Firm productivity and immigrant-native earnings disparities*

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We study the role of firm productivity in explaining the immigrant-native earnings gap using balance sheet and population-wide employer-employee data. The returns to working in firms with higher persistent productivity are especially high for immigrants, who gain the most from avoiding the least productive firms in which they are strongly over-represented. Immigrant-native skill differences can only partly explain the differential sorting across firms. Taken together, our results suggest group-specific barriers to climbing the productivity ladder. We find that one important barrier operates through manager-worker homophily, which reinforces the unequal access to high-productive firms and differential ability of extracting firm rents.

Keywords: Firm productivity; Immigrant-native earnings gap; Wage inequality
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1 Introduction

Two factors suggest that firms are central for understanding the labor market integration of immigrants.[1] First, in labor markets where employers have monopsony power, firm pay policies can explain a substantial part of the earnings gap between groups of advantaged and disadvantaged workers, such as men and women (Card et al., 2016) or whites and nonwhites (Gerard et al., 2021). Second, ethnic workplace segregation is widespread in many countries (Hellerstein and Neumark, 2008; Åslund and Skans, 2010; Glitz, 2014; Andersson et al., 2014; Amior and Stuhler, 2024).[2] Yet, firms have received relatively little attention in the immigration literature.

In this paper, we study the role of firm productivity in explaining the immigrant-native earnings gap using longitudinal matched employer-employee data from Sweden. Quantifying the contribution of firm characteristics and policies to earnings gaps is particularly challenging when segregation is widespread, which is typically the case in the case of immigrant and native workers.[3] We propose a firm ranking procedure that allows us to include fully-segregated firms in the analysis, thus not relying on constructing dual-connected sets of immigrant and native workers, as required for AKM estimations (Abowd et al., 1999).

We group firms based on persistent differences in firm productivity. To do so, we use balance sheet data over the 1998-2017 period and rank firms based on a regression of log value added per worker on firm and year fixed effects. The approach allows us to bin firms into a tractable number of groups while accounting for business cycle fluctuations and productivity shocks. While grouping firms can lead to loss of information, we provide evidence that using deciles of persistent firm productivity still captures a large degree of firm heterogeneity.[4] In addition, we test the robustness of the ranking in several ways and find no indication that the method captures factors other than persistent firm productivity.

The ranking reveals that immigrants strongly sort into the lowest productivity deciles: the

[1] Immigrants tend to earn less than observationally similar natives, even decades after arrival. See Kerr and Kerr (2011), Borjas (2014), Duleep (2015), Dustmann and Görlach (2015), and Rho and Sanders (2021) for overviews of the literature on labor market integration.

[2] The recent theoretical and empirical work by Amior and Stuhler (2024) suggests that workplace segregation can arise from differential employer pay policies.

[3] In our analysis sample, about 60 percent of the firms are native-segregated (i.e. have no immigrant employees).

[4] For instance, while high-productive firms tend to be larger and on average pay more, firms of all sizes and in all industries are found at all levels of productivity.

within-decile share of non-Western workers decreases from almost 20 percent at the bottom to less than 6 percent at the top of the productivity ranking. Assortative matching between high-productive firms and high-skill workers, combined with skill differences across groups, on average explains about 25 percent of the immigrant-native allocation differences.[5] Thus, skills matter but the majority of the sorting remains unexplained.

The group-specific sorting patterns raise the question of whether immigrants and natives experience differential returns to working in firms located in different parts of the firm productivity distribution. To investigate this possibility, we use the firm ranking to estimate the earnings returns to working in more productive firms conditional on worker fixed effects. While both immigrants and natives benefit from working in more productive firms, the corresponding returns are greater for immigrants at the lower end of the productivity distribution, precisely where the immigrant workforce is over-represented. For example, the estimated return to working in the fifth decile relative to the first is 7.5 log points for natives and 11.1 log points for immigrants. Moreover, within the group of immigrant workers, the greater returns to firm productivity are driven by non-Western workers. Differences in returns are not related to years since migration. They are also not explained by heterogeneity within the firm productivity bins, since using ventiles instead of deciles produces qualitatively similar results.

To gauge the overall contribution of firm productivity pay premiums to the earnings gap, we decompose the average premium into a combination of sorting across deciles and a pay-setting component for working in a given decile relative to the lowest one. We find that sorting and pay-setting work in opposite directions. If immigrants' returns to firm productivity were the same as natives', immigrants' over-representation in less productive firms would increase the earnings gap by 21 percent. If the allocation across firm types was instead the same among immigrant and native workers, the higher returns among immigrants would reduce the gap by 27 percent. When combining these two opposing forces, the resulting average premium is 0.7 percentage points higher for immigrants than natives, amounting to 6 percent of the earnings gap.

The fact that immigrants gain more from avoiding less productive firms but are concentrated

[5] We adapt this type of exercise from Gerard et al. (2021), who use it in the context of racial pay differences in Brazil. We capture skills by using individual fixed effects from earnings regressions.

in precisely those types of firms suggests the existence of group-specific barriers to climbing the productivity ladder. A potential channel that can explain these results is manager-worker similarity, which earlier work has shown to affect hiring practices and thus sorting (Åslund et al., 2014; Kerr and Kerr, 2021).[6] We find that immigrant managers are over-represented in firms at the bottom of the productivity distribution and relatively few work at the top, and that there is substantial concentration of workers sharing the manager's background. For example, Rest of the World managers in the bottom three deciles have more than 60 percent of their workers born in the same broad region, and the figure is still about 40 percent in the highest deciles. Manager allocation accounts for more than a third of the sorting of immigrant workers across deciles. We further document that working under immigrant management translates into a lower probability of moving up the firm productivity ladder.

The sorting of workers in firms where the management shares their background can be driven by a lack of opportunity in being hired elsewhere. But it is also possible that such homophily reflects the ability to extract firm rents. Results from rent-sharing specifications that exploit within-employment spell variation in earnings and firm value added suggest that worker remuneration is indeed linked to firm performance. Furthermore, this association is significantly stronger for non-Western workers under immigrant management, a pattern that is particularly pronounced in the low-productive firms where immigrants work more often. Overall, this result signals a closer connection between firm and immigrant worker performance in specific types of low-productive workplaces.

Our work relates to a growing literature on the role of firms in wage inequality that builds on general insights on imperfectly competitive labor markets (Card, 2022). In the context of immigrant-native earnings disparities, evidence on the role of firms is still relatively scarce. Previous studies based on job ladder models that account for individual unobserved heterogeneity (Abowd et al., 1999) show that between-workplace variation explains significant shares of the earnings gap (Damas de Matos, 2017; Dostie et al., 2023; Arellano-Bover and San, 2023; Gorshkov, 2023).[7]

[6] Sorting along origin lines can either come about through job search networks (Dustmann et al., 2016; Currarini et al., 2009) or employer discrimination (Fang and Moro, 2011; Neumark, 2018).

[7] A related literature analyzes the role of employers in the assimilation of immigrants without accounting for worker heterogeneity via individual fixed effects, as it is typically done in

We study immigrant-native earnings differences via a job ladder model based on a firm productivity grouping that allows us to include fully-segregated firms in the analysis. To the best of our knowledge, this has not been done before in this literature and the approach could be more generally applied when studying pay gaps between groups of workers in highly-segregated labor markets.

Our analysis offers new insights on the mechanisms underlying the sorting of workers into workplaces by studying the role of managers. We thus provide a first attempt at building a bridge between the job ladder and the manager origin literatures. In doing so, we also investigate the possibility that worker-manager similarity relates to rent-sharing within firms. We follow the approach adopted in the rent-sharing literature (see, e.g., Card et al., 2018 for a review). Amior and Stuhler (2024) specifically provide evidence on rent-sharing by worker immigrant status. We are not aware of other papers doing this.

Our work also relates to a recent literature that focuses on capturing firm heterogeneity while ensuring dimensionality reduction. Bonhomme et al. (2019) bin firms via k–means clustering based on how similar their earnings distributions are. One advantage of our method is that it is based on firm productivity, a readily observable and directly interpretable measure of firm heterogeneity (Syverson, 2011; Lentz and Mortensen, 2010). Our ranking also relates to that of Bartolucci et al. (2018), who, by contrast, group firms based on average profits without adjusting for idiosyncratic shocks over the business cycle.

The rest of the paper proceeds as follows. In Section 2 we describe the analysis sample. Section 3 lays out the econometric framework. We present our main results in Section 4, while Section 5 analyzes potential mechanisms for the main results. Section 6 concludes.

2 Data and analysis sample

Our analysis is based on a matched employer-employee panel that covers the period 1998 to 2017, and combines data from several administrative registers collected by Statistics Sweden. The firm tax records (RAMS register) provide information on annual earnings paid to each

the job ladder literature. See for instance Aydemir and Skuterud (2008), Pendakur and Woodcock (2010), Barth et al. (2012), Carneiro et al. (2012), and Ansala et al. (2022). There are also findings of immigrant-native productivity differences related to culture in a Swedish context (Ek, 2024).

worker (deflated to 2010 Swedish Kronor, SEK), start and end dates of each employment spell, as well as industry and geographic location.[8] We use employment spells to compute firm size based on the stock of workers employed in November.

For each firm also present in Statistics Sweden's business register on firm-level accounts, we add information on value added (VA) and value added per worker. VA is defined as total value added at each production stage, net of costs for intermediate goods and services, and is equal to total revenues minus intermediate consumption of goods and services.[9] Finally, we complement this information with worker-level demographics (age, gender, education level, country of birth, immigration year) from the Louise/Lisa database.

Our outcome of interest is log monthly earnings from the primary employer, obtained by dividing annual earnings by the number of months worked. The primary employer is defined as the firm paying the highest annual earnings.

2.1 Sample selection

We restrict the sample to workers aged between 18 and 65, who work in private sector firms that have at least two employees in November. To diminish the influence of extreme values, we winsorize earnings at the 99th percentile of their yearly distribution and drop worker histories if log earnings in any year are three standard deviations or more above the sample mean. Finally, to focus on workers sufficiently attached to the labor market, we drop observations where earnings are lower than the yearly Price Base Amount (PBA). The PBA is used to calculate benefits and fees in Sweden. An earnings level equal to three times the PBA can be considered a threshold for being self-supporting (Ruist, 2018), therefore one PBA is a rather conservative threshold.

The sample includes both natives and immigrants. Immigrants are defined as foreign-born with two foreign-born parents. We present results where immigrants are divided into "West" (i.e. Western Europe, USA and Australia) and "Rest of World" based on country of birth.[10]

[8] Firm region is given by where most employees live at the end of the year.

[9] Firm accounts are available until 2015. Excluding firms for which VA information is missing results in about 12 percent of employee-year observations being dropped from the initial sample.

[10] "West" consists of the Nordics except Sweden (Denmark, Finland, Norway, Iceland), Western Europe (Ireland, UK, Germany, Greece, Italy, Malta, Monaco, Portugal, San Marino,

2.2 Sample description

Table 1 shows summary statistics separately for natives and immigrants. Overall, 13 percent of workers are immigrants, most of whom are born in non-Western countries (71 percent). Segregation is prevalent, with 6 percent of immigrants working at all-immigrant firms, and 20 percent of natives at all-native firms.

Table 1: Summary statistics

	Immigrants			Natives
	Total	West	Rest of World	Total
Immigrant from West	0.292	1.000	0.000	0.000
Immigrant from Rest of World	0.707	0.000	1.000	0.000
In native-segregated firms	0.000	0.000	0.000	0.204
In immigrant-segregated firms	0.057	0.021	0.072	0.000
Male	0.615	0.621	0.613	0.648
Age	40.787	45.875	38.687	40.212
Share age ≤ 30	0.218	0.104	0.265	0.273
Share age ≥ 50	0.253	0.416	0.185	0.271
Education, compulsory	0.203	0.218	0.196	0.151
Education, secondary	0.436	0.427	0.440	0.565
Education, post secondary	0.318	0.308	0.322	0.283
Education, missing	0.043	0.047	0.041	0.001
Monthly earnings (2010 SEK)	22290.320	26045.727	20739.065	25029.595
No. observations	6,179,022	1,806,043	4,371,248	40,332,456

Notes: The unit of observation is worker $\times$ year. Native-segregated (immigrant-segregated) firms employ only natives (immigrants).

While natives and Western immigrants have similar earnings, non-Western immigrants earn 20 percent less on average than either of these groups, despite the fact that the figures on educational attainment do not suggest major skill differences across groups. However, the groups likely differ in labor market experience, as Western immigrants are somewhat older and Rest of World immigrants somewhat younger on average than natives.

Spain, the Vatican Sate, Andorra, Belgium, France, Liechtenstein, Luxembourg, the Netherlands, Switzerland. Austria), Canada, USA, Australia and New Zealand. “Rest of World" are non–Western countries.

3 Econometric framework

This section outlines the econometric framework. We first propose a method of classifying employers based on differences in persistent productivity. In the spirit of the firm clustering approach of Bonhomme et al. (2019), our method keeps the number of groups tractable. Moreover, it provides an easily interpretable and intuitive grouping procedure. We then estimate the returns to working in deciles of firms of different productivity.

3.1 Firm ranking procedure

We classify firms based on persistent differences in log VA. To this aim, we use data at the firm-year level on firms with two or more employees in at least two years to estimate the following model:

$$\ln(VA/N)_{ft} = \lambda_f + \lambda_t + \varepsilon_{ft} \tag{1}$$

where $\ln(VA/N)_{ft}$ is log VA per worker for firm f in year t (1998-2015), λ_f are firm fixed effects, λ_t are year fixed effects, and ε_{ft} is an error term. λ_f capture the permanent component in firm-level productivity and λ_t account for year effects common across all firms, due to, for instance, business cycle fluctuations or productivity shocks. We then use the empirical distribution of the estimated firm effects $\widehat{\lambda}_f$ to rank firms into deciles. Since by construction each firm's position in the productivity distribution is fixed over time, we obtain a measure of persistent productivity for the entire 1998–2017 observation period.

The value added-based ranking that we propose has three main advantages compared to alternative rankings based on firm fixed effects à la Abowd et al. (1999). First, unlike AKM firm fixed effects, value added is a readily-observable and directly interpretable measure of firm productivity, which is a key dimension of firm heterogeneity. Second, the productivity ranking allows us to include immigrant- and native-segregated firms in firm premium decompositions. Since fully-segregated firms would not be part of a dual connected set, they would be discarded when ranking employers based on AKM firm fixed effects. Given that about 60 percent of firms in our sample are fully segregated, their inclusion is important for getting a representative picture of how firms relate to the immigrant-native earnings gap. Lastly, the approach makes it possible to abstract from well-known incidental parameter estimation problems (Kline et al.,

2020; Bonhomme et al., 2023), which might be exacerbated in the presence of a high degree of immigrant or native firm segregation. These advantages apply also more generally to studies on other groups of workers that are significantly separated from each other on the labor market.

We perform a number of robustness checks to analyze whether our grouping procedure captures factors other than persistent firm productivity. A first concern with equation (1) is that log value added per worker may mechanically reflect the fact that high-skilled workers are concentrated in certain firms, i.e. firm productivity may be a function of worker productivity. Column (1) in Panel A of Table 2 reports results when we re-estimate equation (1) by including staff characteristics averaged at the firm-year level (share of men, share of workers in each education category, average tenure at the firm, share of immigrants). In Column (2) of Panel A we alternatively control for worker fixed effects averaged at the firm-year level (estimated from an AKM model on log-monthly earnings[11]). In both cases the correlation between the baseline ranking and these alternative rankings is very high (0.95-0.99). Moreover, very few firms are classified at least 10 percentiles higher or lower in the ranking when compared to the baseline (columns 1 and 2 in Panel B).

Table 2: Robustness of the firms ranking

	Staff composition	Worker FEs	Industry	Share of immigrants	Industry and share of immigrants
	(1)	(2)	(3)	(4)	(5)
Panel A: Correlation with baseline ranking					
	0.9820	0.9660	0.9473	0.9944	0.9449
Panel B: Share of firms moving in the ranking					
moving down	0.0060	0.0372	0.0822	0.0001	0.1085
moving up	0.0185	0.0301	0.0631	0.0116	0.0740
No. of firms	313,827	278,329	323,072	323,072	323,072

Notes: Panel A reports Spearman's rank correlations between the baseline productivity ranking and the following alternative measures: Column (1): controlling for education categories, gender, age, tenure, share of immigrants averaged at the firm-year level; Column (2): controlling for average worker FEs estimated via an AKM model of log-monthly earnings. Column (3): ranking firms by industry; Column (4): controlling for the yearly share of immigrants at the firm; Column (5): ranking firms by industry and controlling for the share of immigrants at the firm. Panel B reports the share of firms moving at least 10 percentiles in the ranking as compared to the baseline.

[11] See Table A.1 in Åslund et al. (2021) for a summary of the estimated AKM model.

Two additional concerns are that i) some industries have less scope for being high-productive than others (e.g. hotels and restaurants) and that ii) the share of immigrant workers may affect firm productivity (see e.g. Parrotta et al., 2014). Columns (3)–(5) of Table 2 show that producing the ranking by industry, controlling for the share of immigrants, or doing both leaves the ranking qualitatively unaffected.

Given that the ranking is calculated over a long time span, a final concern is that a time-fixed position might be affected by firm life-cycle dynamics (entry and exit). To assess whether this is the case, we re-compute the ranking separately for 1998-2009 and 2010-2017, respectively, for the sample of firms operating in both periods. The correlation between the 1998-2009 ranking and the baseline full-period ranking is 0.93, with the share of upward (downward) movers at 13 percent (1 percent); similar results are obtained when comparing the 2010-2017 ranking with the baseline (0.89, 14 percent, and 2 percent, respectively). The correlation is virtually 1 when re-computing the full-period ranking by including only the firms that operate in both periods.

All in all, it appears that equation (1) captures a component of firm productivity which is largely independent of worker-level heterogeneity and robust to alternative specifications. We therefore use the baseline ranking in the empirical analysis.

3.2 Estimating and decomposing firm productivity decile premiums

To estimate the returns to working in more productive firms, we use the firm ranking in the following way. We assume that the earnings of worker i in group g in time t are given by:

$$\ln e_{git} = \alpha_{gi} + X'_{git}\beta^g + \theta^g_{D(g,i,t)} + \varepsilon_{git} \tag{2}$$

where α_{gi} is a person fixed effect, X_{git} is a vector of time-varying controls (year dummies interacted with education dummies, and quadratic and cubic terms in age interacted with education dummies), θ^g_d is an earnings premium paid in productivity decile d to workers in group g, $D(g,i,t)$ is a vector of index functions indicating the given productivity decile d of worker i in group g in year t, and ε_{git} captures all remaining determinants of earnings.

We estimate model (2) separately for four groups: natives, immigrants, immigrants from Western countries and immigrants from the Rest of the World. The main coefficients of interest

$\theta^g_{D(g,i,t)}$ capture the return to working in decile d, relative to working in the first decile. The model is identified by cross-decile movers and requires that worker histories are independent of the error term (exogenous mobility assumption). In Appendix A.1, we show that this assumption is likely to hold since earnings are similar among upward and downward movers between decile pairs, which suggests that high-wage workers are not more likely to transition to better firms.

To understand how differences in productivity decile premiums ($\theta^g_{D(g,i,t)}$) relate to the overall earnings gap between immigrants and natives, we perform a decomposition of the decile premiums (Kitagawa, 1955; Oaxaca, 1973; Blinder, 1973) as follows:[12]

$$\sum_d \theta^N_d \pi_{Nd} - \sum_d \theta^I_d \pi_{Id} = \underbrace{\sum_d \theta^N_d (\pi_{Nd} - \pi_{Id})}_{sorting} + \underbrace{\sum_d (\theta^N_d - \theta^I_d)\pi_{Id}}_{pay-setting} \tag{3}$$

where π_{Nd} and π_{Id} denote the fractions of natives and immigrants employed in decile d.

Equation (3) shows that the contribution of the productivity decile premiums to the immigrant-native earnings gap is given by a weighted average of the differences in employment shares of immigrants and natives (weighted by the earnings premium of natives per decile) plus a weighted average of the differences in decile earnings premiums (weighted by the share of immigrants per decile). The sorting component accounts for differences in sorting across the productivity distribution, assuming immigrants were paid the same premiums as natives. The pay-setting component shows how differences in the coefficients across the productivity distribution (relative to working in the first decile of firm productivity) affects the premium gap, given the distribution of immigrants across productivity deciles.

Assortative matching between high-productive firms and high-productive workers could result in differential allocation of immigrant and native workers. To investigate this possibility, we separate skill-based sorting from other types of sorting.[13] We divide workers into a total

[12] Taking expectations of equation (2), we can express mean immigrant and native earnings as $E[\ln e_{Iit}] = \alpha_I + \bar{X}'_I\beta_I + \sum_d \theta^I_d \pi_{Id}$ and $E[\ln e_{Nit}] = \alpha_N + \bar{X}'_N\beta_N + \sum_d \theta^N_d \pi_{Nd}$ respectively, where $\alpha_g = E[\alpha_{gi}]$ and $\bar{X}_g = E[X_{git}]$. The mean immigrant-native gap is then given by the following expression, of which we decompose the third term: $E[\ln\ e_{Nit}] - E[\ln e_{Iit}] = \alpha_N - \alpha_I + \bar{X}'_N\beta_N - \bar{X}'_I\beta_I + \sum_d \theta^N_d \pi_{Nd} - \sum_d \theta^I_d \pi_{Id}$.

[13] The exercise draws on Gerard et al. (2021) and relates to previous work on workplace segregation (Hellerstein and Neumark, 2008; Åslund and Skans, 2010).

of twenty age-by-skill groups based on five age categories (18-24, 25-34, 35-44, 45-54, 55 and above) and four skill categories (either quartiles of the overall distribution of person effects from estimating equation (2), pooling immigrants and natives together, or four education categories). For each region and separately by year, we then calculate the number of workers in each firm productivity decile and age-by-skill group. We multiply this number by the share of immigrants among all workers in a region, year and age-by-skill group (across all deciles). We sum over the thus-obtained cell-level shares to construct decile-level counterfactual employment shares of natives and immigrants (π^*_{Nd} and π^*_{Id}), i.e. the shares that we would observe if employers only took into account age and skill, but not immigrant status, when making hiring decisions. We present graphically the results of this prediction exercise for immigrants in section 4.2.

We use the counterfactual employment shares of immigrants and natives to build the following modified version of the first term in equation (3), which measures the counterfactual *skill-based sorting* component and captures how much of the observed sorting component of the earnings gap that is due to differences in age and skill:

$$\sum_d \theta^N_d (\pi^*_{Nd} - \pi^*_{Id}) \tag{4}$$

To obtain a measure of sorting that consists of practices that disproportionately affect immigrants (including for instance discrimination), we take the difference between the sorting effect from equation (3) and the skill-based sorting effect from equation (4); we call this term *residual sorting*:

$$\sum_d \theta^N_d (\pi_{Nd} - \pi_{Id}) - \sum_d \theta^N_d (\pi^*_{Nd} - \pi^*_{Id}) \tag{5}$$

4 Results

4.1 Worker and employer characteristics across the firm productivity distribution

Table 3 summarizes the characteristics of firms and workers in each productivity decile. A first result is that the value added-based classification of firms is able to capture a large degree of firm heterogeneity. The ranking reflects the empirical fact that firm productivity increases with size (see, e.g., Lentz and Mortensen, 2010). At the same time, firms in all industries, all regions, and of all sizes are found in each firm productivity decile. Thus, working in more productive firms does not mechanically reflect working in specific sectors, nor does it reflect geographic sorting.

A second finding is that firm segregation is widespread. In particular, the fraction of fully native-segregated firms is around 60 percent and is constant across all productivity deciles. By contrast, the fraction of fully immigrant-segregated firms is on average 5 percent, and is significantly higher in the bottom than in the top productivity deciles. Hence, it appears to be important to use an approach that allows us to include fully-segregated firms in the analysis.

Third, more productive firms tend to pay more and to employ more highly-educated workers, which indicates positive assortative matching. Moreover, the average share of immigrants at the firms decreases dramatically across productivity deciles from 22 percent in decile 1 to less than 9 percent in decile 10, a pattern driven by immigrants from the Rest of the World (Panel A of Table 3). While the total number of workers increases with productivity, this gradient is much steeper for natives (Figure A.4). Immigrants, instead, have become more concentrated in low-productive firms over time, a development partly explained by changing country of birth composition (Figure A.5).

Table 3: Summary statistics by productivity decile

	1	2	3	4	5	6	7	8	9	10
Panel A: Firm statistics										
Number of firms × year	149,551	208,458	241,521	275,804	284,838	298,082	309,096	319,588	326,531	327,569
Mean yearly firm size	11.610	10.667	14.815	18.946	19.384	20.628	23.663	26.761	29.991	41.870
Firm size 2-9	0.826	0.787	0.737	0.678	0.660	0.619	0.589	0.576	0.580	0.566
Firm size 10-49	0.153	0.186	0.224	0.277	0.284	0.321	0.339	0.338	0.328	0.319
Firm size 50-249	0.019	0.025	0.034	0.038	0.049	0.053	0.063	0.073	0.076	0.091
Firm size 250-999	0.002	0.003	0.004	0.005	0.006	0.006	0.008	0.010	0.013	0.019
Firm size $\geq$ 1000	0.000	0.000	0.001	0.002	0.001	0.001	0.002	0.002	0.003	0.005
Mean fraction immigrants at firm	0.222	0.207	0.176	0.148	0.131	0.116	0.105	0.097	0.089	0.085
Share native-segregated firms	0.646	0.638	0.639	0.632	0.636	0.627	0.618	0.617	0.619	0.600
Share immigrant-segregated firms	0.135	0.108	0.075	0.050	0.041	0.033	0.027	0.023	0.019	0.016
Share immigrant managers	0.220	0.206	0.170	0.138	0.120	0.102	0.088	0.079	0.075	0.070
Share Western managers	0.049	0.046	0.042	0.042	0.039	0.037	0.035	0.034	0.035	0.038
Share Rest of World managers	0.171	0.161	0.129	0.096	0.081	0.066	0.054	0.045	0.040	0.032
Manufacturing	0.077	0.079	0.097	0.105	0.131	0.144	0.157	0.153	0.135	0.105
Construction	0.062	0.080	0.103	0.123	0.167	0.200	0.189	0.159	0.113	0.061
Retail and trade	0.285	0.295	0.280	0.250	0.247	0.234	0.220	0.207	0.203	0.224
Transport	0.035	0.046	0.058	0.057	0.064	0.067	0.088	0.103	0.111	0.068
Hotels and restaurants	0.181	0.183	0.139	0.091	0.069	0.049	0.033	0.025	0.016	0.007
Other social	0.067	0.063	0.060	0.049	0.037	0.031	0.026	0.022	0.023	0.021
Stockholm	0.303	0.260	0.248	0.235	0.226	0.221	0.220	0.227	0.257	0.324
Gothenburg	0.156	0.162	0.164	0.163	0.165	0.165	0.170	0.173	0.169	0.169
North Sweden	0.104	0.119	0.126	0.126	0.129	0.129	0.129	0.122	0.109	0.081
Panel B: Worker statistics										
Number of workers × year	1,076,050	1,142,203	1,972,505	3,006,821	3,480,919	4,252,322	5,431,989	6,714,962	7,872,442	11,561,265
Share immigrants	0.241	0.238	0.218	0.212	0.175	0.143	0.123	0.107	0.101	0.101
Share immigrants: West	0.049	0.041	0.041	0.039	0.039	0.036	0.037	0.035	0.036	0.043
Share immigrants: Rest of World	0.192	0.197	0.178	0.173	0.136	0.107	0.086	0.072	0.065	0.059
Share male	0.546	0.535	0.506	0.475	0.571	0.619	0.656	0.681	0.702	0.693
Share age $\leq$ 30	0.223	0.381	0.382	0.343	0.334	0.308	0.290	0.263	0.232	0.197
Share age $\geq$ 50	0.356	0.211	0.208	0.230	0.242	0.258	0.261	0.277	0.287	0.286
Share compulsory educ.	0.281	0.201	0.188	0.186	0.179	0.180	0.169	0.161	0.146	0.117
Share secondary educ.	0.516	0.565	0.577	0.580	0.597	0.602	0.604	0.582	0.527	0.468
Share tertiary educ.	0.190	0.215	0.220	0.223	0.215	0.211	0.221	0.252	0.324	0.410
Mean log earnings	9.557	9.534	9.594	9.644	9.717	9.798	9.892	9.970	10.084	10.233
Std. dev. log earnings	0.579	0.600	0.575	0.564	0.546	0.544	0.536	0.534	0.529	0.545
Imm/native earnings gap	-0.058	-0.068	-0.032	-0.026	-0.029	-0.036	-0.058	-0.063	-0.065	-0.037

Notes: The unit of observation in the top panel is firm × year, and in the bottom panel it is worker × year. Native-segregated (immigrant-segregated) firms employ only natives (immigrants). The included industries are not exhaustive. *Other social* includes industries like sewage and refuse disposal, membership organization activities, cultural and sporting activities, and services such as hairdressing. Regions in the middle and south of Sweden are omitted from the table.

4.2 Skill-based and residual sorting

As Table 3 shows, immigrants are over-represented in low-productive firms and natives are on average more educated than immigrants. If high-productive firms tend to disproportionately hire high-skilled workers, the type of sorting that we observe may reflect differences in skill demand and not group-specific firm pay policies. We investigate the importance of this mechanism for the allocation of workers across firms by decomposing sorting into a skill-based component and a residual component (as described in the second part of Section 3.2).

In Figure 1a, the black dashed line shows the observed share of immigrants in a given decile, as seen also in Table 3; the orange line gives the counterfactual share of immigrants if employers in a given decile were to hire based on age only (*age-adjusted prediction*), and the blue line shows the counterfactual share of immigrants if employers hired based on age and skill (*preserving skill distribution*). According to the age-adjusted prediction, we would find roughly equal shares of immigrants across the firm productivity distribution if age was the only hiring criterion. The skill-preserving prediction suggests that around 25% of the productivity sorting can be explained by skill differences as captured by individual fixed effects.[14] The majority of the sorting thus remains unexplained. We return to sorting in Section 4.5, where we investigate the role of managers.

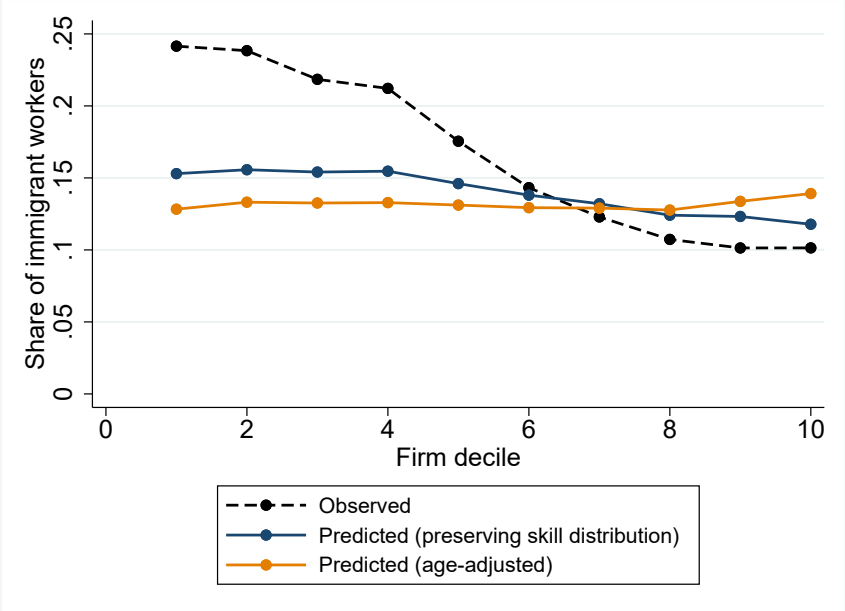
Figure 1b reveals that both the overall sorting and the explanatory power of the skill-preserving prediction can be attributed to Rest of World workers. For Western immigrants, the observed shares and the predictions are quite even across the firm productivity distribution.[15]

4.3 Earnings returns to working in more productive firms

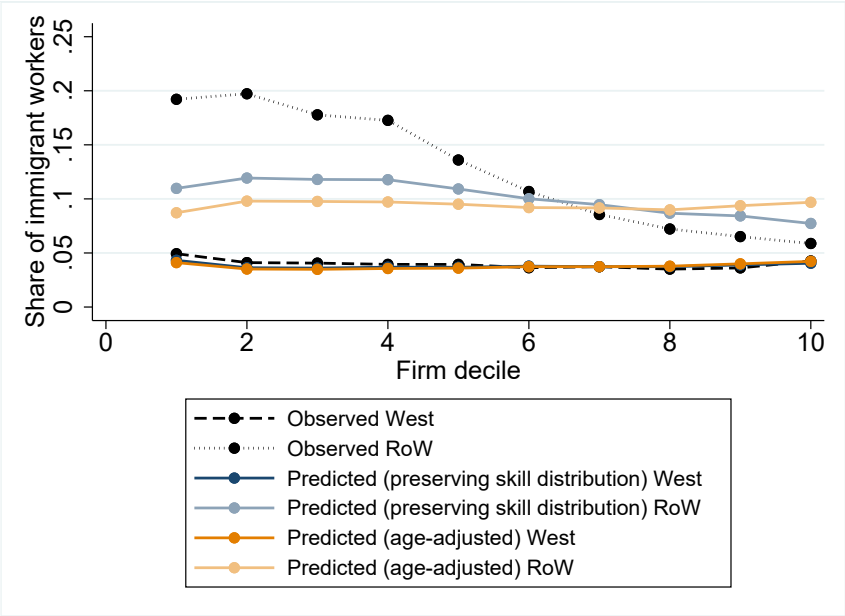
The sorting prediction exercise highlighted striking group differences that are largely unexplained by skills. A decomposition of the within-group variance of log earnings (Table A.1) additionally shows that person and firm decile effects are substantially correlated (0.285 and

[14] This is computed by taking the mean across deciles d of $(I_{d,skill-adjusted} - I_{d,age-adjusted})/(I_{d,observed} - (I_{d,age-adjusted})$, where I is share of immigrant workers (available in Table A.4). Intuitively, it captures the mean distance between the age-adjusted and observed shares explained by adjusting for skill.

[15] We get very similar patterns when using deciles instead of quartiles of the person effects as our skill measure. However, using four education categories explains less of the overall sorting (Figures A.6a and A.6c).



(a) All immigrants



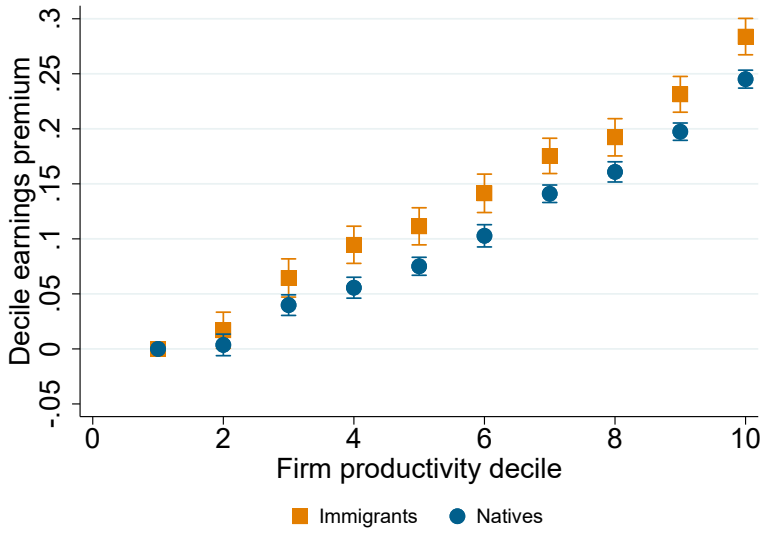
(b) By immigrant group

Figure 1: Skill-based sorting

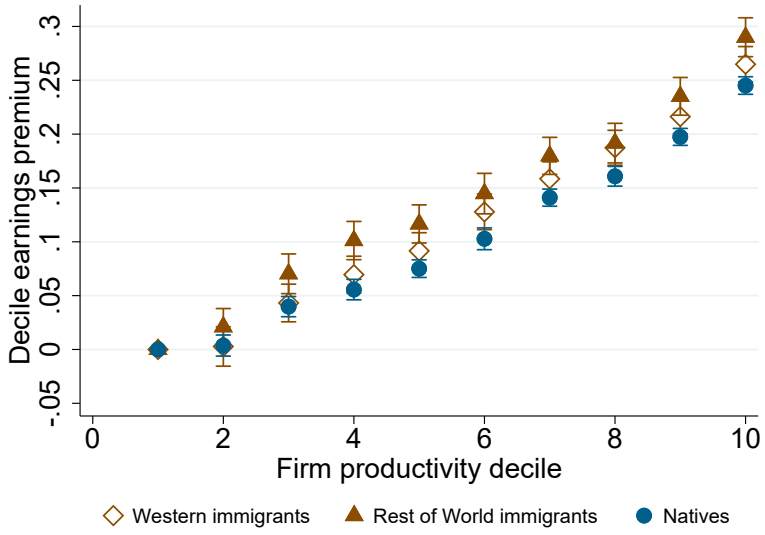
Notes: The figure shows the observed distribution of immigrants within firm productivity deciles, as well as two predicted distributions. The age-adjusted distribution maintains the age distribution of each decile. The skill-preserving distribution maintains the joint age-skill distribution of each decile. Skill is given by quartiles of the person fixed effects estimated in equation (2). Panel (a) uses the person fixed effects from a regression where the group of immigrants is pooled, while Panel (b) uses the person fixed effects from separate regressions for Western and Rest of World immigrants.

0.335 for natives and immigrants respectively).[16] Therefore, a question that arises is whether

the returns to firm productivity are different for immigrants and natives.



(a) All immigrants



(b) By immigrant group

Figure 2: Earnings returns to working in more productive firms

Notes: Panel (a) plots $\hat{\theta}_D$ from equation (2) for the sample of natives and immigrants. Panel (b) plots $\hat{\theta}_D$ from the same equation for the sample of natives (circles), Western immigrants (diamonds), and Rest of World immigrants (triangles). All specifications include individual fixed effects, year fixed effects and controls as specified in Section 3. Table A.2 displays point estimates.

[16]Person effects explain a large share of the log earnings variance (38.9 percent for natives and 46.5 percent for immigrants). In line with Bonhomme et al. (2019), who also cluster firms into groups, firm decile effects explain a relatively small share of the variance in earnings (1.5 percent and 2 percent).

To investigate this possibility, we use the firm ranking to estimate the earnings returns to working in more productive firms while accounting for worker fixed effects. Figure 2 presents the estimated decile earnings premiums $\hat{\theta}_D^g$ from the main model (2) (see Table A.2 for the corresponding estimates). Panel (a) of Figure 2 compares natives to immigrants, while Panel (b) compares natives to the sample of immigrants split into West and Rest of the World.

Figure 2 shows that there are substantial positive returns to working in more productive firms for all groups of workers and across the productivity distribution. However, Panel (a) shows that immigrants gain relatively more from avoiding firms at the very bottom of the productivity distribution. For example, the estimated return to working in the fifth decile compared to the first is 7.5 log points for natives and 11.2 log points for immigrants. From the fourth decile and up, each step up on the productivity ladder results in similar gains for natives and immigrants (i.e. the difference relative to decile one remains roughly constant).[17]

We saw in Figure 1b that Rest of the World immigrants are relatively more concentrated in the bottom part of the productivity distribution. Panel (b) of Figure 2 shows that the differential returns from avoiding the low-productive firms are primarily driven by this group of immigrant workers. By contrast, immigrants from the West have earnings returns that are more similar to those of natives. While region of origin clearly matters, time spent in Sweden does not seem to be a crucial determinant of the returns to firm productivity: separate estimates for immigrants that have spent less than vs. at least 10 years in Sweden highlight similar returns to firm productivity, in both cases greater than for natives (Figure A.8).

Clustering firms into ten categories may hide firm heterogeneity and worker sorting within these categories. We investigate this possibility by inspecting the distribution of immigrants and natives within deciles, and by estimating the earnings returns using ventiles instead of deciles. Figure A.9 suggests that within each productivity decile, immigrant and native workers are similarly distributed. This finding supports the idea that the ten-group classification captures relevant aspects of firm heterogeneity and worker sorting. Furthermore, Figure A.10 shows that the steady returns to firm productivity found in Figure 2 are also present with the finer grouping

[17] Results are qualitatively similar when accounting for the unequal distribution of the total number of workers in different deciles as seen in Figure A.4 by using an employee-weighted productivity ranking (Figure A.7).

of firms.[18]

4.4 Decomposition of decile premiums into sorting and pay-setting

We now turn to evaluating the contribution of productivity decile-specific pay premiums to the immigrant-native earnings gap according to equation (3). Table 4 shows the decomposition results for both the overall group of natives and immigrants and separately for immigrants from West and Rest of World countries.

Starting with the first row, we see that the average decile premium of immigrants is quite similar to that observed for natives (16.5 vs. 15.8 percent). This similarity hides two opposing forces. The sorting component in column (5) is positive (i.e. increases the gap) and amounts to around 21 percent of the earnings gap between immigrants and natives. The pay-setting component in column (8) instead reduces the gap by around 27 percent.[19] Thus, the fact that immigrants work in lower-productivity firms is on average fully compensated by their higher returns to firm productivity.[20] Columns (6) and (7) further decompose the sorting component into skill-based and residual sorting (cf. Section 3.2). The figures suggest that approximately 40 percent of the sorting component of the earnings gap can be explained by differential firm allocation due to skill differences (as captured by individual fixed effects from earnings regressions).

The second and third rows of Table 4 separate immigrants by region of origin. Western immigrants in our sample have a slight earnings advantage over natives, and the pay-setting effect accounts for a substantial part of this. For Rest of the World migrants, the pay-setting component is similar in magnitude to that of Western migrants, but the sorting component

[18]For all groups of workers, the estimates suggest negative returns to moving from the lowest productivity ventile to the second and third ventiles. Table A.3 suggests that this result may relate to firm size, since the first ventile contains a comparatively greater number of large firms, which on average pay higher earnings. While there may be additional firm-related factors affecting earnings such as firm size, the overall picture of the earnings returns to firm productivity for different groups of workers remains.

[19]The pay-setting component is dependent on choice of reference category, while the sorting component is not (Fortin et al., 2011). Relating to the firms with the lowest productivity is a natural reference category as these are the firms with the lowest rents.

[20]The signs on these effects are in line with those in Dostie et al. (2023), who decompose *firm-specific* as opposed to decile-specific premiums using a similar method; the magnitudes are not directly comparable.

is remarkably different. In particular, the concentration of these immigrants in firms of low productivity yields an overall productivity decile premium – when sorting and pay-setting are combined – that is on average similar to that of natives.

Table 4: Decomposition of immigrant-native earnings gap

	Earnings gap	Mean decile premium			Sorting			Pay-setting
		Natives	Immigrants	Gap	Total	Skill-based	Residual	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
All	0.121	0.158	0.165	-0.007	0.026	0.011	0.015	-0.033
West	-0.041	0.158	0.173	-0.015	0.003	0.001	0.002	-0.018
RoW	0.188	0.158	0.159	-0.002	0.035	0.014	0.021	-0.037

Notes: Column 1 shows the mean log earnings gap between immigrants and natives in different groups. Columns 2 and 3 show the mean decile premium received by natives and immigrants, respectively. Column 4 gives the difference between column 2 and column 3. We decompose the gap in column 4 into a between-decile sorting effect (column 5) and a differential within-decile pay-setting effect (column 8). We further decompose the sorting effect into skill-based sorting (column 6) and residual sorting (column 7).

4.5 The role of manager origin: sorting, quality and earnings returns

The fact that immigrants are less likely to work in high-productive firms despite the relatively higher returns to doing so indicates that there may be immigrant-specific barriers affecting entry and mobility. One such barrier can be due to manager hiring practices. If immigrant managers are more likely to be found in the bottom of the firm productivity distribution, an increased likelihood of hiring other immigrants could contribute to the concentration of immigrant workers in low-productive firms.[21]

Panel A of Table 3 confirms that the share of immigrant managers declines with firm productivity, with immigrant managers relatively concentrated in the bottom four deciles of the productivity distribution. This pattern is driven by Rest of World managers, and is thus similar to the worker sorting pattern. In addition, the share of immigrant workers at immigrant-managed firms vastly exceeds the share at native-managed firms throughout the firm productiv-

[21] We define a manager as the person with the highest yearly earnings at the firm. Previous work using this definition on Swedish data suggests a strong correlation between highest wage and manager occupational classification (Åslund et al., 2014).

ity distribution (Figure 3a). The gap to native-managed firms is large for firms under Western management, and even greater for workplaces with Rest of World managers.[22]

How can manager sorting across productivity deciles explain worker sorting? To gauge this, we compute the counterfactual share of immigrant workers per decile as $(I_d S_I + N_d S_N)/(I_d + N_d)$, where I_d (N_d) are the number of workers in decile d under immigrant (native) management, and S_I (S_N) is the overall immigrant share under immigrant (native) management across firm productivity deciles. This simple quantification exercise (which assumes that the manager allocation across productivity deciles precedes that of workers) suggests that manager-related sorting accounts for a significant share of the disproportionate presence of immigrants in low-productive firms. For example, the immigrant share in the second decile would be 17.6 percent if hiring was based on manager-worker homophily. This is substantially higher than the age-adjusted prediction of 13.3, and thus closer to the observed 23.8 percent. Full results are available in Table A.4. On average, relative to the baseline age-adjusted prediction, the allocation of workers to same-origin managers accounts for more than a third of the sorting.

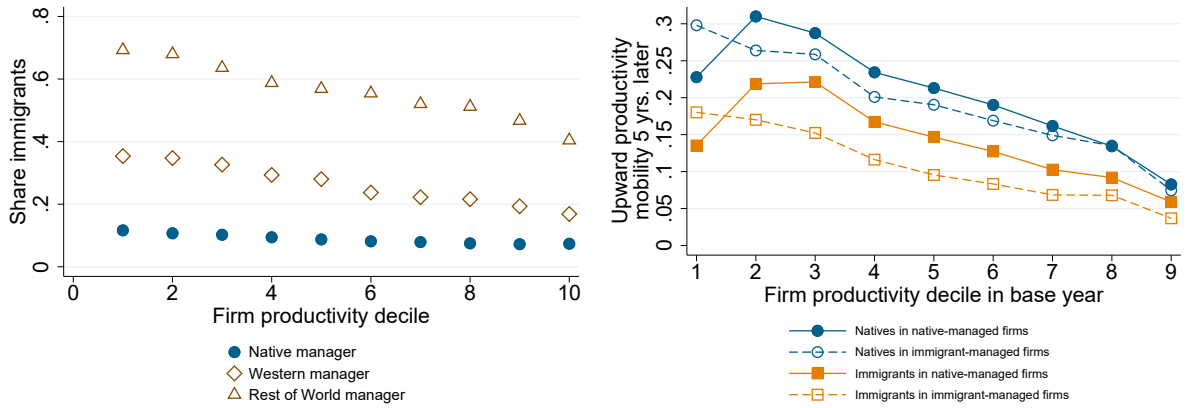
To assess whether the concentration of immigrant managers in low-productive firms is due to them being “poor managers", we study manager quality and estimate the following equation on the largest connected set of firms linked by manager mobility (see, e.g., Graham et al., 2012):

$$\ln(VA/N)_{ft} = \alpha_t + \gamma_f + \lambda_{manager} + \beta X_{ft} + \varepsilon_{ft}$$

where α_t are year fixed effects, γ_f are firm fixed effects, X_{ft} is a vector of time-varying firm-level characteristics (the same that we use in Column 1 of Table 2) and $\lambda_{manager}$ are manager fixed effects. Ranking the latter into deciles, we find that the quality distribution of native and immigrant managers is similar, with a slight over-representation of immigrant managers both at the bottom and at the top of the distribution (Figure A.13a). Moreover, we document that homophily applies across the manager quality distribution: the share of immigrants working in immigrant-managed firms is substantially higher than the share in native-managed firms at all

[22] Our relatively coarse classification for immigrants from different parts of the world appears to capture sorting along manager origin lines: Figure A.11 shows that across the productivity distribution, the share of Rest of World (Western) workers is much higher under Rest of World (Western) management than in firms with another manager origin.

levels of manager quality (A.13b). This suggests that differences in manager quality by origin are unlikely to drive the sorting of workers across firms.



(a) Share immigrants, by manager type and firm productivity

(b) Upward mobility, by manager type and firm productivity

Figure 3: Firm productivity and managers

Notes: Panel (a) shows the leave-out-manager share of immigrants in each firm productivity decile, by manager type. Panel (b) shows the probability of working in a firm of higher productivity five years later relative to the first year an individual is observed in the data, by immigrant status and manager type.

Immigrants thus sort into immigrant-managed firms, and immigrant managers are concentrated in the bottom of the productivity distribution. These two patterns may reinforce each other and affect immigrants' ability to climb the productivity ladder. To shed light on whether worker-manager similarity relates to upward mobility, Figure 3b shows mobility rates by worker and manager origin, across the productivity distribution of the initial firm. Both immigrant and native workers are less likely to move to a more productive firm under initial immigrant management. The gap between immigrant and native workers is similar across manager types, and the subgroups of immigrants fare similarly in this case (Figure A.14). Thus, there is no clear indication that worker-manager similarity affects mobility prospects directly.

The concentration of workers in firms where the management share their background can be driven by a lack of opportunities in being hired elsewhere. But it is also possible that such homophily affects the ability to extract firm rents. To investigate this possibility, we estimate rent-sharing specifications, exploiting within-employment spell variation in earnings and firm value added. The model allows for different rent-sharing between immigrants and natives, and lets the association between earnings and firm value added vary between three groups: Rest

of the World, Western, and natives. We also interact the group categories with a dummy for immigrant manager. The analysis allows us to gauge how changes in value added at the firm over time translate into changes in earnings, and whether this relationship differs across groups. The model keeps the sorting of workers to firms constant, and controls for time-invariant worker and firm heterogeneity:

$$\begin{aligned}\ln(e_{ift}) = c + \lambda_t + \lambda_{if} + \delta_1 \ln(VA/N)_{ft} + \delta_2 ImmManager_{ft} \\ + \boldsymbol{\delta}_3 ImmManager_{ft} \cdot ImmGr_g + \delta_4 ImmManager_{ft} \cdot \ln(VA/N)_{ft} \\ + \boldsymbol{\delta}_5 \ln(VA/N)_{ft} \cdot ImmGr_g + \boldsymbol{\delta}_6 \ln(VA/N)_{ft} \cdot ImmGr_g \cdot ImmManager_{ft} + \varepsilon\end{aligned} \tag{6}$$

where $\ln(e_{ift})$ are log earnings for worker i in year t at firm f, $\ln(VA/N)_{ft}$ is a time-varying measure of log value added per worker at the firm-level, λ_{if} is a firm-worker match fixed effect, $ImmManager_{ft}$ is an indicator variable for immigrant managers, and g indexes the immigrant group (Western, Rest of World). We exclude from the analysis workers that at some point become managers.

Table 5 reports the estimated coefficients on all terms that include $\ln(VA/N)_{ft}$. The column (1) specification does not include any additional controls, while column (2) includes individual time-varying controls (age squared, age cubed, and tenure).[23] Individual controls are also interacted with the immigrant group to allow the coefficients to vary for natives and immigrants. Column (3) only includes firms in deciles 1 to 5, and column (4) only includes firms in deciles 6 to 10.

[23]To compute tenure we use data back to 1985. Because we have observed workers in 1998 for fewer years than workers in 2015, the tenure variable is left-truncated. We therefore include tenure in six bands: 1 year (omitted category), 2-3 years, 4-6 years, 7-9 years, 10-13 years and 14+ years.

Table 5: Rent-sharing among immigrants and natives

	(1)	(2)	(3)	(4)
Log VA per worker	0.020***	0.018***	0.017***	0.018***
	(0.002)	(0.002)	(0.002)	(0.003)
Rest of World × Log VA per worker	0.001	-0.002	0.007**	-0.007**
	(0.003)	(0.002)	(0.003)	(0.003)
Western × Log VA per worker	-0.004**	0.003*	0.008***	0.002
	(0.002)	(0.002)	(0.003)	(0.002)
Immigrant manager × Log VA per worker	-0.004	-0.002	-0.003	-0.002
	(0.003)	(0.003)	(0.005)	(0.004)
Rest of World × Immigrant manager × Log VA per worker	0.013***	0.011***	0.024***	0.007
	(0.004)	(0.004)	(0.006)	(0.006)
Western × Immigrant manager × Log VA per worker	0.004	0.001	0.004	0.000
	(0.003)	(0.003)	(0.007)	(0.004)
R^2	0.759	0.770	0.728	0.754
N	29,351,051	29,351,051	5,420,940	23,930,111
Decile	1-10	1-10	1-5	6-10
Year FE	Yes	Yes	Yes	Yes
Spell FE	Yes	Yes	Yes	Yes
Individual controls	No	Yes	Yes	Yes

Note: This table provides the results of estimating equation 6. Individual controls are age squared, age cubed, and tenure. Controls are also interacted with the immigrant group. Standard errors are clustered by firm and reported in parentheses. Columns (1) and (2) include firms in all productivity deciles. Column (3) only includes firms in deciles 1 to 5, and column (4) only includes firms in deciles 6 to 10.

Since the within-firm standard deviation in log value added is approximately 0.36, the estimate of 0.020 suggests that if a firm moves from low to high productivity (increasing its log value added by two within-firm standard deviations), earnings of native workers are expected to increase by 1.4 log points.[24] This association is substantially larger in magnitude for Rest of World workers under immigrant management, a pattern that is primarily driven by low-productive firms (see the comparison between columns 3 and 4). Thus, we find that productivity changes spill over onto changes in earnings, particularly where there is homophily. These results suggest that immigrants are able to bargain over their wages in certain settings, and that immigrant pay responds to productivity changes not only across but also within firms (cf. results above based on movers).

Despite having a relatively larger degree of rent-sharing in low-productive firms, immi-

[24]The overall and between standard deviations in the firm-year sample are 0.61 and 0.56, respectively.

grants are not better off in absolute terms since they disproportionately work in firms where both the *size* of rents and level of earnings are low. Moreover, the rent-sharing results should be interpreted in a setting where outside options are kept fixed. As Manning (2020) points out, immigrants are likely to have lower reservation wages and face greater search frictions than natives. Finally, the fact that rent-sharing is particularly high for Rest of World immigrants in low-productive firms can reflect that these workers bear the burden of decreases in value added in bad times, and not just extract rents in good times. In any case, the estimates point to immigrant workers being more connected to changes in firm performance in immigrant-managed firms.

5 Discussion and conclusion

In this paper, we analyze how firm heterogeneity influences immigrant-native earnings gaps. We classify firms into deciles using a firm productivity classification that accounts for business cycle fluctuations and productivity shocks and allows for the inclusion of fully segregated firms, and find that workers born outside Western countries have a lot to gain from avoiding the low-productive firms in which they are particularly concentrated.

The estimated earnings returns to firm productivity are present across the distribution of firms for both immigrants and natives. However, the gains from avoiding the least productive firms are higher for immigrants. Taken together, our analysis shows that immigrants are over-represented in less productive firms, which affects their earnings negatively, but have returns to productivity that are at least as high as for natives. This suggests that immigrants are able to reap the benefits of employment in high productivity firms once they actually reach that step on the job ladder, but face barriers in doing so.

The concentration of immigrants from non-Western countries in low-productive firms can have several explanations. Skill differences between immigrants and natives can only explain part of the worker allocation in our data. We document striking worker-manager homophily and find this similarity to be an important determinant of worker allocation across firms of different productivity. In addition, rent-sharing is higher among non-Western immigrants if the manager shares their background.

Our results can be interpreted in the context of monopsonistic labor markets. The presence of earnings gains associated with working in more productive firms is consistent with firms, rather than markets, setting wages (Card, 2022; Manning, 2020). The dual result that immigrants are concentrated in low-productivity firms, but have at least as high returns as natives in high-productivity firms, points to a combination of two factors: immigrants face barriers to climbing the job ladder, and firms exert varying degrees of monopsony power over different groups of workers. Our results echo work by Hirsch and Jahn (2015), who conjecture that search costs may be greater for immigrants than natives and find that immigrants supply labor to the firm less elastically than natives, and Bassier et al. (2022) who find that the degree of monopsony power is higher for low-wage workers and in low-wage sectors like retail and restaurants. They are also consistent with Amior and Stuhler (2024), who develop a model where the driving force behind immigrant-native wage differentials are firm pay-setting practices coupled with recent immigrants' lower reservation wages. This creates a segregated labor market: non-discriminating low-wage firms hire low reservation wage workers over high reservation wage workers (i.e. natives), creating a low-pay immigrant-dominated sector in equilibrium. In line with our empirical results, the sorting patterns are not solely due to skill-differences between immigrants and natives, but rather due to firms' monopsony power.

The existence of firm productivity premiums may not only be about monopsonistic labor markets, but also about institutions and norms. Conditional on accessing a high-productive firm, immigrants with poor outside options could for instance gain more from firm policies that benefit all employees in similar ways (e.g. due to high union density and general egalitarian social norms). Furthermore, our finding that worker-manager origin similarity is related to the extent of rent-sharing within firms suggests that there are also group-specific, intra-firm mechanisms at work.

From a policy perspective, it is particularly striking that immigrant groups with poor labor market positions deviate the most from natives in sorting and returns. This speaks against voluntary sorting due to worker preferences and signals the potential individual and societal gains from more equal employer access. Overall, our results suggest that a better understanding of the role firms play in immigrant labor market integration is needed.

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A Appendix

A.1 Exogenous mobility

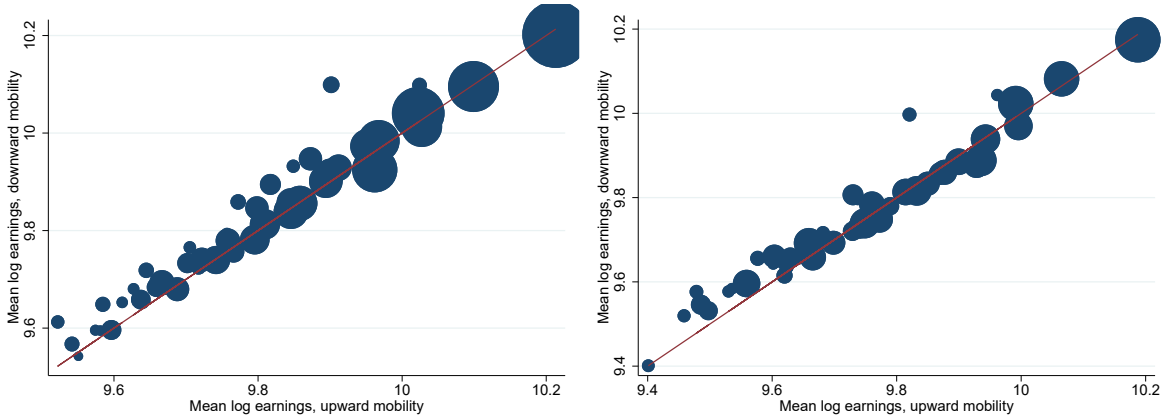
To estimate our main regression (2), we require variation coming from workers moving across firm productivity deciles. In particular, in order for OLS to return a consistent estimator, worker history needs to be independent of the error term (the exogenous mobility assumption in the context of two-way fixed effect models a la Abowd et al., 1999). We here show that the assumption is likely to hold in our context.

To test this assumption, we restrict our attention to workers who move across firms at least once in 2000–2016 and who are employed for at least four consecutive years at firms with non-missing productivity ranking: two years at their pre-move employer and two years at the new employer. We then apply the same sampling restrictions adopted in the main analyses.[25] Figure A.1 shows regression-adjusted log-earnings averaged between the year of a decile move and the year before for each pair of downward and upward firm productivity decile movers (the test is akin to that in Bonhomme et al., 2019). For instance, for the combination of deciles 1 and 2, one dot represents the average log-earnings of the 2-to-1 (downward) movers on the y-axis paired with the corresponding outcome of the 1-to-2 (upward) movers on the x-axis.

Intuitively, for the additive model with exogenous mobility to hold, it is necessary that workers who move towards opposite deciles exhibit symmetric earnings changes (same magnitude and opposite sign). Log-earnings are adjusted for education dummies, quadratic age, the interaction between the two, and calendar year. We estimate the model separately by year and immigrant status using the sub-sample of decile-stayers, and use it to predict the outcome for the decile-movers using their observable characteristics. For both immigrants and natives the upwards and downwards mobility across firm productivity deciles is approximately symmetric across the decile transitions. We find qualitatively similar results when plotting raw, unadjusted log-earnings, although in that case for immigrants the average log-earnings of the upward movers appear slightly larger than those of downward movers (Figure A.2). Results are

[25] Figure A.3 shows group-specific transition matrices which give, conditional on the pre-move decile, the shares of individuals moving to each of the ten deciles. For both groups, the least mobile are those in the bottom and top deciles, but there is otherwise a non-trivial amount of movement across deciles. The patterns are similar between immigrants and natives.

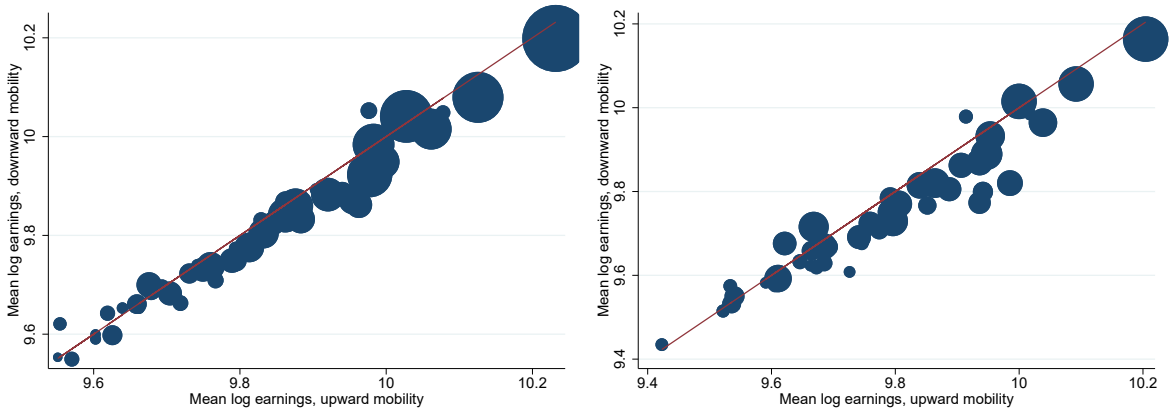
also qualitatively similar when using earnings information only in the decile move year rather than averaging earnings the year of the move and that before. Overall, the results support that exogenous mobility holds in our setting.



(a) Natives (b) Immigrants

Figure A.1: Average log-earnings for downward vs. upward decile movers

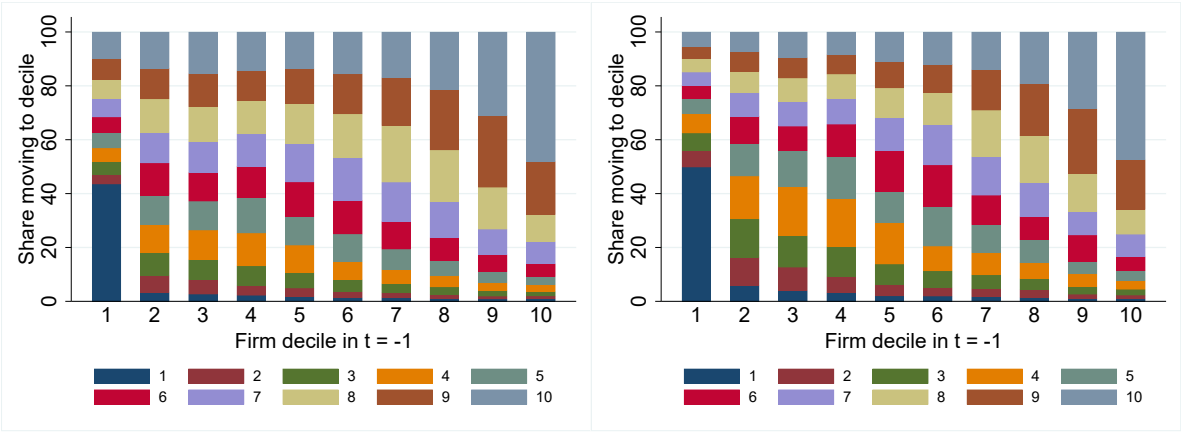
Notes: Each dot reports regression-adjusted log-earnings averaged the year of a firm productivity decile move and the year before for the pair of downward and opposite upward movers. The regression adjustment is implemented by estimating a log-earnings model adjusting for calendar year, education dummies, quadratic age, and education and quadratic age interacted. The model is separately estimated by year and for immigrants and natives with decile-stayers observations. The estimated model is then used predict the outcome for the decile-movers. Dot size is proportional to the number of observations in the year of the move. 45-degree line in red.



(a) Natives (b) Immigrants

Figure A.2: Unadjusted average log-earnings for downward vs. upward decile movers

Notes: Each dot reports raw (unadjusted) log-earnings averaged between the year of the move and that before for the pair of downward and opposite upward movers. Dot size is proportional to the number of observations in the year of the move. 45-degree line in red.



(a) Natives (b) Immigrants

Figure A.3: Mobility across firm productivity deciles

A.2 Additional figures

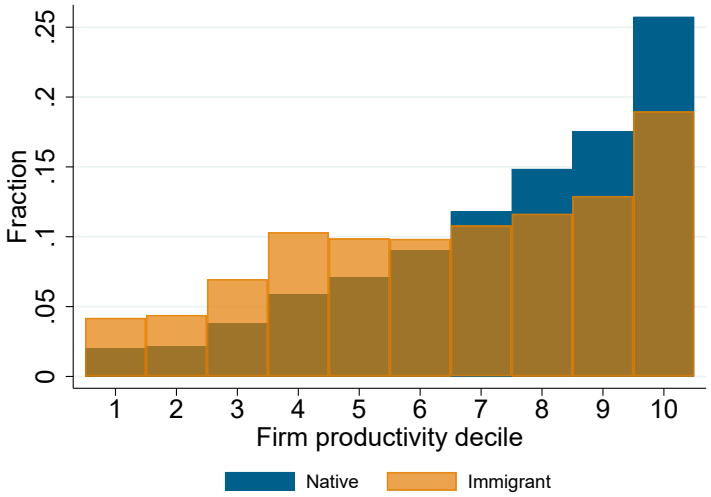


Figure A.4: Distribution of immigrants and natives across productivity deciles

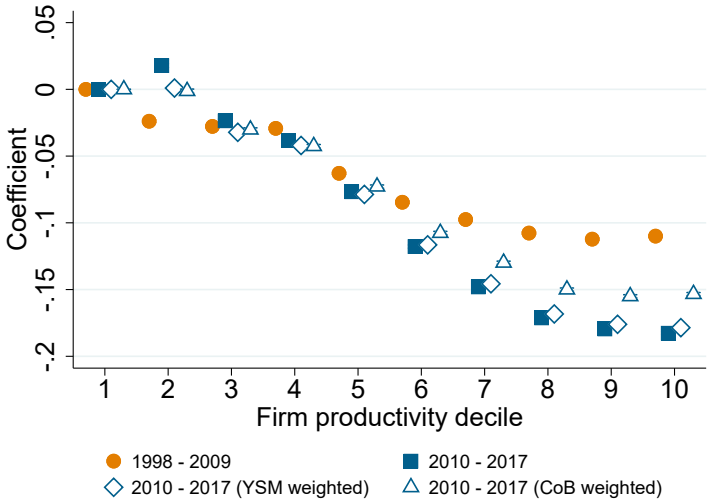
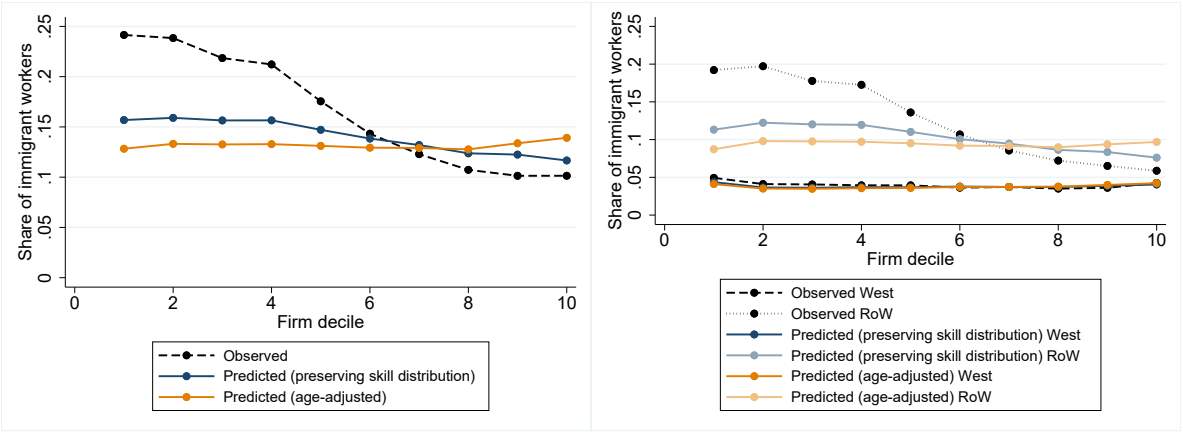


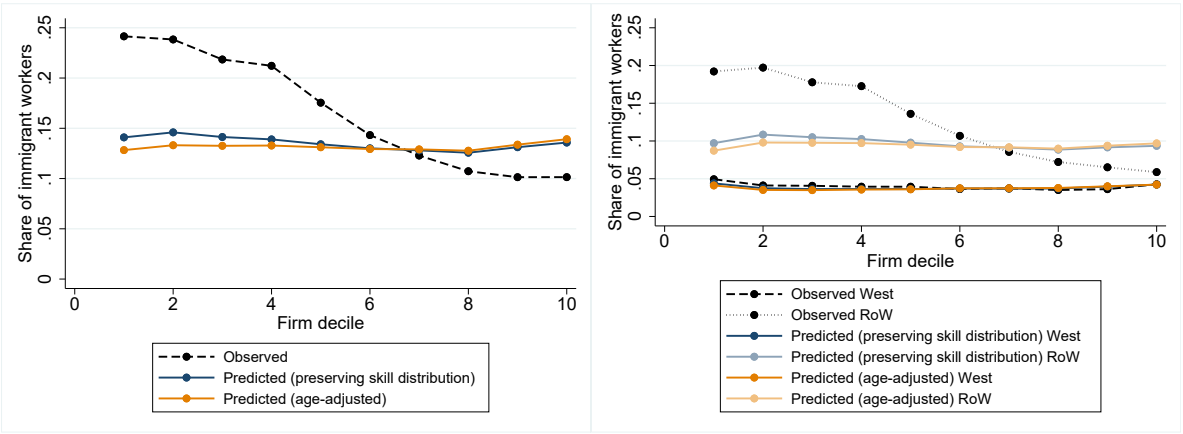
Figure A.5: Sorting of immigrants across productivity deciles

Notes: The figure plots the estimated β_{dp} coefficients from estimating the following regression, separate by two sub-periods p (where imm_i is an indicator variable for being an immigrant and $decile_d$ refers to productivity decile): $imm_i = \alpha_p + \sum_{d=2}^{10} \beta_{dp} decile_d + \varepsilon_{ip}$. The first decile is omitted such that the immigrant shares in a particular decile are estimated relative to the bottom decile. The hollow dots re-weight the second sub-period (2010–2017) to match the first (1998–2009) either in terms of the country of birth (CoB) composition or the years since migration (YSM) composition.



(a) All immigrants, deciles of person fixed effects

(b) By immigrant group, deciles of person fixed effects

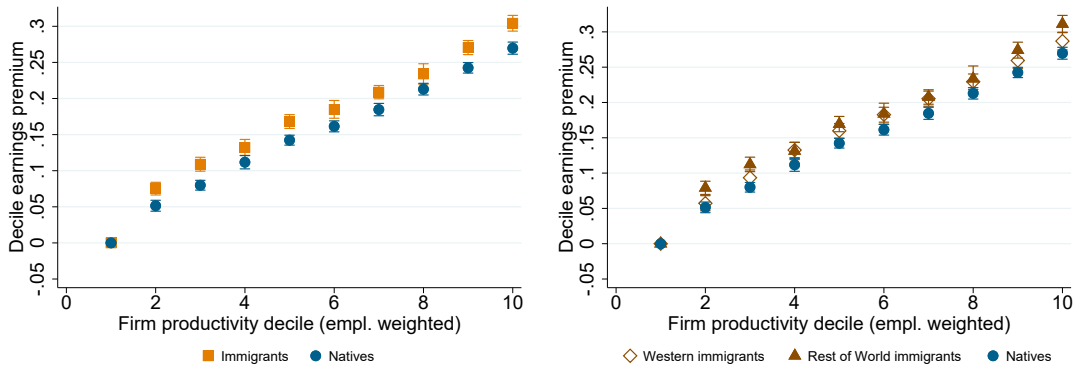


(c) All immigrants, education groups

(d) By immigrant group, education groups

Figure A.6: Skill-based sorting using alternative skill measures

Notes: The figures show the observed distribution of immigrants across firm productivity deciles, as well as two predicted distributions. The naive distribution maintains the age distribution of each decile. The skill-preserving distribution maintains the joint age-skill distribution of each decile. Skill is given by deciles of the person fixed effects estimated in equation (2) in the top panel and by four education groups (missing, compulsory, secondary and tertiary) in the bottom panel. Panels (a) and (c) show the distributions for the pooled group of immigrants and panels (b) and (d) break the group down into West and Rest of World.



(a) All immigrants (b) By immigrant group

Figure A.7: Earnings returns to working in more productive firms (employee-weighted ranking)

Notes: The figure plots $\hat{\theta}_D$ from equation (2) for the sample of natives and immigrants respectively, using the employee-weighted ranking of firms. All specifications include individual fixed effects, year fixed effects and controls as specified in Section 3.

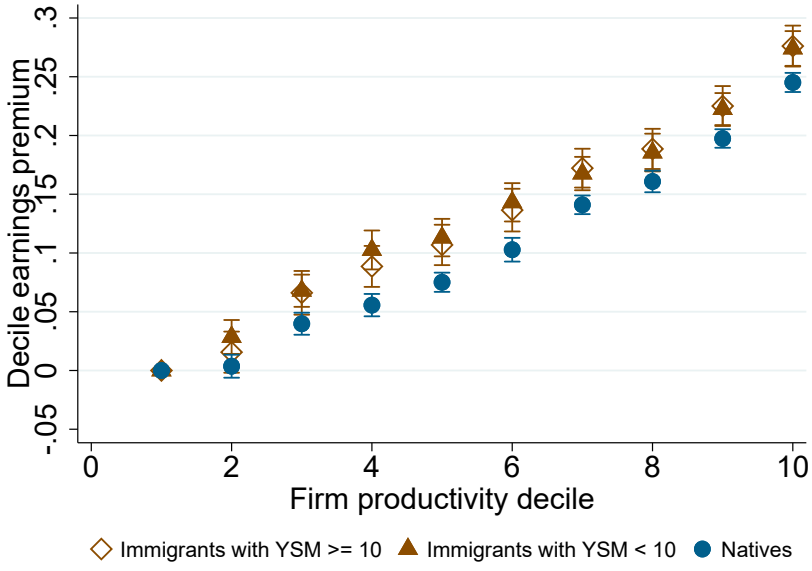
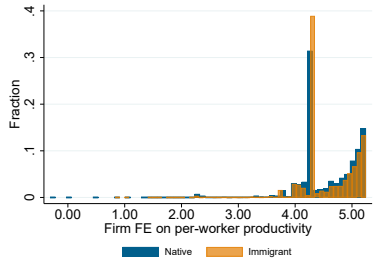
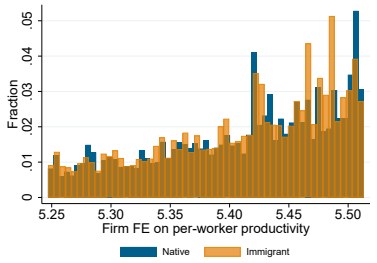


Figure A.8: Earnings returns to working in more productive firms – YSM

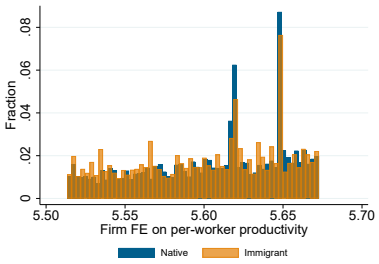
Notes: The figure plots $\hat{\theta}_D$ from equation (2) for the sample of natives and immigrants respectively, where the immigrant group is split by their years since migration (YSM). All specifications include individual fixed effects, year fixed effects and controls as specified in Section 3.



(a) Decile 1

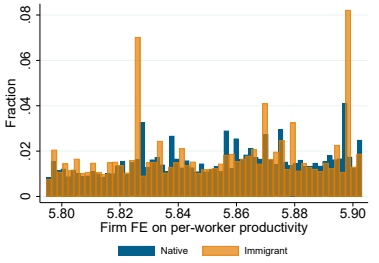


(b) Decile 2

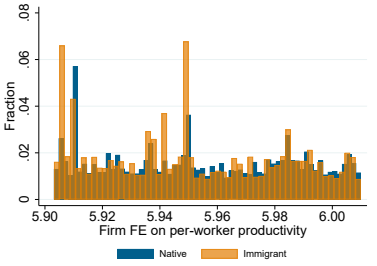


(c) Decile 3

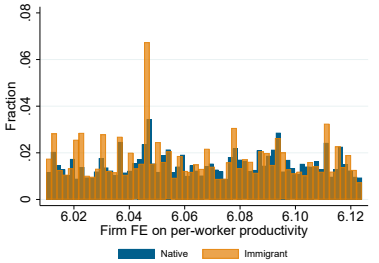
(d) Decile 4



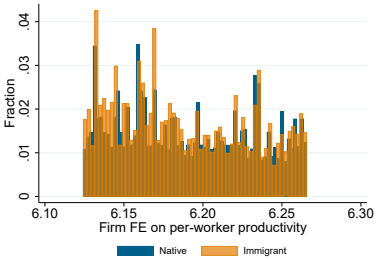
(e) Decile 5



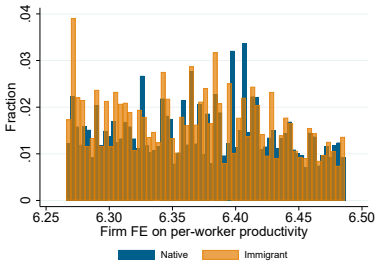
(f) Decile 6



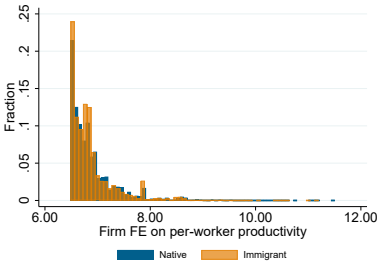
(g) Decile 7



(h) Decile 8

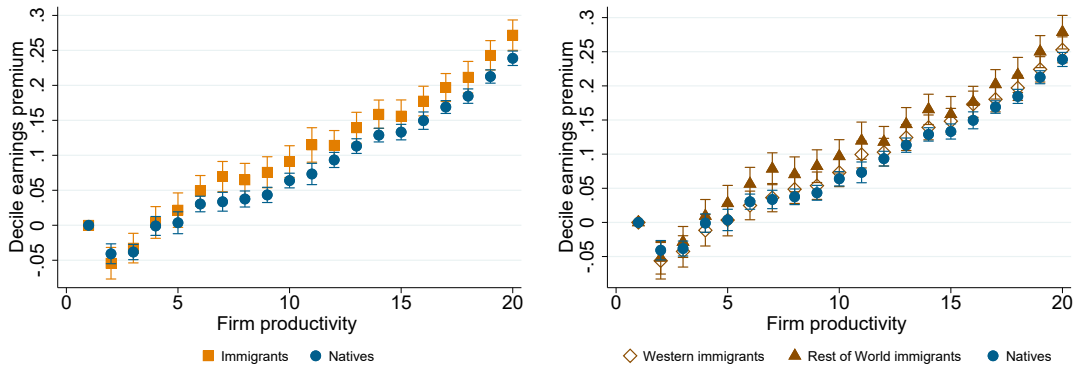


(i) Decile 9



(j) Decile 10

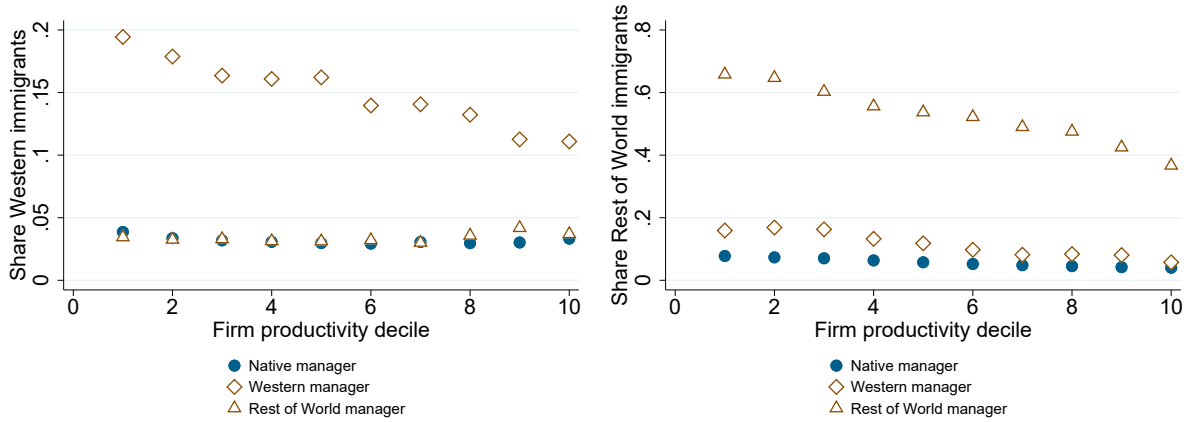
Figure A.9: Within-decile distribution of immigrants and natives



(a) All immigrants (b) By immigrant group

Figure A.10: Earnings returns to working in more productive firms (ventiles)

Notes: The figure plots $\hat{\theta}_D$ from equation (2) for the sample of natives and immigrants respectively, using ventiles of firm productivity. All specifications include individual fixed effects, year fixed effects and controls as specified in Section 3.

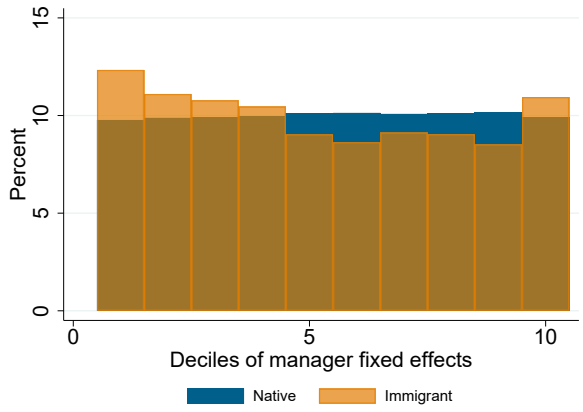


(a) Share Western immigrants, by manager type and firm productivity

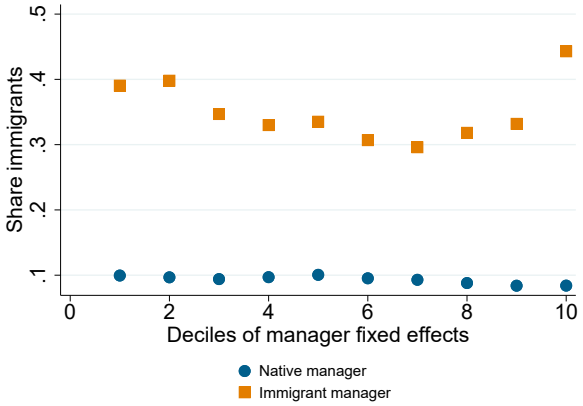
(b) Share Rest of World immigrants, by manager type and firm productivity

Figure A.11: Manager and worker interactions by subgroups

Notes: Panel (a) shows the leave-out-manager share of Western immigrants in each firm productivity decile, by manager type. Panel (b) shows the leave-out-manager share of Rest of World immigrants in each firm productivity decile, by manager type.



(a) Manager fixed effects distribution, by immigrant status



(b) Share immigrants, by manager quality

Figure A.13: Manager quality

Notes: Panel (a) shows the distribution of manager fixed effects $\lambda_{manager}$ estimated from the following equation on the largest connected set of firms linked by manager mobility: $\ln(VA/N)_{ft} = \alpha_t + \gamma_f + \lambda_{manager} + \beta X_{ft} + \varepsilon_{ft}$, where α_t are year fixed effects, γ_f are firm fixed effects, X_{ft} is a vector of time-varying firm-level characteristics (the same that we use in Column 1 of Table 2). Panel (b) shows the leave-out-manager share of immigrants, by manager quality and type.

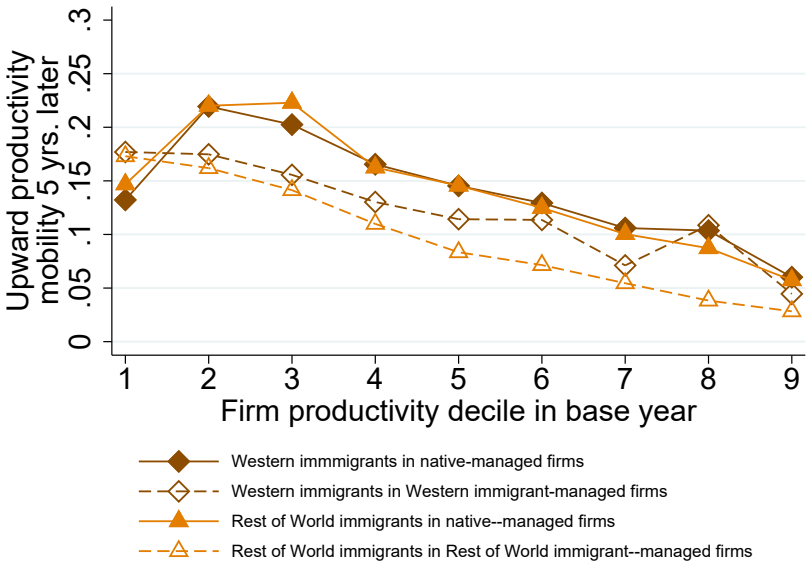


Figure A.14: Upward mobility by worker and manager origin

Notes: The figure shows the probability of working in a firm of higher productivity five years later relative to the first year an individual is observed in the data, by immigrant group and manager type.

A.3 Additional tables

Table A.1: Variance decomposition

	Natives	Immigrants	Western immigrants	Rest of World immigrants
	(1)	(2)	(3)	(4)
Person effects	0.389	0.465	0.523	0.436
Firm decile effects	0.015	0.021	0.020	0.021
Cov. person and firm decile effects	0.044	0.066	0.069	0.058
Xb and associated covariances	0.222	0.097	0.080	0.100
Residual	0.330	0.352	0.308	0.385
Corr. person/firm decile effects	0.285	0.335	0.337	0.299

Notes: Results from two-way fixed effects models estimated separately for natives (column 1), immigrants (column 2) Western immigrants (column 3) and Rest of World immigrants (column 4). Models include year dummies interacted with education dummies, and quadratic and cubic terms in age interacted with education dummies.

Table A.2: Earnings returns to working in more productive firms

Decile	Natives	All immigrants	Western immigrants	Rest of World immigrants
	(1)	(2)	(3)	(4)
2	0.004 (0.005)	0.017 (0.008)	0.003 (0.009)	0.021 (0.009)
3	0.040 (0.005)	0.065 (0.009)	0.043 (0.009)	0.070 (0.009)
4	0.056 (0.005)	0.095 (0.009)	0.070 (0.009)	0.101 (0.009)
5	0.075 (0.004)	0.111 (0.009)	0.091 (0.009)	0.117 (0.009)
6	0.103 (0.005)	0.141 (0.009)	0.128 (0.008)	0.145 (0.010)
7	0.141 (0.004)	0.175 (0.008)	0.159 (0.008)	0.180 (0.009)
8	0.161 (0.005)	0.192 (0.009)	0.187 (0.008)	0.192 (0.009)
9	0.197 (0.004)	0.231 (0.008)	0.216 (0.008)	0.235 (0.009)
10	0.245 (0.004)	0.284 (0.008)	0.265 (0.008)	0.290 (0.009)

Notes: Columns (1) and (2) show $\hat{\theta}_D$ from equation (2) for the full sample of natives and immigrants, respectively. Columns (3) and (4) show $\hat{\theta}_D$ from equation (2) for Western immigrants and Rest of World immigrants, respectively. All specifications include individual fixed effects, year fixed effects and controls as specified in Section 3.

Table A.3: Summary statistics by productivity ventile, ventiles 1-10

	1	2	3	4	5	6	7	8	9	10
Panel A: Firm statistics										
Number of firms × year	62,001	87,550	99,104	109,354	117,277	124,244	134,840	140,964	139,966	144,872
Mean yearly firm size	16.471	8.167	9.379	11.834	12.869	16.652	19.861	18.070	17.761	20.953
Firm size 2-9	0.829	0.823	0.801	0.774	0.754	0.721	0.693	0.665	0.670	0.651
Firm size 10-49	0.147	0.157	0.174	0.196	0.210	0.237	0.264	0.288	0.276	0.291
Firm size 50-249	0.021	0.018	0.024	0.025	0.031	0.036	0.035	0.041	0.047	0.050
Firm size 250-999	0.002	0.001	0.002	0.004	0.004	0.005	0.006	0.005	0.006	0.007
Firm size $\geq$ 1000	0.001	0.000	0.000	0.001	0.001	0.001	0.002	0.001	0.001	0.002
Mean fraction immigrants at firm	0.219	0.223	0.215	0.199	0.189	0.165	0.156	0.140	0.138	0.125
Share native-segregated firms	0.650	0.643	0.638	0.638	0.631	0.645	0.629	0.634	0.635	0.636
Share immigrant-segregated firms	0.137	0.133	0.118	0.099	0.083	0.067	0.057	0.044	0.045	0.037
Share immigrant managers	0.216	0.223	0.215	0.198	0.185	0.157	0.147	0.129	0.128	0.112
Share Western managers	0.049	0.049	0.047	0.044	0.044	0.039	0.043	0.041	0.038	0.039
Share Rest of World managers	0.168	0.174	0.168	0.154	0.140	0.117	0.104	0.088	0.090	0.073
Manufacturing	0.079	0.077	0.080	0.079	0.090	0.103	0.103	0.108	0.125	0.138
Construction	0.055	0.067	0.073	0.086	0.098	0.107	0.115	0.131	0.161	0.173
Retail and trade	0.278	0.289	0.295	0.295	0.282	0.278	0.261	0.240	0.249	0.245
Transport	0.031	0.038	0.043	0.048	0.057	0.059	0.056	0.059	0.064	0.065
Hotels and restaurants	0.169	0.189	0.187	0.179	0.154	0.124	0.101	0.082	0.074	0.064
Other social	0.069	0.066	0.064	0.062	0.063	0.058	0.053	0.045	0.040	0.033
Stockholm	0.313	0.295	0.270	0.250	0.258	0.238	0.236	0.235	0.233	0.220
Gothenburg	0.158	0.155	0.153	0.171	0.157	0.171	0.165	0.161	0.165	0.166
North Sweden	0.096	0.109	0.118	0.120	0.125	0.126	0.128	0.125	0.129	0.130
Panel B: Worker statistics										
Number of workers × year	723,511	352,539	459,442	682,761	793,627	1,178,878	1,574,994	1,431,827	1,532,285	1,948,634
Share immigrants	0.244	0.236	0.238	0.239	0.238	0.205	0.224	0.199	0.181	0.171
Share immigrants: West	0.052	0.044	0.043	0.040	0.042	0.040	0.039	0.040	0.041	0.038
Share immigrants: Rest of World	0.192	0.192	0.195	0.199	0.196	0.166	0.185	0.159	0.140	0.133
Share male	0.552	0.534	0.536	0.535	0.518	0.498	0.465	0.487	0.525	0.608
Share age $\leq$ 30	0.160	0.353	0.380	0.382	0.368	0.392	0.360	0.325	0.341	0.330
Share age $\geq$ 50	0.417	0.230	0.216	0.208	0.219	0.201	0.222	0.239	0.240	0.244
Share compulsory educ.	0.321	0.197	0.204	0.199	0.204	0.177	0.186	0.185	0.178	0.180
Share secondary educ.	0.501	0.546	0.567	0.564	0.571	0.582	0.581	0.580	0.593	0.601
Share tertiary educ.	0.166	0.237	0.209	0.220	0.208	0.228	0.221	0.225	0.218	0.211
Mean log earnings	9.592	9.487	9.483	9.568	9.566	9.613	9.641	9.648	9.688	9.739
Std. dev. log earnings	0.554	0.622	0.588	0.605	0.584	0.568	0.570	0.558	0.548	0.543
Imm/native earnings gap	-0.044	-0.091	-0.057	-0.076	-0.035	-0.026	-0.014	-0.041	-0.020	-0.034

Notes: The unit of observation in the top panel is firm × year, and in the bottom panel it is worker × year. Native-segregated (immigrant-segregated) firms employ only natives (immigrants). The included industries are not exhaustive. *Other social* includes industries like sewage and refuse disposal, membership organization activities, cultural and sporting activities, and services such as hairdressing. Regions in the middle and south of Sweden are omitted from the table.

Table A.4: Share immigrants by decile

	1	2	3	4	5	6	7	8	9	10
Panel A: All immigrants										
Observed	0.241	0.238	0.218	0.212	0.175	0.143	0.123	0.107	0.101	0.101
Preserving skill distribution	0.153	0.156	0.154	0.155	0.146	0.138	0.132	0.124	0.123	0.118
Age-adjusted	0.128	0.133	0.133	0.133	0.131	0.129	0.129	0.128	0.134	0.139
Manager allocation	0.130	0.176	0.151	0.152	0.127	0.120	0.119	0.113	0.113	0.117
Panel B: Western immigrants										
Observed	0.049	0.041	0.041	0.039	0.039	0.036	0.037	0.035	0.036	0.043
Preserving skill distribution	0.043	0.036	0.036	0.037	0.037	0.038	0.037	0.037	0.039	0.040
Age-adjusted	0.041	0.035	0.035	0.036	0.036	0.037	0.037	0.038	0.040	0.042
Manager allocation	0.035	0.038	0.037	0.038	0.035	0.035	0.037	0.036	0.036	0.037
Panel C: Rest of World immigrants										
Observed	0.192	0.197	0.178	0.173	0.136	0.107	0.086	0.072	0.065	0.059
Preserving skill distribution	0.110	0.119	0.118	0.118	0.109	0.100	0.095	0.087	0.084	0.077
Age-adjusted	0.087	0.098	0.098	0.097	0.095	0.092	0.092	0.090	0.094	0.097
Manager allocation	0.094	0.140	0.112	0.108	0.088	0.081	0.074	0.069	0.070	0.071

Notes: The table shows observed and predicted shares of immigrant workers by decile. The Preserving skill distribution and Age-adjusted predicted shares are discussed in Section 4.2. The Manager allocation predicted shares are discussed in Section 4.5.