEX	CAN
Sector A															
CAN	0.00	0.15	0.00	0.00	0.00	0.56	0.65	0.10	0.00	0.16	0.00	0.20	0.00	0.00	
MEX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
CUB	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.50	0.00		0.00	0.00
ENG	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.10
ITA	0.25	0.00	0.00	0.00	0.13	0.00	0.13	0.20	0.00	0.14		0.00	0.00	0.00	0.13
DEU	0.67	0.20	0.12	0.00	0.00	0.83	0.53	0.00	0.00		0.00	0.33	0.00	0.00	0.22
POL	0.14	0.00	0.00	0.00	0.00	0.00	0.13	0.20		0.00	0.17	0.00	0.00	0.00	0.00
RUS	0.10	0.11	0.83	0.00	0.20	0.00	0.83		0.00	0.00	0.20	0.00	0.00	0.00	0.10
CHN	0.00	0.12	0.21	0.42	0.79	0.48		0.83	0.25	0.16	0.00	0.20	0.00	0.00	0.13
KOR	0.11	0.00	0.87	0.00	0.53		0.48	0.10	0.00	0.83	0.17	0.00	0.00	0.00	0.00
PHL	0.59	0.56	0.31	0.45		0.15	0.26	0.30	0.00	0.63	0.00	0.00	0.00	0.00	0.71
VNM	0.00	0.00	0.00		0.45	0.00	0.42	0.00	1.00	0.00	0.00	0.00	0.50	0.00	0.00
IND	0.43	0.00		0.00	0.31	0.13	0.21	0.83	0.00	0.18	0.17	0.25	0.00	0.00	0.19
AFR	0.13		0.18	0.00	0.17	0.18	0.12	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.50
ME		0.63	0.87	0.00	0.12	0.17	0.45	0.30	0.00	0.20	0.25	0.11	0.00	0.00	0.50
Sector B															
CAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MEX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
CUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00
ENG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00
ITA	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
DEU	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.00	0.00		0.00	0.00	0.00	0.00	0.00
POL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
RUS	0.10	0.00	0.00	0.00	0.00	0.00	-0.83		0.00	0.00	0.00	0.00	0.00	0.00	0.00
CHN	0.00	0.00	0.00	0.42	0.26	0.00		0.00	0.00	0.53	0.00	0.00	0.00	0.00	-0.32
KOR	0.00	0.00	0.00	0.00	0.53		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PHL	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VNM	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IND	0.00	0.00		0.00	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AFR	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
ME		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sector C															
CAN	-0.50	0.50	0.00	0.00	0.00	0.00	-0.65	0.00	0.00	0.00	0.00	-0.10	0.00	0.00	
MEX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33		0.00
CUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		-0.33	0.00
ENG	0.00	0.00	0.00	0.00	0.00	0.00	-0.10	0.00	0.00	0.00	0.00		0.00	0.00	0.00
ITA	0.00	0.00	0.00	0.00	-0.13	-0.17	0.00	0.00	0.00	-0.14		0.00	0.00	0.00	0.00
DEU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
POL	0.00	0.00	-0.83	0.00	0.00	-0.20	0.00	0.00		0.00	0.00	0.00	0.00	0.00	-0.10
RUS	-0.32	-0.45	0.00	-0.48	0.00	0.00	-0.48		-0.83	0.00	-0.53	0.00	-0.10	0.00	0.00
CHN	0.00	0.00	0.00	0.00	0.00	0.00		0.00	-0.10	0.00	-0.83	0.00	0.00	0.00	-0.77
KOR	-0.36	-0.12	0.00	0.00	0.00		-0.53	0.00	0.00	0.00	-0.63	0.00	0.00	0.00	-0.36
PHL	0.00	0.00	0.00	0.00		-0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VNM	-0.37	0.00	-0.36		0.00	0.00	0.00	0.00	0.00	0.00	-0.59	0.00	0.00	0.00	0.00
IND	0.00	-0.63		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AFR	0.00		-0.63	-0.43	0.00	0.00	0.00	-0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ME		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sector D															
CAN	-0.05	-0.05	-0.04	0.00	-0.04	0.00	0.00	0.00	0.00	0.00	0.00	-0.10	0.00	0.00	
MEX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
CUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.33	0.00	0.00	0.00	0.00		0.00	0.00
ENG	0.00	0.00	-0.13	0.00	-0.22	0.00	0.00	0.00	0.00	-0.22	0.00		0.00	0.00	-0.20
ITA	0.00	0.00	0.00	0.00	0.00	-0.17	-0.13	0.00	-0.17	0.00		0.00	0.00	0.00	0.00
DEU	0.00	0.00	-0.06	0.00	-0.13	-0.08	0.00	0.00	0.00		0.00	0.00	0.00	0.00	-0.05
POL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
RUS	-0.10	0.00	-0.08	0.00	0.00	-0.20	-0.17		0.00	0.00	0.00	0.00	0.00	0.00	0.00
CHN	0.00	0.00	0.00	0.00	0.00	-0.10		0.00	0.00	-0.11	0.00	0.00	-0.20	0.00	-0.03
KOR	0.00	0.00	-0.09	0.00	-0.11		-0.05	-0.10	0.00	0.00	0.00	0.00	0.00	0.00	-0.06
PHL	0.00	-0.06	-0.03	-0.05		0.00	-0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.07
VNM	0.00	0.00	0.00		0.00	0.00	-0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IND	0.00	-0.04		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.04
Africa	0.00		0.00	0.00	-0.06	-0.06	0.00	0.00	0.00	-0.07	0.00	0.00	0.00	0.00	0.00
ME		0.00	-0.22	-0.09	0.00	-0.06	-0.05	-0.20	0.00	0.00	0.00	0.00	-0.20	0.00	0.00

Each entry denotes the fraction of rankings affected by an extra year of schooling for workers from the row country.

Table 15: The effect of English proficiency by sector and group

	ME	AFR	IND	VNM	PHL	KOR	CHN	RUS	POL	DEU	ITA	ENG	CUB	MEX	CAN
Sector A															
MEX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
CUB	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.25	0.00		0.00	0.00
ITA	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
DEU	0.00	0.67	0.00	0.00	0.63	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
POL	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.20		0.00	0.17	0.00	0.00	0.00	0.00
RUS	0.10	0.11	0.83	0.00	0.10	0.10	0.83		0.00	0.00	0.20	0.00	0.00	0.00	0.10
CHN	0.45	0.80	0.95	0.83	0.15	0.95		0.00	0.25	0.53	0.00	0.10	0.00	0.00	0.97
KOR	0.11	0.12	0.87	0.67	0.00		0.95	0.10	0.00	0.25	0.33	0.00	0.00	0.00	0.11
PHL	0.00	0.00	0.00	0.00		0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VNM	0.00	0.00	0.00		1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.50	0.00	0.00
IND	0.00	0.36		0.00	0.31	0.43	0.24	0.00	0.00	0.59	0.00	0.00	0.00	0.00	0.00
AFR	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ME		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.13	0.00	0.00	0.00	0.00
Sector B															
MEX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
CUB	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00		0.00	0.00
ITA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
DEU	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.00	0.00		0.00	0.00	0.00	0.00	0.00
POL	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00		0.00	0.00	0.00	0.00	0.00	0.00
RUS	0.00	0.11	0.83	0.00	0.20	0.20	0.17		0.00	0.10	0.00	0.14	0.00	0.00	0.00
CHN	0.00	0.80	0.71	0.42	0.13	0.00		0.83	0.00	0.22	0.00	0.00	0.00	0.00	0.65
KOR	0.11	0.59	0.13	0.00	0.53		0.29	0.50	0.00	0.25	0.00	0.29	0.00	0.00	0.11
PHL	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VNM	1.00	0.13	0.42		0.45	0.67	0.83	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
IND	0.00	0.36		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AFR	0.00		0.00	0.00	0.56	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ME		0.00	0.43	0.00	0.59	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sector C															
MEX	0.17	0.00	0.00	0.22	0.71	0.77	0.00	0.00	0.60	0.00	0.20	0.00	0.67		0.00
CUB	0.00	0.40	0.33	0.00	0.17	0.00	0.00	0.00	1.00	0.00	0.25	0.00		0.00	0.00
ITA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00		0.00	0.00	0.00	0.00
DEU	0.00	0.00	0.59	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
POL	0.29	0.60	0.17	0.00	0.13	0.17	0.00	0.00		0.00	0.33	0.00	0.00	0.20	0.00
RUS	0.00	0.00	0.00	0.00	0.00	0.10	0.00		0.20	0.00	0.00	0.00	0.33	0.00	0.00
CHN	0.45	0.00	0.24	0.42	0.00	0.48		0.17	0.00	0.00	0.00	0.00	0.00	0.53	0.65
KOR	0.00	0.59	0.43	0.13	0.00		0.48	0.10	0.00	0.17	0.00	0.00	0.00	0.00	0.10
PHL	0.00	0.00	0.00	0.00		0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VNM	0.00	0.13	0.83		0.23	0.13	0.83	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00
IND	0.00	0.36		0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00
AFR	0.00		0.00	0.00	0.11	0.00	0.40	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00
ME		0.00	0.00	0.00	0.00	0.00	0.45	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sector D															
MEX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
CUB	0.00	0.00	0.00	-0.50	0.00	-0.33	-0.40	-0.33	0.00	-0.20	0.00	-0.20		0.00	-0.14
ITA	-0.13	0.00	0.00	0.00	0.00	0.00	-0.13	0.00	0.00	0.00		0.00	0.00	0.00	0.00
DEU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
POL	-0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	-0.17	0.00	0.00	0.00	0.00
RUS	-0.40	0.00	-0.17	-0.17	-0.10	-0.30	-0.17		0.00	0.00	-0.40	-0.14	-0.33	0.00	0.00
CHN	-0.18	-0.08	-0.10	-0.08	-0.08	-0.19		-0.17	-0.25	-0.32	-0.13	0.00	-0.40	0.00	-0.13
KOR	-0.17	-0.24	-0.13	-0.07	-0.26		-0.29	0.00	0.00	-0.33	0.00	-0.43	0.00	0.00	-0.28
PHL	0.00	0.00	0.00	0.00		-0.05	-0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VNM	-0.09	-0.06	-0.04		0.00	-0.07	-0.08	-0.17	0.00	-0.11	0.00	0.00	0.00	0.00	0.00
IND	-0.04	-0.04		0.00	-0.03	0.00	0.00	0.00	0.00	0.00	-0.17	0.00	0.00	0.00	0.00
AFR	-0.06		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ME		0.00	-0.13	0.00	0.00	0.00	0.00	-0.10	0.00	0.00	-0.13	-0.11	-0.40	0.00	0.00

Each entry denotes the fraction of rankings affected by the full English proficiency of workers from the row country.

Table 16: The effect of the arrival year and length of stay by sector and group

	ME	AFR	IND	VNM	PHL	KOR	CHN	RUS	POL	DEU	ITA	ENG	CUB	MEX	CAN
Sector A															
CAN	0.00	0.50	0.75	0.00	0.71	0.56	0.32	0.00	0.00	0.22	0.00	0.10	0.00	0.00	
MEX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
CUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00		0.00	0.00
ENG	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.11	0.00		0.00	0.00	0.20
ITA	0.13	0.13	0.40	0.00	0.00	0.13	0.00	0.13	0.20	0.00		0.00	0.00	0.00	0.00
DEU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.20		0.00	0.17	0.00	0.00	0.00
POL	0.20	0.10	0.11	0.83	0.00	0.20	0.10	0.83		0.00	0.00	0.20	0.00	0.00	0.00
RUS	0.16	0.45	0.80	0.24	0.83	0.53	0.00		0.83	0.25	0.53	0.00	0.10	0.00	0.00
CHN	0.56	0.56	0.00	0.43	0.67	0.00		0.95	0.10	0.00	0.17	0.17	0.00	0.00	0.00
KOR	0.00	0.24	0.11	0.31	0.45		0.16	0.26	0.20	0.00	0.00	0.13	0.11	0.00	0.00
PLH	0.00	0.00	0.00	0.00		0.45	0.67	0.00	0.00	1.00	0.00	0.00	0.00	0.50	0.00
VNM	0.75	0.87	0.71		0.00	0.31	0.13	0.17	0.83	0.00	0.12	0.17	0.13	0.00	0.00
IND	0.50	0.63		0.17	0.00	0.11	0.18	0.80	0.00	0.00	0.67	0.00	0.13	0.00	0.00
AFR	0.00		0.13	0.43	0.00	0.18	0.17	0.00	0.40	0.14	0.67	0.25	0.00	0.00	0.00
ME		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sector B															
CAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MEX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
CUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.14	0.00	0.00	0.00	0.00		0.00	0.00
ENG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00
ITA	0.00	0.00	0.00	0.00	0.00	-0.83	-0.53	0.00	0.00	0.00		0.00	0.00	0.00	0.00
DEU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
POL	0.00	0.00	0.00	0.00	0.00	0.00	-0.83	0.00		0.00	0.00	0.00	0.00	0.00	0.00
RUS	0.00	0.00	0.00	0.00	0.00	0.00	0.00		-0.13	-0.53	0.00	0.00	0.00	0.00	0.00
CHN	-0.56	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
KOR	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PHL	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VNM	0.00	0.00	0.00		0.00	-0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IND	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.50
AFR	0.00		-0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ME		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sector C															
CAN	-0.50	-0.50	0.00	0.00	-0.17	-0.56	-0.23	-0.20	0.00	-0.16	0.00	-0.40	0.00	0.00	
MEX	-0.17	0.00	-0.56	-0.53	-0.17	-0.77	-0.53	0.00	-0.20	-0.27	-0.20	0.00	-0.33		0.00
CUB	-0.20	0.00	0.00	0.00	-0.17	-0.33	0.00	-0.33	0.00	-0.40	0.00	-0.20		-0.67	-0.14
ENG	-0.22	0.00	-0.13	0.00	-0.11	0.00	0.00	0.00	0.00	-0.22	0.00		0.00	0.00	-0.10
ITA	-0.38	-0.60	-0.17	0.00	-0.25	-0.17	0.00	0.00	-0.50	-0.29		-0.17	-0.25	-0.20	0.00
DEU	-0.13	-0.13	-0.18	-0.11	-0.63	-0.25	-0.16	0.00	0.00		0.00	-0.33	0.00	0.00	-0.26
POL	-0.29	0.00	0.00	0.00	0.00	-0.17	0.00	-0.20		-0.14	-0.33	-0.25	-1.00	-0.60	0.00
RUS	-0.30	-0.11	-0.83	0.00	-0.10	-0.20	-0.17		0.00	-0.20	-0.20	-0.14	0.00	0.00	0.00
CHN	-0.14	-0.80	-0.19	-0.42	-0.53	-0.48		-0.83	0.00	0.00	0.00	-0.50	0.00	0.00	-0.13
KOR	-0.28	-0.18	-0.43	-0.67	-0.15		-0.14	-0.20	-0.33	0.00	-0.17	-0.29	0.00	0.00	-0.11
PHL	-0.18	-0.22	-0.94	-0.27		-0.15	-0.26	0.00	-0.25	-0.63	-0.13	0.00	-0.17	-0.17	0.00
VNM	-1.00	-0.63	-0.13		-0.45	-0.20	-0.17	0.00	0.00	0.00	0.00	0.00	-1.00	-0.22	0.00
IND	-0.13	-0.17		-0.83	-0.31	-0.22	-0.26	0.00	-0.33	-0.59	-0.17	-0.25	-0.33	0.00	-0.75
AFR	-0.19		-0.18	-0.25	-0.56	-0.18	0.00	-0.22	-0.60	-0.27	0.00	0.00	-0.40	0.00	-0.50
ME		-0.13	-0.87	0.00	-0.59	-0.56	-0.14	-0.10	-0.29	-0.33	0.00	-0.11	0.00	-0.83	-0.10
Sector D															
CAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	
MEX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
CUB	0.40	0.00	0.00	0.00	0.00	0.00	0.20	0.33	0.00	0.00	0.00	0.00		0.00	0.00
ENG	0.11	0.00	-0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.10
ITA	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.20	0.17	0.00		0.00	0.00	0.00	0.00
GER	0.00	0.07	0.00	0.00	0.00	0.00	0.11	0.00	0.00		0.00	0.11	0.00	0.00	0.00
POL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.17	0.00	0.00	0.00	0.00
RUS	0.10	0.00	0.00	0.17	0.00	0.00	0.17		0.00	0.00	0.00	0.00	0.00	0.00	0.00
CHN	0.00	0.00	0.00	0.04	0.05	0.00		0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00
KOR	0.00	0.00	0.04	0.00	0.05		0.10	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PHL	0.00	0.00	0.03	0.00		0.05	0.03	0.00	0.00	0.06	0.00	0.22	0.00	0.00	0.04
VNM	0.09	0.00	0.00		0.05	0.00	0.08	0.17	0.00	0.00	0.00	0.00	0.50	0.00	0.00
IND	0.09	0.00		0.00	0.00	0.04	0.00	0.08	0.00	0.06	0.00	0.00	0.00	0.00	0.04
AFR	0.00		0.04	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
ME		0.06	0.04	0.00	0.00	0.06	0.00	0.20	0.00	0.00	0.13	0.00	0.00	0.00	0.05

Each entry denotes the fraction of rankings affected by the 10 year earlier arrival and 10 year longer tenure of workers from the row country.

Table 17: The effect of the 10 percent increase in the share of workers in sector A by sector and group

	ME	AFR	IND	VNM	PHL	KOR	CHN	RUS	POL	DEU	ITA	ENG	CUB	MEX	CAN
Sector A															
CAN	0.00	0.10	0.00	0.00	0.00	0.56	0.32	0.10	0.00	0.15	0.00	0.20	0.00	0.00	
MEX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
CUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00
ENG	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.10
ITA	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14		0.00	0.00	0.00	0.13
DEU	0.00	0.20	0.12	0.00	0.00	0.83	0.53	0.00	0.00		0.00	0.33	0.00	0.00	0.16
POL	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00		0.00	0.00	0.00	0.00	0.00	0.00
RUS	0.10	0.11	0.83	0.00	0.00	0.00	0.00		0.00	0.00	0.20	0.00	0.00	0.00	0.10
CHN	0.00	0.80	0.17	0.42	0.26	0.48		0.83	0.00	0.15	0.00	0.10	0.00	0.00	0.97
KOR	0.11	0.00	0.00	0.00	0.53		0.48	0.10	0.00	0.83	0.17	0.00	0.00	0.00	0.56
PHL	0.59	0.56	0.00	0.45		0.15	0.00	0.20	0.00	0.63	0.00	0.00	0.00	0.00	0.71
VNM	0.00	0.00	0.00		0.45	0.00	0.42	0.00	1.00	0.00	0.00	0.00	0.50	0.00	0.00
IND	0.00	0.00		0.00	0.31	0.13	0.95	0.83	0.00	0.59	0.00	0.13	0.00	0.00	0.19
AFR	0.00		0.17	0.00	0.11	0.59	0.80	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.10
ME		0.00	0.13	0.00	0.59	0.56	0.45	0.20	0.00	0.67	0.13	0.00	0.00	0.00	0.00
Sector B															
CAN	0.00	-0.50	0.00	0.00	-0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MEX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
CUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00
ENG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	-0.10
ITA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
DEU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	-0.11	0.00	0.00	-0.53
POL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
RUS	0.00	0.00	0.00	0.00	0.00	0.00	-0.83		0.00	0.00	0.00	0.00	0.00	0.00	0.00
CHN	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.32
KOR	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PHL	0.00	0.00	0.00	0.00		-0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VNM	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IND	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AFR	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ME		0.00	0.00	0.00	0.00	0.00	0.00	-0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sector C															
CAN	-0.50	-0.10	-0.37	0.00	0.00	0.56	0.00	0.00	0.00	0.00	0.00	0.00	-0.14	0.00	
MEX	0.00	0.00	0.00	0.00	-0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.33		0.00
CUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.20		0.00	0.14
ENG	0.00	0.00	-0.13	0.00	0.11	0.00	-0.10	0.00	0.00	0.11	0.00		0.20	0.00	-0.10
ITA	-0.13	0.00	-0.17	0.00	-0.13	0.00	0.00	0.00	-0.17	-0.14		0.00	0.00	0.00	0.00
DEU	-0.67	0.67	0.00	0.00	-0.63	0.00	-0.53	0.00	0.00		0.00	-0.22	0.00	0.00	-0.16
POL	0.00	0.00	0.00	0.00	0.00	-0.17	0.00	0.00		0.00	0.17	0.00	0.00	0.00	0.00
RUS	0.00	0.00	-0.83	0.00	-0.10	-0.10	0.00		0.00	0.00	0.00	0.00	0.00	0.00	-0.10
CHN	0.00	0.00	-0.24	0.42	0.00	0.00		-0.83	0.00	-0.53	0.00	-0.10	0.00	0.00	-0.13
KOR	0.56	0.00	0.87	0.00	-0.53		-0.48	-0.20	0.17	-0.17	-0.33	0.00	0.00	-0.77	-0.56
PHL	-0.18	-0.56	0.00	0.00		0.00	0.00	0.00	-0.13	-0.63	0.00	-0.11	0.00	0.36	-0.36
VNM	0.00	0.00	0.00		-0.45	0.00	-0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IND	-0.13	-0.36		-0.42	0.00	-0.87	-0.12	0.00	0.00	-0.12	0.17	0.00	0.00	0.00	-0.37
AFR	-0.13		0.00	0.00	0.00	0.00	0.00	-0.11	0.00	-0.13	0.00	0.00	-0.20	0.00	0.50
ME		0.00	0.43	0.00	0.00	-0.56	-1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sector D															
CAN	-0.50	-0.50	-0.37	0.00	-0.36	0.00	0.00	0.00	0.00	-0.53	0.00	0.10	0.00	0.00	
MEX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
CUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00
ENG	0.00	0.00	-0.13	0.00	0.00	0.00	0.00	0.00	0.00	-0.11	0.00		0.00	0.00	-0.30
ITA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
GER	0.00	0.00	0.00	0.00	0.00	0.83	-0.53	0.00	0.00		0.00	-0.11	0.00	0.00	0.00
POL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
RUS	-0.10	0.00	0.00	0.00	0.00	-0.10	-0.17		0.00	0.00	0.00	0.00	0.00	0.00	0.00
CHN	0.00	0.00	0.00	0.00	0.00	-0.48		0.00	0.00	0.53	0.00	0.00	-0.20	0.00	0.00
KOR	-0.56	0.00	-0.43	0.00	-0.53		-0.48	0.00	0.00	-0.83	-0.17	0.00	0.00	0.00	0.00
PHL	0.00	-0.56	0.00	-0.45		0.00	0.00	0.00	0.00	0.00	0.00	-0.11	0.00	0.00	-0.36
VNM	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IND	0.00	-0.36		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AFR	0.00		0.00	0.00	0.00	-0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ME		0.00	0.00	-1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.20	0.00	0.00

Each entry denotes the fraction of rankings affected by the 10 % increase in the share of workers from the row country in sector A.

Table 18: The effect of the 10 percent increase in the share of workers in sector B by sector and group

	ME	AFR	IND	VNM	PHL	KOR	CHN	RUS	POL	DEU	ITA	ENG	CUB	MEX	CAN
Sector B															
CAN	0.50	0.50	0.11	0.00	0.18	0.56	0.97	0.00	0.00	0.15	0.00	0.10	0.00	0.00	
MEX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
CUB	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00		0.00	0.00
ENG	0.11	0.13	0.00	0.00	0.22	0.14	0.00	0.14	0.00	0.22	0.00		0.00	0.00	0.20
ITA	0.25	0.00	0.00	0.00	0.00	0.17	0.00	0.20	0.17	0.00		0.00	0.00	0.00	0.00
GER	0.67	0.00	0.59	0.00	0.63	0.00	0.16	0.10	0.00		0.00	0.11	0.00	0.00	0.15
POL	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00		0.00	0.00	0.00	0.00	0.00	0.00
RUS	0.20	0.00	0.83	0.00	0.20	0.20	0.25		0.00	0.20	0.00	0.14	0.00	0.00	0.00
CHN	0.45	0.00	0.14	0.42	0.15	0.95		0.83	0.00	0.22	0.00	0.00	0.00	0.00	0.32
KOR	0.22	0.12	0.87	0.00	0.53		0.19	0.40	0.00	0.33	0.00	0.14	0.00	0.00	0.11
PHL	0.00	0.11	0.94	0.45		0.53	0.53	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.71
VNM	0.00	0.00	0.42		0.45	0.00	0.42	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00
IND	0.27	0.18		0.00	0.94	0.13	0.48	0.83	0.00	0.18	0.00	0.00	0.00	0.00	0.15
AFR	0.13		0.36	0.00	0.28	0.59	0.80	0.00	0.00	0.67	0.00	0.00	0.00	0.00	0.50
ME		0.13	0.13	0.00	0.12	0.56	0.18	0.30	0.00	0.13	0.00	0.11	0.00	0.00	0.10
Sector C															
CAN	-0.50	-0.50	-0.37	0.00	-0.36	0.00	-0.13	-0.10	0.00	-0.53	0.00	-0.10	0.00	0.00	
MEX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
CUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00
ENG	0.00	0.00	-0.13	0.00	0.00	0.00	-0.10	0.00	0.00	0.00	0.00		0.00	0.00	-0.10
ITA	0.00	0.00	-0.17	0.00	0.00	0.00	0.00	0.00	-0.17	0.00		0.00	0.00	0.00	0.00
GER	-0.13	0.00	0.00	0.00	-0.63	0.00	-0.53	-0.10	0.00		0.00	-0.11	0.00	0.00	-0.16
POL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
RUS	-0.10	0.00	-0.83	0.00	-0.10	-0.10	0.00		0.00	0.00	0.00	0.00	0.00	0.00	-0.10
CHN	0.00	-0.40	-0.14	0.00	0.00	0.00		-0.83	0.00	-0.15	0.00	-0.10	0.00	0.00	-0.13
KOR	-0.11	-0.59	0.00	0.00	-0.53		-0.14	-0.10	0.00	-0.17	-0.17	-0.14	0.00	-0.77	-0.56
PHL	-0.18	-0.11	0.00	-0.45		0.00	-0.26	0.00	-0.25	-0.63	0.00	-0.11	0.00	0.00	-0.36
VNM	0.00	0.00	0.00		-0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.53	0.00
IND	-0.13	0.00		0.00	-0.31	-0.17	-0.14	-0.83	0.00	-0.59	0.00	-0.13	0.00	0.00	-0.37
AFR	-0.13		-0.36	0.00	0.00	0.00	-0.80	0.00	-0.20	-0.67	0.00	0.00	0.00	0.00	-0.50
ME		-0.63	-0.43	0.00	-0.59	-0.11	-0.14	0.00	-0.14	-0.67	-0.13	0.00	0.00	0.00	-0.10
Sector D															
CAN	-0.50	-0.50	-0.37	0.00	-0.36	0.00	-0.13	-0.10	0.00	-0.53	0.00	-0.10	0.00	0.00	
MEX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
CUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.33	0.00	0.00	0.00	0.00		0.00	0.00
ENG	0.00	0.00	-0.25	0.00	-0.33	-0.14	-0.10	0.00	0.00	-0.33	0.00		0.00	0.00	-0.40
ITA	-0.13	0.00	0.00	0.00	-0.13	0.00	-0.13	0.00	-0.17	-0.14		0.00	0.00	0.00	0.00
GER	0.00	0.00	-0.59	0.00	-0.19	-0.83	-0.15	-0.10	0.00		0.00	-0.22	0.00	0.00	-0.22
POL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.17	0.00	0.00	0.00	0.00
RUS	-0.50	0.00	-0.17	-0.17	-0.20	-0.20	-0.25		0.00	0.00	-0.20	-0.14	0.00	0.00	-0.10
CHN	-0.14	-0.12	-0.17	-0.42	-0.53	-0.19		0.00	0.00	-0.37	0.00	0.00	-0.40	0.00	-0.19
KOR	-0.22	-0.59	-0.17	-0.67	-0.22		-0.19	-0.10	0.00	-0.25	-0.17	-0.29	0.00	0.00	-0.28
PHL	0.00	-0.22	-0.63	-0.45		0.00	-0.53	0.00	0.00	0.00	0.00	-0.11	0.00	0.00	-0.14
VNM	0.00	0.00	-0.42		0.00	0.00	-0.42	0.00	0.00	-0.11	0.00	0.00	0.00	0.00	0.00
IND	0.00	-0.18		0.00	-0.94	0.00	-0.71	0.00	0.00	-0.59	-0.17	-0.13	0.00	0.00	-0.19
AFR	-0.63		-0.36	0.00	-0.56	-0.12	0.00	0.00	0.00	-0.13	0.00	-0.25	0.00	0.00	0.00
ME		-0.19	-0.35	-1.00	0.00	0.00	-1.00	-0.10	0.00	-0.67	-0.25	-0.22	-0.20	0.00	-0.50

Each entry denotes the fraction of rankings affected by the 10% increase in the share of workers from the row country in sector B.

Table 19: The effect of the 10 percent increase in the share of workers in sector C by sector and group

	ME	AFR	IND	VNM	PHL	KOR	CHN	RUS	POL	DEU	ITA	ENG	CUB	MEX	CAN
Sector C															
CAN	0.50	0.00	0.37	0.00	0.00	0.56	0.13	0.10	0.00	0.15	0.00	0.10	0.00	0.00	
MEX	0.00	0.00	0.00	0.53	0.00	0.77	0.00	0.00	0.20	0.00	0.20	0.00	0.00		0.00
CUB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00		0.33	0.14
ENG	0.00	0.00	0.00	0.20	0.11	0.00	0.00	0.00	0.25	0.11	0.17		0.20	0.00	0.00
ITA	0.13	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.17	0.00		0.00	0.00	0.00	0.00
GER	0.67	0.13	0.12	0.00	0.63	0.17	0.15	0.00	0.00		0.14	0.00	0.20	0.00	0.00
POL	0.14	0.20	0.17	0.00	0.25	0.00	0.00	0.00		0.00	0.33	0.00	0.00	0.00	0.00
RUS	0.00	0.00	0.00	0.00	0.00	0.10	0.83		0.00	0.00	0.00	0.00	0.33	0.00	0.00
CHN	1.00	0.40	0.95	0.42	0.26	0.48		0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00
KOR	0.56	0.00	0.87	0.00	0.53		0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00
PHL	0.00	0.56	0.31	1.00		0.53	0.00	0.00	0.00	0.63	0.25	0.00	0.17	0.36	0.00
VNM	0.00	0.63	0.42		1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IND	0.00	0.00		0.00	0.00	0.00	0.00	0.83	0.00	0.00	0.33	0.00	0.00	0.00	0.37
ME	0.00		0.36	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.10
AFR		0.63	0.13	0.00	0.59	0.00	0.00	0.20	0.14	0.00	0.00	0.00	0.00	0.00	0.50
Sector D															
CAN	0.00	0.06	-0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.20	0.00	
MEX	-0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.13	0.00		0.00
CUB	-0.04	0.00	0.00	0.00	-0.03	0.04	0.00	0.00	0.00	0.06	0.00	0.13		0.00	0.00
ENG	0.00	0.00	0.00	0.00	0.00	0.00	-0.08	-0.17	0.00	0.00	0.00		0.00	0.00	0.00
ITA	0.00	-0.11	-0.03	-0.05	0.00	-0.05	-0.05	0.00	0.00	0.00		0.00	0.00	0.00	-0.04
DEU	-0.11	-0.06	-0.04	0.00	-0.05	0.00	-0.10	0.00	0.00		0.00	0.00	0.00	0.00	-0.06
POL	0.00	0.00	0.00	0.00	0.00	-0.05	0.00	-0.17		-0.05	0.00	0.10	-0.20	0.00	0.00
RUS	-0.10	0.00	-0.08	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	-0.33	0.00	0.00
CHN	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	-0.17	0.00	0.00	0.00	0.00
KOR	0.00	0.00	-0.06	0.00	0.00		0.00	0.00	0.00	0.00	0.00	-0.11	0.00	0.00	-0.05
PHL	0.00	0.00	0.00	0.00		-0.17	-0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VNM	0.00	0.00	-0.13		0.00	0.00	-0.10	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00
IND	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ME	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AFR		-0.05	-0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	-0.10	0.00	0.00	0.00

Each entry denotes the fraction of rankings affected by the 10% increase in the share of workers from the row country in sector C.

Table 20: Fraction of affected rankings between China and selected countries in sector A

ME	AFR	IND	KOR	DEU	ENG	CAN
English proficiency*						
0.13	0.25	0.14	0.40	0.10	0.10	0.14
Extra year of schooling						
0.25	0.38	0.40	0.40	0.22	0.30	0.35
Extra year of schooling to less than HS						
0.13	0.13	0.13	0.00	0.11	0.00	0.13
Extra 2 years of schooling to less than HS						
0.13	0.38	0.20	0.20	0.00	0.10	0.17
10% increase in network size in the top sector**						
0.13	0.00	0.10	0.00	0.11	0.00	0.09
15% increase in network size in the top sector						
0.15	0.05	0.13	0.00	0.15	0.05	0.15

*63 percent of Chinese workers report speaking English well; **Average share of Chinese workers employed in sector A jobs is 0.20.

Table 21: Fraction of affected rankings between Korea and selected countries in sector B

ME	AFR	IND	CHN	DEU	ENG	CAN
English proficiency*						
0.33	0.17	0.19	0.43	0.27	0.33	0.13
Extra year of schooling						
0.43	0.17	0.13	0.31	0.27	0.20	0.13
Extra year of schooling to less than HS						
0.14	0.00	0.00	0.00	0.00	0.00	0.13
Extra 2 years of schooling to less than HS						
0.14	0.17	0.00	0.08	0.00	0.20	0.13
Extra 5 years of schooling to less than HS						
0.43	0.33	0.20	0.46	0.27	0.20	0.13
5% increase in network size in sector B**						
0.00	0.17	0.06	0.21	0.18	0.33	0.13
10% increase in network size in sector B						
0.57	0.33	0.07	0.31	0.27	0.20	0.13
15% increase in network size in sector B						
0.57	0.33	0.19	0.50	0.27	0.33	0.13

*62 percent of Koreans report speaking English well;
**Average share of Korean workers employed in sector B jobs is 0.14

Table 22: Placement in the distribution of occupations

	CAN	MEX	ENG	DEU	CHN	KOR	PHL	VNM	IND	AFR	ME
Sector A											
Atlanta, GA				0.04							
Chicago-Gary-Lake, IL				0.09					0.11		
Las Vegas, NV	0.16		0.28							0.18	
Los Angeles-Long Beach, CA								0.07			
Philadelphia, PA/NJ	0.23										
San Antonio, TX						0.05		0.08	0.18		
San Francisco-Oakland, CA										0.03	
Sector B											
Boston, MA				0.09	0.07						0.19
Chicago-Gary-Lake, IL							0.01		0.19		0.08
Dallas-Fort Worth, TX									0.08		
Fort Lauderdale-Hollywood, FL							0.03				
Honolulu, HI								0.08			0.39
Houston-Brazoria, TX							0.17				
Las Vegas, NV					0.03						
Los Angeles-Long Beach, CA		0.02			0.30	0.33			0.28	0.27	
Orange County, CA										0.05	0.10
Bergen-Passaic, NJ									0.17		
Middlesex-Somerset, NJ					0.28		0.02				
Phoenix, AZ		0.06									
San Antonio, TX					0.20	0.18			0.36		
Oakland, CA							0.05				
Vallejo-Fairfield-Napa, CA									0.07		
Stockton, CA		0.04									
Tampa-St. Petersburg, FL						0.09					
Sector C											
Boston, MA	0.08				0.17				0.16		
Chicago-Gary-Lake, IL					0.16						0.18
Dallas-Fort Worth, TX		0.38						0.36	0.25		
Fort Worth-Arlington, TX		0.41						0.36			
Houston-Brazoria, TX		0.43					0.30				
Las Vegas, NV		0.35	0.22					0.34		0.29	
Los Angeles-Long Beach, CA								0.22	0.14		
Orange County, CA			0.14								
Orlando, FL					0.11				0.19		
Phoenix, AZ					0.17		0.33		0.17		
San Antonio, TX		0.17			0.18		0.25			0.22	
San Francisco-Oakland-Vallejo, CA								0.21	0.27	0.21	
Tampa-St. Petersburg, FL				0.18				0.18		0.21	

Table 23: Allocation of new arrivals in the occupational distribution

	Actual shares				Model predictions			
	A	B	C	D	A	B	C	D
Houston,TX								
CAN	0.34	0.47	0.14	0.04	0.12	0.00	0.18	0.70
CHN	0.46	0.23	0.18	0.13	0.12	0.00	0.23	0.65
ENG	0.21	0.52	0.28	0.00	0.10	0.03	0.17	0.70
KOR	0.56	0.18	0.12	0.15	0.09	0.00	0.31	0.60
IND	0.28	0.43	0.23	0.06	0.09	0.03	0.27	0.61
DEU	0.23	0.52	0.23	0.03	0.08	0.00	0.28	0.64
AFR	0.14	0.19	0.36	0.31	0.08	0.00	0.31	0.61
PHL	0.18	0.22	0.46	0.14	0.07	0.00	0.37	0.56
VNM	0.05	0.08	0.44	0.43	0.07	0.00	0.34	0.59
ME	0.19	0.32	0.29	0.20	0.07	0.33	0.19	0.41
MEX	0.02	0.06	0.34	0.58	0.06	0.00	0.25	0.69
Orange County, CA								
IND	0.19	0.54	0.17	0.09	0.09	0.18	0.14	0.59
CHN	0.32	0.37	0.18	0.13	0.08	0.06	0.16	0.70
DEU	0.22	0.44	0.11	0.22	0.07	0.03	0.21	0.69
AFR	0.23	0.37	0.26	0.14	0.07	0.03	0.18	0.72
CAN	0.34	0.32	0.29	0.05	0.06	0.31	0.14	0.49
KOR	0.15	0.44	0.30	0.11	0.06	0.04	0.21	0.69
PHL	0.08	0.22	0.40	0.29	0.06	0.00	0.26	0.68
VNM	0.03	0.13	0.34	0.50	0.06	0.00	0.24	0.70
ME	0.12	0.27	0.41	0.20	0.06	0.11	0.17	0.66
MEX	0.00	0.05	0.18	0.76	0.04	0.00	0.21	0.75
Seattle-Everett,WA								
CAN	0.19	0.62	0.13	0.07	0.05	0.00	0.05	0.90
CHN	0.14	0.48	0.11	0.28	0.04	0.06	0.07	0.83
KOR	0.11	0.44	0.21	0.24	0.04	0.00	0.08	0.88
VNM	0.01	0.12	0.19	0.67	0.04	0.00	0.09	0.87
IND	0.09	0.77	0.06	0.08	0.04	0.25	0.07	0.64
AFR	0.06	0.20	0.22	0.52	0.04	0.00	0.08	0.88
Stockton,CA								
MEX	0.03	0.06	0.31	0.60	0.08	0.00	0.29	0.63
PHL	0.15	0.38	0.24	0.24	0.11	0.30	0.14	0.45

Columns 2-5 present the actual shares of migrants in each sector while columns 6-9 present the shares of the "extra" workers as predicted by the model.