# The Role of Firms in the Assimilation of Immigrants[*]

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### Abstract

This paper studies the role of firms in immigrants' labor market assimilation. We do so in the context of a large and sudden international migration shock: the arrival of nearly one million former Soviet Union (FSU) Jews to Israel in the 1990s. We use newly available Israeli population employer-employee data with information on workers' place of birth and immigration year. Over the course of twenty-five years since arrival to Israel, immigrants gradually enter higher-paying, larger, older, and less segregated firms. Gradual access to higher-paying firms explains a significant fraction of immigrants' labor market assimilation. Firm-specific pay premiums account for (i) 10–12% of the immigrant-native salary differential in the first ten years since arrival, and (ii) 28% of the gap between immigrants' own salary one and twenty-five years since arrival. FSU immigrants, who were highly educated, surpass natives after twenty years in Israel in terms of their employers' pay premiums, size, and age. An implication of our findings is that a significant fraction of the immigrant-native wage gap, especially shortly after arrival, is due to immigrants finding jobs at small, new, and disproportionately low-paying firms.

# 1  Introduction

This paper studies how do firm heterogeneity and firm-specific pay premiums contribute to the process of immigrants' assimilation—that is, the evolution of immigrants' labor market outcomes relative to natives as time since arrival to the host country increases. We address this question in the context of a mass migration shock: the arrival of nearly one million Jews from the former Soviet Union (FSU) to Israel during the 1990s. Equipped with newly available administrative employer-employee matched data on the entire population of Israel, we document the types of firms in which immigrants are employed compared to natives, show how this differential sorting evolves as immigrants' time in Israel increases, and quantify how much of the earnings assimilation experienced over twenty-five years is explained by differences in firms' pay premiums.

While there is growing evidence on the importance of firms in labor markets—showing how firms offer systematic and quantitatively important pay premiums—evidence on what fraction of the much-studied immigrant-native wage gap can be accounted for by such firm-specific pay differentials is scarce.[1] Firms can play a role in the assimilation process if, relative to comparable natives, recently arrived immigrants are initially employed by lower-paying firms and, as time goes by, eventually access jobs at higher-paying firms. A better grasp of these mechanisms would inform how much of the immigrant-native wage gap, or assimilation more broadly, can be attributed to sorting across heterogeneous employers as opposed to underlying worker differences.

We study the role of firms in the assimilation of immigrants combining a large and unexpected migration shock with population employer-employee matched data that includes information on workers' place of birth and year of arrival to Israel. The nature of the migration shock is favorable for our study: the USSR unexpectedly relaxed emigration restrictions in 1989, leading to a sudden and mass migration of FSU Jews to Israel, the only country which admitted them unconditionally and granted them citizenship on arrival. This context implies that the timing of migration is more likely than in other settings to be exogenous, and that return migration, a common empirical challenge in assimilation studies, was uncommon.[2] Further, the scale of the migration episode together with our population data deliver large sample sizes (of both immigrants and natives), which are key to study mobility across firms and firm premiums. Combining this unique historical setting with rich administrative data allows us to fill gaps in the literature with respect to firms and immigrants' assimilation.

We begin by documenting stylized facts on immigrants and firms that address two questions: first, how does such a large inflow of immigrants allocate between existing firms and

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[1] For examples on firm-specific pay premiums see Card et al. (2013, 2016, 2018); Goldschmidt and Schmieder (2017); Sorkin (2018); Gerard et al. (2018); Song et al. (2019). Some studies on immigrants' labor market assimilation include Chiswick (1978); Borjas (1985); Lubotsky (2007); Cohen-Goldner et al. (2012); Abramitzky et al. (2014). Damas de Matos (2017) and a recent paper by Dostie et al. (2020) comprise the evidence linking firms' pay premiums and immigrant-native wage gaps.

[2] See Lubotsky (2007) and Abramitzky et al. (2014) for a discussion on return migration and the importance of using longitudinal data like we do.

new firms created in the midst of the migration shock?; second, how segregated is immigrant employment across firms? First, we document a spike in firm creation in Israel during the mass arrival years. Then, we show that a significant number of newly created firms absorbed the initial immigration shock: in 1991, 22% of 1990 FSU arrivals were employed in a firm born in 1989 or later. The dynamics are such that the share of 1990 arrivals who are employed at new firms (i.e., less than 5 years old) evolves from 34% in 1991 to 13% in 2015. With respect to segregation, we document high initial levels of employment segregation that gradually diminish as time in Israel increases: in 1991, 72% of 1990 arrivals were employed in a firm whose workforce was 50% or more FSU immigrants. By 2015, this share was equal to 27%.

We next turn our attention to firm-specific pay premiums and immigrants' assimilation. We lay out a wage-setting framework, building on Card et al. (2016), which delivers a salary equation that depends on a worker's unobserved type, the firm's pay premium and, for immigrants, time since arrival to Israel. This resulting equation is a simple extension of the two-way fixed effects model of Abowd et al. (1999) (AKM). We use this framework to define and interpret a series of assimilation statistics that we later estimate. We consider two types of assimilation statistics: the first type compares immigrants to natives ("immigrant-native assimilation") while the second type compares immigrants to themselves after twenty-five years in Israel ("immigrant-immigrant assimilation").

Immigrant-native assimilation statistics contrast the salary of immigrants with that of comparable natives as a function of immigrants' time since arrival to Israel. We consider two versions of immigrant-native assimilation: in the first statistic (*overall*), comparable natives are similar to immigrants only in terms of age and calendar year; in the second statistic (*within firm*), comparable natives are also similar in terms of their employer. Comparing estimates of these two assimilation statistics starts to shed light on the relevance of sorting across heterogeneous firms in the immigrant-native assimilation process.

On the other hand, immigrant-immigrant assimilation statistics contrast the salary of immigrants at a point in time with that of themselves after twenty-five years in Israel. These statistics have the advantage of netting out time-invariant worker characteristics. Here we also consider two versions of immigrant-immigrant assimilation: in the first statistic (*overall*), immigrants are compared to themselves twenty-five years after arrival, only adjusting for age and time effects; in the second statistic (*within firm*), we further adjust for firms' pay premiums. Comparing estimates of these two versions quantifies the importance of variation in firms' pay policies in the immigrant-immigrant assimilation process.

We next go beyond assimilation in *earnings* and define assimilation statistics where outcome variables are workers' *employer* characteristics: firms' pay premiums, size (number of employees), and age. That is, we compare the characteristics of immigrants' employers to those of natives, or to those of immigrants themselves twenty-five years after arrival. The firm premium assimilation statistic, compared to the two versions of salary statistics, is an alternative, more direct way of documenting the evolution of immigrants' firm premiums vis-á-vis natives as time in Israel increases. Documenting assimilation in terms of firm size

and firm age provides a description of assimilation in firm characteristics that are measured in a model-free way, and correlated with potentially valuable non-wage job characteristics.[3]

The different immigrant-native and immigrant-immigrant assimilation statistics are estimated with OLS monthly salary equations featuring flexible time-since-arrival effects, and including a varying set of fixed effects (worker, firm, or both). Equations that estimate immigrant-native assimilation do not include worker fixed effects and simply adjust for age and time effects. When estimating within-firm immigrant-native assimilation regressions also include firm fixed effects. On the other hand, equations that estimate immigrant-immigrant assimilation all include worker fixed effects (making time-since-arrival effects a within-worker comparison) and normalize to zero the time-since-arrival effect after twenty-five years. When estimating immigrant-immigrant assimilation that additionally accounts for sorting into firms with varying pay premiums, regressions additionally include firm fixed effects. This last specification is an augmented version of an AKM model.

We find that one year after arrival, FSU immigrants earned .84 log points less than Israeli natives (overall gap). This gap is equal to -.58 log points after five years, and is practically closed after twenty-five years. The immigrant-native gap is significantly reduced, especially shortly after arrival, when comparing immigrants to natives working in similar firms (within-firm gap). After including firm fixed effects, the immigrant-native gap is 32% smaller one year after arrival (-.57 vs. -.84 log points), and 34% smaller five years after arrival (-.38 vs. -.58 log points).

Immigrant-immigrant salary assimilation is also substantial and impacted by firms' pay premiums. After adjusting for age and time effects, one year after arrival immigrants earned .29 log points less than themselves after twenty-five years in Israel. Including firm fixed effects, and thus adjusting for gradual sorting into higher-paying firms, reduces this gap by 28% (-.21 vs. -.29 log points).

The importance of firms in immigrants' assimilation that is inferred from comparing salary assimilation statistics with and without firm effects is confirmed when directly analyzing as *outcomes* the characteristics of workers' employers. We find that one year after arrival, immigrants, compared to natives, are employed in firms with pay premiums that are lower by .10 log points, smaller in size by 1.35 log points, and with a .14 higher probability of being new (less than 5 years of age). These differentials steadily shrink as time in Israel increases and, after twenty years, FSU immigrants (who were more likely than native Israelis to be highly educated) are employed in higher-paying, larger, and older firms than natives. A similar pattern arises when comparing employer characteristics of immigrants with themselves after twenty-five years in Israel. One year after arrival and relative to themselves after twenty-five years, FSU migrants are employed in firms with pay premiums that are lower by .08 log points, smaller in size by 0.80 log points, and with a .11 higher probability of being new.

Overall, our results illustrate how the process of FSU immigrants' assimilation comes from two main sources: i) changes in immigrants' productivity in the Israeli labor market

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[3]For instance, see see Brown et al. (1990) on the relationship between firm size and non-wage amenities.

(e.g. learning Hebrew, adjusting existing skills developed in the FSU, adapting to different labor market and cultural norms), and ii) the gradual access to greater labor market rents by climbing the job ladder into firms with greater pay premiums.[4] The main contribution of this paper is to quantify the importance of the latter channel—differences in firm pay policies—as well as documenting immigrants' assimilation, not only in salaries, but also in employer characteristics. Employer characteristics are relevant aspects of immigrants' assimilation, especially when labor markets are not perfectly competitive and when workers value non-wage job characteristics.[5]

The rest of this paper is structured as follows. Section 2 discusses existing work on firm-driven wage differentials and on immigrants' assimilation. Section 3 lays out the historical context of Jewish FSU migration to Israel, and related literature. Section 4 describes our data. Section 5 presents stylized facts on firm creation and immigrants' allocation to firms. Section 6 introduces the wage-setting framework and the assimilation statistics that build upon it. Section 7 describes the estimation of the assimilation statistics, and Section 8 presents the results. Section 9 concludes.

## 2  Firm-Driven Wage Inequality and Immigrants' Assimilation

A growing literature documents the contribution of firms to wage inequality, highlighting how the existence of firm-specific pay premiums results in similar workers earning different wages at different firms (e.g. Abowd et al., 1999; Card et al., 2013, 2016, 2018; Goldschmidt and Schmieder, 2017; Sorkin, 2018; Gerard et al., 2018; Song et al., 2019). Classic earnings differentials have been studied through the lens of this literature: works on the gender wage gap (Card et al., 2016; Sorkin, 2017) and the racial wage gap (Gerard et al., 2018) find that differential sorting into firms with different pay premiums explains substantial fractions of these gaps.

In parallel, a long-standing literature has studied how do immigrants fare in their host countries and their assimilation in the labor market (e.g. Chiswick, 1978; Borjas, 1985; Lubotsky, 2007; Cohen-Goldner et al., 2012; Abramitzky et al., 2014). Most of this literature focuses on earnings and occupations, with few examples considering the role of heterogeneous employers. Using survey data from Canada, Aydemir and Skuterud (2008) and Pendakur and Woodcock (2010) document differential sorting of immigrants into employers with lower pay premiums. Carneiro et al. (2012) and Barth et al. (2012) find similar patterns in Portugal and Norway, respectively. However, all these studies (most of which lack panel data) consider firm premiums that, unlike the tradition following Abowd et al. (1999) (AKM) and Card et al. (2018), do not account for unobserved worker effects.

In addition to this paper, the two existing studies that speak to both of these two literatures are Damas de Matos (2017) and a recent paper by Dostie et al. (2020). Damas de

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[4]Search frictions, a growing social and professional network, or higher-paying firms valuing experience in the Israeli labor market could explain this process.

[5]See Manning (2011) for frictional labor markets with imperfect competition, and Sorkin (2018) for non-wage amenities.

Matos (2017) estimates immigrant-native wage catch-up in Portugal using an AKM framework. Dostie et al. (2020) quantify how much of the earnings level and growth differences between natives and permanent migrants in Canada are accounted for by firm-specific pay premiums.

Compared to existing studies, this paper is the first to combine an unexpected mass migration shock together with a long panel (twenty-five years) of population employer-employee data in which date-of-arrival is observed. This allows us to study the role of firms in long-run assimilation, doing so for a large number of immigrants who arrived to Israel without immigration policy restrictions and received citizenship from minute one. We further expand the focus of the analysis by documenting immigrant sorting and assimilation in relationship to a broad set of firm characteristics.

## 3  FSU Migration to Israel: Historical Context and Literature

In 1989 the USSR relaxed emigration restrictions and Soviet Jews, fleeing antisemitism and the collapse of the Soviet Union, started to leave the country in massive numbers. Israel accepted FSU Jews unconditionally and granted them citizenship. Between 1989 and 1999, around 840,000 FSU Jews migrated to Israel, which in 1989 had a population of 4.5 million.[6] Between 1989–1991 alone, 345,000 FSU immigrants arrived in Israel, 7.7% of the total 1989 Israeli population. As a comparison, around 16,000 Soviet immigrants had arrived in Israel between 1980–1988. Figure 1 plots the number of FSU yearly arrivals to Israel between 1948–2015. Peak migration in 1990–1991 was followed by sustained levels of around 60,000 annual arrivals until 1999, with a steady decline starting thereafter. During 1990–1999, between 80–90% of all immigrants arriving to Israel did so from the FSU (see Appendix Figure A1).

On arrival, FSU immigrants were granted citizenship, full access to social benefits, and had freedom over residential and labor market choices (Smooha, 2008; Buchinsky et al., 2014). The government offered assistance settling in, initially subsidizing rent and mortgages, and providing voluntary Hebrew language classes (which most immigrants did not speak). Even though assistance was comprehensive and covered many dimensions, it was modest in quantity and immigrants had to find complementary income sources very early on after arriving to Israel (Remennick, 2007).

The magnitude of this migration shock notwithstanding, existing studies find that negative effects on natives' wages and employment were, if any, modest and short-lived (Friedberg, 2001; Cohen-Goldner and Paserman, 2011; Cohen-Goldner et al., 2012). Capital accumulation and technology responses have been put forward as explanations for the absence of meaningful impacts on natives' wages (Gandal et al., 2004; Cohen-Goldner et al., 2012).

FSU immigrants were highly educated relative to the Israeli population. Out of those who arrived in 1990–1991, 30% of prime-age males had a college degree compared to 17%

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[6]Migration options outside of Israel were less accessible. The US, for instance, stopped granting refugee status to Soviet Jews in October 1989. Germany, which admitted the greatest number of FSU Jews after Israel and the US, started granting asylum visas in 1990 but didn't offer citizenship as Israel did (Remennick, 2007).

of prime-age male Israelis at the time; 70% of migrants had held middle- or high-skilled occupations in the FSU compared to 30% of Israelis (Cohen-Goldner et al., 2012). Immigrants typically found employment quickly but initial occupational downgrading with respect to previous FSU jobs was prevalent, with the job prospects of many hindered by lacking language skills or limited portability of human capital acquired in the FSU (Friedberg, 2000; Weiss et al., 2003; Remennick, 2007). Over time, FSU immigrants climbed the occupational ladder and experienced rapid rates of wage growth. Using survey data, Cohen-Goldner et al. (2012) provide a detailed study of FSU immigrants' integration in the Israeli labor market. They estimate that college-educated FSU immigrants who arrived in 1990–1991 initially earned 58% of what comparable natives earned, 68% after five years, and 90% after 20 years. However, Cohen-Goldner et al. (2012) lacked employer-employee data and did not study assimilation through heterogeneous firms or the role of firm-specific pay premiums.

We complement these studies being the first to study this remarkable historical episode using administrative matched employer-employee population data. This allows us to document new facts and provide new evidence on the contribution of heterogeneous firms and differential worker-firm matches in the evolution of FSU immigrants' labor market outcomes and assimilation.

# 4   Data

We use newly available matched employer-employee administrative records from Israel. These data span 1983-2015 and contain information about the entire Israeli workforce collected from tax records. The dataset includes person identifiers, firm identifiers, monthly indicators for each firm where a person worked, the yearly salary received from each employer in a year, and firms' industry.

The employment tax records are merged with the Israeli Population Registry. This dataset covers the full population of Israel and includes demographic information such as date of birth, sex, ethnic group, country of birth, and date of arrival to Israel. Crucially, country of birth and date of arrival allow us to identify FSU migrants and the amount of time they have lived in Israel at any point in time. Observing the date of arrival allows us to know the actual amount of time an immigrant has spent in Israel without relying on the timing of the first appearance in employment records. Finally, starting in 2000 we observe yearly geocoded information on persons' city and neighborhood of residence.

## 4.1   Sample Selection

Our sample includes (i) male Israeli natives, excluding Arabs and ultra-Orthodox Jews, who were aged 25–64 between 1991–2015, and (ii) male FSU immigrants who arrived in Israel between 1990–1999 and who were ages 25–64 between 1991–2015. We further exclude from our sample worker-year observations with earnings less than 25% the national average

monthly wage.[7] The time span of our analysis sample is 1991–2015 (from the first year after the full start of the migration shock until the latest year available). We call the sample resulting after these restrictions "full sample."

Taking the full sample, we then limit attention to all FSU immigrants and, for computational reasons, a randomly drawn 25% sample of natives (drawn from the person-level data of all natives who appear at least once in tax records during 1991–2015). This procedure makes the resulting sample have approximately the same number of FSU immigrants and natives. We call this sample the "random sample." With its over-representation of FSU immigrants, the random sample is not representative of the Israeli workforce as a whole; however, natives and FSU immigrants in our random sample are representative of natives and FSU immigrants in the population, respectively. The fact that each group in our sample is representative of the population group ensures our assimilation analysis results representative.

Finally, we take the random sample and restrict attention to observations belonging to the largest connected set of firms. A connected set of firms, linked by worker movements, is required for the identification of models with worker and firm fixed effects. The observations belonging to the largest connected set of firms comprise our analysis sample, which we call "connected sample."

Our analysis sample is a panel dataset at the annual frequency, assigning each person-year observation the firm where that person was employed during the month of November. We calculate the monthly salary by dividing the yearly salary in a firm by the number of months worked at that firm. If someone was employed at more than one firm during November, we follow previous literature and assign him to the firm that paid a greater monthly salary.

## 4.2 Summary Statistics

Table 1 shows sample sizes and sample means, separately for natives and immigrants, for the full sample, random sample, and connected sample. The connected sample—our main analysis sample—has over 5 million worker-year observations on 475,607 workers and 204,557 firms.

Going from the random sample to the connected sample we lose 2.4% and 0.4% of native and immigrant worker-year observations, respectively. This is due to 15,767 firms (7.2% of the total firms in the random sample) that are not in the largest connected set. As expected, these dropped firms are relatively small as evidenced by a higher average firm size in the connected sample.

FSU immigrants comprise twenty percent of the full sample and half of the random and connected samples. Immigrants are on average five years older than natives: the average birth year for natives is 1970 compared to 1965 for migrants.[8] The average monthly salary

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[7]The monthly minimum wage in 2015 was 48.8% of the average wage in that year. This ratio fluctuates between 40%–50% in 1990–2015. Therefore, we exclude workers earn approximately 50% or less the minimum wage.

[8]Appendix Figure A2 shows the age at arrival to Israel for immigrants in our sample. It is rather smooth

for natives is around 16,000 Shekels (2017 prices) while that of FSU immigrants is around 10,000 Shekels—a 37.5% raw differential when averaging over the whole sample period.

From these raw summary statistics, we can already see that, averaging across years, immigrants and natives are sorted into different types of firms. Natives are employed in significantly larger firms. In the connected sample, the native-worker-weighted average firm size is 4,023 employees, whilst the immigrant-worker-weighted average firm size is 1,845 employees. The differential sorting of immigrants into firms is also reflected in firms' immigrant employee share. On average, an FSU immigrant works in a firm where 54% of its employees are other FSU immigrants. On average, an Israeli native works in a firm where 28% of its employees are FSU immigrants. Finally, when averaging over the whole sample period, differences in firm age are not as pronounced. The native-worker-weighted and immigrant-worker-weighted average firm ages are 13.74 and 13.50 years, respectively.

## 5   Firm Creation and Immigrants' Allocation to Firms

How was such a large inflow of FSU immigrants absorbed across existing firms and firms born in the midst of the shock? How segregated were FSU immigrants' jobs? This section addresses these questions presenting stylized facts on i) the creation of new firms in Israel, ii) the allocation of FSU immigrants between old and new firms, and iii) the segregation of FSU immigrants' employment across firms. Regarding immigrants' allocation to firms we focus attention on the arrival cohort of 1990 and follow them over the following years.[9]

### 5.1   Creation of new firms

Figure 2 plots the number of new firm births in Israel between 1989–2015. Relative to what the 1989/90–2000s trend, there is an "extra mass" of firm births during the 1990s—the peak years of mass FSU arrivals. In 1995 about 24,000 new firms were born, compared to 17,000 in 1989. After the 1995 peak, a comparable number of firms were not born until 2015.

We investigate how many of the extra mass of new firms are firms primarily employing FSU immigrants. These could be either firms created by FSU immigrants, or by native entrepreneurs disproportionately drawing from the new pool of FSU labor. Figure 3 plots new firm births for three alternative definitions of "FSU firms": firms which, at birth, their employees are i) 100% FSU immigrants, ii) 75% or more FSU immigrants, or iii) 50% or more FSU immigrants. Across the three definitions, the 1995–97 peak of "FSU firm" creation is between 1,300–2,200 firms per year. Comparing this number to the extra mass in Figure 2 (roughly 5,000 firms in 1995), we conclude that "FSU firms" represent less than half of the spur of firm creation that occurred in the midst of the mass arrival shock. This could possibly be due to demand effects originated by the substantial positive population shock that FSU immigrants generated.

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with a spike around 18 years of age, which is the age in which high school ends and military service begins.

[9]As Figure 1 shows, this was the first full-scale year of the migration shock, and the one in which the most FSU immigrants arrived.

## 5.2 Immigrants' allocation between new and old firms

The darker series in Figure 4 plots the fraction of the 1990 arrival cohort who are employed at firms born in 1989 or after. It is informative to see that in 1991 this share was equal to 22%. This implies that newly created firms absorbed a significant fraction of new arrivals. Naturally, as time goes by the fraction working in firms born 1989 or after increases.

The lighter series in Figure 4 plots the fraction of the 1990 arrival cohort who, at any point in time, are employed at new firms (firms that are 5 years old or younger). 34% of the 1990 arrival cohort were employed at new firms in 1991. As time goes by, these immigrants are less and less likely to be employed at new firms (either by changing firms, or because their firm is no longer new). The fraction employed at new firms reaches 24% by 2000, and 13% by 2015. We provide additional results regarding firm age (including comparisons with natives) in Section 8.

## 5.3 Immigrants' segregation across firms

Figure 5 plots the time series of the share of 1990 arrivals who work at firms with varying levels of FSU-immigrant concentration. For instance, the middle series labeled "firm FSU share $\geq 0.5$" indicates that in 1991, 72% of 1990 arrivals were employed in a firm whose workforce was majority FSU immigrants. The figure shows that initial segregation was high: as many as 28% of immigrants where employed in 1991 in a firm in which over 70% of the workforce were FSU immigrants. As time in Israel goes by, this segregation decreases sharply, due to a gradual within-firm mixing of natives and immigrants. For instance, by 2015 only 27% of 1990 arrivals are employed at a firm where more than half of the workforce are FSU immigrants.

# 6 Framework: Wage Setting and Assimilation Statistics

In this section, we introduce a wage-setting framework that leads to a salary equation that is additive in worker and firm effects. We then define a series of assimilation statistics that build upon this framework.

## 6.1 Wage Setting

We frame our empirical analysis with a wage-setting model building on Card et al. (2016). This simple model allows us to quantify migrants' assimilation since the arrival to Israel, and the impact of heterogeneous firms in this process. Workers are indexed by $i$ and time periods are indexed by $t$. The firm where worker $i$ is employed at period $t$ is indexed by $J(i,t)$. Nativity of a worker $i$ (Israel native vs. FSU immigrant) is given by $B(i) \in \{N, M\}$, where $N$ denotes native and $M$ denotes immigrant.

Log monthly salary is given by

$$w_{it} = m_{it} + \gamma S_{iJ(i,t)t}. \tag{1}$$

Where $m_{it}$ represents the outside option of worker $i$ in period $t$, $S_{iJ(i,t)t}$ is the surplus of the $i$-$J(i,t)$ match in period $t$, and $\gamma$ denotes the share of the surplus the worker receives.

Surplus $S_{iJ(i,t)t}$ is decomposed in the following way:

$$S_{iJ(i,t)t} = \overline{S}_{J(i,t)} + \phi_{J(i,t)t} + u_{iJ(i,t)}. \tag{2}$$

$\overline{S}_{J(i,t)}$ captures time-invariant determinants of a firms' surplus (e.g. market power, productivity), $\phi_{J(i,t)t}$ captures shocks to the firm surplus that impact all workers equally, and $u_{iJ(i,t)}$ captures a time-invariant match-specific component for worker $i$ and firm $J(i,t)$.

Additionally, the worker's outside option $m_{it}$ is decomposed in the following way:

$$m_{it} = \underbrace{f(A_{it}) \cdot \mathbf{1}\{B(i) = M\}}_{\equiv \theta_{A_{it}}} + \alpha_i + X'_{it}\beta + r_{it}. \tag{3}$$

$A_{it}$ denotes years since arrival to Israel and $f(A_{it})$ summarizes the reward for immigrants' attributes that evolve as time in Israel increases (e.g. Hebrew language, other skills relevant to the Israeli society and labor market, growing social and professional networks). Simplifying notation, we define $\theta_{A_{it}} \equiv f(A_{it}) \cdot \mathbf{1}\{B(i) = M\}$. The component $\alpha_i$ represents time-invariant unobserved worker characteristics (e.g. education, ability), while $X_{it}$ captures observed time-varying worker characteristics rewarded similarly for migrants and natives (age and time effects).

Combining equations (1), (2), and (3) we can write log monthly salary as

$$w_{it} = \theta_{A_{it}} + \alpha_i + \psi_{J(it)} + X'_{it}\beta + \varepsilon_{it} \tag{4}$$

Where $\psi_{J(it)} = \gamma \overline{S}_{J(i,t)}$ and $\varepsilon_{it} = \gamma(\phi_{J(i,t)t} + u_{iJ(i,t)}) + r_{it}$.

Note that an alternative interpretation for equation (4) arises from a model of monopsonistic wage setting (Card et al., 2018). In such a model, workers have idiosyncratic preferences for different employers and firms set profit-maximizing wages, with more productive firms setting higher wages to attract a larger workforce. In the framework laid out above, premiums $\psi_J$ are a combination of $J$'s average match surplus and workers' surplus share. In the monopsonistic setting, $\psi_J$ are a combination of $J$'s value-added per worker and a labor supply parameter. Our main findings and interpretations build up on equation (4) and do not meaningfully change between the bargaining and monopsonistic interpretations of the premiums.

## 6.2 Identification Assumptions

Consistent estimation of the parameters in equation (4) using OLS requires exogenous mobility assumptions to hold (see Card et al., 2016, for a detailed discussion). Threats to identification arise from mobility into or out of a given firm being correlated with the unobservable wage components $\phi_{jt}$ (firm-level shocks), $u_{ij}$ (match-specific component), or $r_{it}$ (transitory wage shocks).

Card et al. (2013), Card et al. (2016), Macis and Schivardi (2016), and Gerard et al. (2018) carry out a variety of tests indicating that, reassuringly, administrative data from Germany, Portugal, Italy, and Brazil are consistent with the exogenous mobility assumption. We plan on carrying out the same type of tests in the Israeli data. Bonhomme et al. (2019), in the context of a more flexible model, show that modeling firm and worker heterogeneity in a log-additive way is a good approximation.

The gradual sorting of migrants into higher-paying firms as their time in Israel increases does not necessarily pose a threat to identification since we explicitly condition on time since arrival to Israel. Similarly, sorting based on time-invariant worker characteristics (e.g. higher ability workers matching with high-paying firms) does not pose a threat thanks to the inclusion of worker and firm fixed effects.

Limited mobility of workers and firms can lead to limited mobility bias (Andrews et al., 2008) and overestimation of the role of firm effects on the variance of salaries in models such as (4). However, recent evidence shows that, in long panels such as ours, the bias is small (Lachowska et al., 2020).

## 6.3 Assimilation Statistics: Earnings

We define different earnings assimilation statistics and map them into the wage-setting model above. This exercise provides a way of defining and decomposing what part of immigrants' labor market assimilation is accounted for by firms' pay premiums. We describe the estimation of the assimilation statistics defined below in Section 7.

### 6.3.1 Earnings: Immigrant to Native Comparisons

The first assimilation statistic compares immigrants' earnings to those of natives as a function of immigrants' time spent in Israel, simply adjusting for age and time effects. This assimilation statistic, capturing the overall earnings gap, is defined as:

$$MN^w(A_{it}) \equiv E\left(w_{it}|M, A_{it}, X_{it}\right) - E\left(w_{it}|N, X_{it}\right) \tag{5}$$

Based on equation (4) and omitting $X_{it}$ for notational simplicity, $MN^w(A_{it})$ amounts to:[10]

$$MN^w(A_{it}) = \underbrace{\theta_{A_{it}}}_{\text{non-firm assimilation}} + \underbrace{E\left(\alpha_i|M\right) - E\left(\alpha_i|N\right)}_{\text{baseline differences}} + \underbrace{E\left(\psi_{J(it)}|M, A_{it}\right) - E\left(\psi_{J(it)}|N\right)}_{\text{firm assimilation}}$$
(6)

We estimate $MN^w(A_{it})$ below in specification (15).

The next statistic compares immigrants' earnings to those of natives as a function of time spent in Israel, additionally controlling for employers' identity. This assimilation statistic, capturing the within-firm earnings gap, is defined as:

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[10]Note that assuming no selective sample attrition we have that $E\left(\alpha_i|M.A_{it}\right) = E\left(\alpha_i|M\right)$.

$$MN^w(A_{it}|J(it)) \equiv E\left(w_{it}|M, A_{it}, X_{it}, \psi_{J(it)}\right) - E\left(w_{it}|N, X_{it}, \psi_{J(it)}\right) \tag{7}$$

Based on equation (4) and abstracting from $X_{it}$ for notational simplicity, $MN^w(A_{it}|J(it))$ amounts to:

$$MN^w(A_{it}|J(it)) = \underbrace{\theta_{A_{it}}}_{\text{non-firm assimilation}} + \underbrace{E\left(\alpha_i|M, \psi_{J(it)}\right) - E\left(\alpha_i|N, \psi_{J(it)}\right)}_{\text{within-firm baseline differences}} \tag{8}$$

We estimate $MN^w(A_{it}|J(it))$ below in specification (16).

### 6.3.2 Earnings: Immigrant to Immigrant Comparisons

We define assimilation statistics which document within-immigrant convergence trends. That is, we document how do the earnings of a given immigrant compare to his own earnings after 25 years in Israel. In its simplest comparison—adjusting for age, time, and invariant person effects—this assimilation statistic is defined as:

$$MM^w(A_{it}) \equiv E\left(w_{it}|M, A_{it}, \alpha_i, X_{it}\right) - E\left(w_{it}|M, A_{it}=25, \alpha_i, X_{it}\right) \tag{9}$$

Abstracting from $X_{it}$ for notational simplicity, $MM^w(A_{it})$ amounts to

$$MM^w(A_{it}) = \underbrace{\theta_{A_{it}} - \theta_{25}}_{\text{non-firm self-assimilation}} + \underbrace{E\left(\psi_{J(it)}|M, A_{it}, \alpha_i\right) - E\left(\psi_{J(it)}|M, A_{it}=25, \alpha_i\right)}_{\text{firm self-assimilation}} \tag{10}$$

We estimate $MM^w(A_{it})$ below in specification (17).

Finally, we define within-immigrant convergence trends that additionally control for employers' identity. This assimilation statistic is defined as:

$$MM^w(A_{it}|J(it)) \equiv E\left(w_{it}|M, A_{it}, \alpha_i, X_{it}, \psi_{J(it)}\right) - E\left(w_{it}|M, A_{it}=25, \alpha_i, X_{it}, \psi_{J(it)}\right) \tag{11}$$

Abstracting from $X_{it}$ for notational simplicity, $MM^w(A_{it}|J(it))$ amounts to

$$MM^w(A_{it}|J(it)) = \underbrace{\theta_{A_{it}} - \theta_{25}}_{\text{non-firm self-assimilation}} \tag{12}$$

We estimate $MM^w(A_{it}|J(it))$ below in specification (18).

## 6.4 Assimilation Statistics: Firm Characteristics

We are interested in decomposing how much of earnings assimilation is attributable to sorting at heterogeneous firms. We can quantify this decomposition by comparing estimates

of the earnings assimilation statistics defined above.[11] A different approach is to directly estimate *firm assimilation* (defined in equation (6)) and *firm self-assimilation* (defined in equation (10)) using a two-step procedure.[12] First, estimating firm pay premiums $\psi_{J(it)}$, and second, using these estimates to directly estimate firm assimilation and firm self-assimilation.

Further, we are interested in documenting assimilation in other employer characteristics different from pay premiums. Specifically, we define and estimate assimilation statistics in terms of firm size and firm age. Two main reasons motivate this exercise. The first is to better understand how does assimilation through firms occurs, focusing on firm attributes that are model-free and easily observable by all (e.g. workers, policymakers). The second is the observation that workers value non-wage job amenities (e.g. Sorkin, 2018); to the extent that firm size and firm age are correlated with non-wage amenities (e.g. Brown et al., 1990), documenting assimilation along these dimensions will complement documenting assimilation in earnings. Together with the previous exercises, the goal is to paint a more complete picture of immigrants' labor market assimilation.

### 6.4.1 Firm Characteristics: Immigrant to Native Comparisons

Let a characteristic of firm $J$ where worker $i$ is employed at time $t$ be denoted by $\pi_{J(it)t}$. The first firm assimilation statistic compares immigrant-worker-weighted firm characteristics with native-worker-weighted firm characteristics, documenting how this difference changes as immigrants' time since arrival to Israel increases. This assimilation statistic is defined as:

$$MN^f(A_{it}) \equiv E\left(\pi_{J(it)t}|M, A_{it}, X_{it}\right) - E\left(\pi_{J(it)t}|N, X_{it}\right) \tag{13}$$

Note that when $\pi_{J(it)t} = \psi_{J(it)}$, $MN^f(A_{it})$ is equivalent to the firm assimilation definition in equation (6). We estimate $MN^f(A_{it})$ below in specification (19).

### 6.4.2 Firm Characteristics: Immigrant to Immigrant Comparisons

Lastly, we define a within-immigrant firm assimilation statistic that compares firms where immigrants are employed at different points in time since arrival to firms where they themselves are employed after 25 years in the country. This assimilation statistic is defined as:

$$MM^f(A_{it}) \equiv E\left(\pi_{J(it)t}|M, A_{it}, \alpha_i, X_{it}\right) - E\left(\pi_{J(it)t}|M, A_{it}=25, \alpha_i, X_{it}\right) \tag{14}$$

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[11] For instance, comparing $MM^w(A_{it})$ and $MM^w(A_{it}|J(it))$ provides an estimate of firm self-assimilation

$$MM^w(A_{it}) - MM^w(A_{it}|J(it)) = E\left(\psi_{J(it)}|A_{it}, M, \alpha_i\right) - E\left(\psi_{J(it)}|A_{it}=25, M, \alpha_i\right)$$

[12] Note that we cannot estimate firm assimilation simply subtracting $MN^w(A_{it}|J(it))$ from $MN^w(A_{it})$ due to sorting. That is,

$$E\left(\alpha_i|M\right) - E\left(\alpha_i|N\right) \neq E\left(\alpha_i|M, \psi_{J(it)}\right) - E\left(\alpha_i|N, \psi_{J(it)}\right)$$

Note that when $\pi_{J(it)t} = \psi_{J(it)}$, $MM^f(A_{it})$ is equal to the firm self-assimilation definition in equation (10).

# 7 Estimating Assimilation: Earnings and Firm Characteristics

In this section we describe how we estimate the assimilation statistics defined above. The four earnings assimilation statistics are $MN^w(A_{it})$, $MN^w(A_{it}|J(it))$, $MM^w(A_{it})$, and $MM^w(A_{it}|J(it))$. The two firm-characteristics assimilation statistics are $MN^f(A_{it})$ and $MM^f(A_{it})$.

## 7.1 Estimation of Earnings Assimilation

We start by estimating earnings assimilation statistics and, in the process of doing so, we estimate the firm-specific pay premiums we will use in the estimation of firm assimilation statistics.

### 7.1.1 Immigrant to Native Assimilation in Earnings

We estimate immigrant-native earnings assimilation statistics $MN^w(A_{it})$ and $MN^w(A_{it}|J(it))$, which compare immigrants to natives at different points in time, with the following regressions:

$$w_{it} = M_i \cdot \left[ \sum_{a=1}^{A} \beta_a \mathbf{1}\{A_{it} = a\} \right] + X'_{it}\gamma + \varepsilon_{it} \tag{15}$$

$$w_{it} = M_i \cdot \left[ \sum_{a=1}^{A} \beta_a \mathbf{1}\{A_{it} = a\} \right] + \phi_{J(it)} + X'_{it}\gamma + \varepsilon_{it} \tag{16}$$

Where $i$ indexes people, $t$ calendar years, $w_{it}$ are log monthly earnings, $M_i$ is a dummy variable equal to one if $i$ is an immigrant, $A_{it}$ are years since arrival to Israel, $X'_{it}$ includes time and age effects,[13] and $\phi_{J(it)}$ are firm fixed effects (indexing firms with $J$).

The parameters $\beta_a$ capture how does the immigrant-native differential change as immigrants spend more time in Israel. We set $A = 25$, thus documenting convergence trends for a period of 25 years since arrival. The parameters $\beta_a$ in specification (15) represent $MN^w(A_{it})$, while the equivalent parameters in specification (16) represent $MN^w(A_{it}|J(it))$.[14]

### 7.1.2 Immigrant to Immigrant-after-25-years Assimilation in Earnings

We estimate within-immigrant earnings assimilation statistics $MM^w(A_{it})$ and $MM^w(A_{it}|J(it))$, which compare immigrants at different points in time to themselves 25 years after arrival,

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[13]Throughout the paper time effects are calendar year fixed effects, while age effects are age fixed effects in specifications without worker fixed effects, and quartic polynomials of age restricted to be flat at age 40 in specifications with worker fixed effects (Card et al., 2018).

[14]Note that since model (16) does not include person fixed effects, the firm effects $\phi_{J(it)}$ do not have the same interpretation as AKM firm effects. Rather, they represent average firm wages thus combining firms' pay premiums and workforce composition.

with the following regressions:

$$w_{it} = M_i \cdot \left[ \sum_{a=1}^{A} \beta_a \mathbf{1}\{A_{it} = a\} \right] + \alpha_i + X'_{it}\gamma + \varepsilon_{it} \tag{17}$$

$$w_{it} = M_i \cdot \left[ \sum_{a=1}^{A} \beta_a \mathbf{1}\{A_{it} = a\} \right] + \alpha_i + \psi_{J(it)} + X'_{it}\gamma + \varepsilon_{it} \tag{18}$$

Where $i$ indexes people, $t$ calendar years, $w_{it}$ are log monthly earnings, $M_i$ is a dummy variable equal to one if $i$ is an immigrant, $A_{it}$ are years since arrival to Israel, $X'_{it}$ includes time and age effects, $\alpha_i$ are person fixed effects, and $\psi_{J(it)}$ are firm fixed effects.

We set $A = 25$ and normalize $\beta_{25} = 0$. In this way, and given the inclusion of person fixed effects $\alpha_i$, the parameters $\beta_a$ for $a \in \{1, \ldots, 24\}$ capture the earnings convergence trend of an immigrant with respect to himself 25 years after arrival.

The parameters $\beta_a$ in specification (17) represent $MM^w(A_{it})$, while the equivalent parameters in specification (18) represent $MM^w(A_{it}|J(it))$.

We store AKM firm fixed effects $\hat{\psi}_{J(it)}$ estimated in specification (18) and we use them next when estimating assimilation in firm characteristics.

## 7.2   Estimation of Firm Characteristics Assimilation

We estimate firm assimilation statistics focusing on various employer characteristics $\pi_{J(it)t}$: pay premiums $\psi_{J(it)}$, size (number of employees), whether a firm is new or not (less than 5 years old), and age (in years).[15]

### 7.2.1   Immigrant to Native Assimilation in Employer Characteristics

We estimate immigrant-native employer assimilation $MN^f(A_{it})$, which compares employers of immigrants and natives at different points in time, with the following regression:

$$\pi_{J(i,t)t} = M_i \cdot \left[ \sum_{a=1}^{A} \beta_a \mathbf{1}\{A_{it} = a\} \right] + X'_{it}\gamma + \varepsilon_{it} \tag{19}$$

The parameters $\beta_a$ capture how do immigrant-native employer differentials change as immigrants spend more time in Israel. We set $A = 25$, thus documenting convergence trends for a period of 25 years since arrival. The parameters $\beta_a$ in this regression represent $MN^f(A_{it})$.

### 7.2.2   Immigrant to Immigrant-after-25-years Assimilation in Employer Characteristics

We estimate within-immigrant employer assimilation $MM^f(A_{it})$, which compares employers of migrants at different points since arrival with their own employers after 25 years,

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[15]Note that pay premiums $\psi_{J(it)}$ are a time-invariant firm characteristic while measures of size and age are time-varying. Results are very similar if we use time-invariant measures of firm size and age (average across the sample years). A firm's age is computed using the year in which it first appears in tax records, truncated at 1983.

with the following regression:

$$\pi_{J(i,t)t} = M_i \cdot \left[ \sum_{a=1}^{A} \beta_a \mathbf{1}\{A_{it} = a\} \right] + \alpha_i + X'_{it}\gamma + \varepsilon_{it} \tag{20}$$

$\beta_{25}$ is normalized to zero, and the remaining $\beta_a$ parameters in this regression represent $MM^f(A_{it})$.

## 8 Results

### 8.1 Results: Earnings Assimilation

Figure 6 shows estimates and 95% confidence intervals of the different earnings assimilation statistics $MN^w(A_{it})$, $MN^w(A_{it}|J(it))$, $MM^w(A_{it})$, and $MM^w(A_{it}|J(it))$ described above. Columns (1)–(4) in Table 2 show corresponding point estimates and standard errors (clustered at the person level).

#### 8.1.1 Results: Immigrant-Native Earnings Assimilation

The gray line with round markers in Figure 6 is the estimate of the immigrant-native assimilation statistic $MN^w(A_{it})$. This statistic, estimated with specification (15), combines non-firm assimilation, firm assimilation, and baseline differences. One year after arrival, FSU immigrants earn .84 log points less than comparative natives. This differential shrinks to -.58 log points after five years, -.20 log points after twenty years, and is practically closed after twenty-five years.

The estimate of $MN^w(A_{it}|J(it))$, which compared to $MN^w(A_{it})$ nets out firm assimilation and is estimated with specification (16), is represented by the orange line with square markers. The within-firm differences between immigrants and natives are substantially smaller. One year after arrival, immigrants earn .57 log points less than comparable natives at comparable firms. This differential shrinks to -.38 log points after five years, -.16 after twenty years, and -.07 after twenty-five.

Comparing the two estimates, $MN^w(A_{it})$ and $MN^w(A_{it}|J(it))$, we can see that the within-firm gap is about 32–34% smaller than the overall gap during the first ten years since arrival. Twenty-three years after arrival the two lines actually cross. This crossing indicates that after twenty-three years in Israel, FSU immigrants are actually working in higher-paying firms than comparable natives. This is plausibly related to the higher level of education of FSU immigrants.

#### 8.1.2 Results: Immigrant-Immigrant Earnings Assimilation

The blue line with triangular markers in Figure 6 is the estimate of the immigrant-immigrant assimilation statistic $MM^w(A_{it})$. This statistic, estimated with specification (17), combines non-firm self-assimilation and firm self-assimilation. One year after arrival, FSU immigrants earn .29 log points less than themselves after twenty-five years (adjusting for

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age and time effects). This differential shrinks to -.12 log points after five years, and -.04 log points after twenty years.

The estimate of $MM^w(A_{it}|J(it))$, which compared to $MM^w(A_{it})$ nets out firm-self assimilation and is estimated with specification (18), is represented by the green line with diamond markers. After netting out firm differences, the within-firm immigrant-immigrant differential is substantially smaller. One year after arrival and after controlling for firm effects, FSU immigrants earn .21 log points less than themselves after twenty-five years. This differential shrinks to -.06 log points after 5 years, and -.02 after twenty years.

Comparing the two estimates, $MM^w(A_{it})$ and $MM^w(A_{it}|J(it))$, we can see that accounting for firm effects reduces the immigrant-immigrant differential by 28% one year after arrival, 50% five years after arrival, and 50% twenty-years after arrival. Thus, a sizable share of immigrants' self-assimilation occurs by climbing the job ladder and accessing better-paying firms.

In sum, results in Section 8.1 show that firms play a quantitatively important role in the earnings assimilation of immigrants. The within-firm immigrant-native gap is about 32% smaller than the overall gap during the first 10 years since arrival. Further, employment at higher-paying firms accounts for between 28%–50% of the gap between immigrants and themselves after twenty-five years.

## 8.2    Results: Firm Characteristics Assimilation

Figures 7, 8, and 10 show estimates and 95% confidence intervals of the firm characteristics assimilation statistics $MN^f(A_{it})$ and $MM^f(A_{it})$ for firms' pay premiums, size, and age, respectively. Columns (5)–(10) in Table 2 show corresponding point estimates and standard errors (clustered at the person level).

### 8.2.1    Results: Immigrant-Native Firm Characteristics Assimilation

*Pay premiums*. The gray line with round markers in Figure 7 is the estimate of the immigrant-native assimilation statistic $MN^f(A_{it})$ when focusing on pay premiums as a firm characteristic. This statistic is estimated in two steps with specifications (18) and (19).[16] One year after arrival and relative to comparable natives, FSU immigrants are employed in firms with pay premiums that are smaller by .10 log points (12% of the overall immigrant-native earnings gap). This differential evolves linearly with a positive slope, actually changing sign 19 years after arrival. Twenty-five years after arrival, FSU immigrants are employed in firms with pay premiums that are *larger* by .05 log points.

*Firm size*. The gray line with round markers in Figure 8 is the estimate of the immigrant-native assimilation statistic $MN^f(A_{it})$ when focusing on size as a firm characteristic. This

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[16]The current standard errors (clustered at the person level) do not account for the two-step estimation procedure; in the future, we plan to compute the standard errors proposed by Kline et al. (2019).

statistic is estimated in specification (19) using firm size (log number of employees) as an outcome variable. One year after arrival and relative to comparable natives, FSU immigrants are employed in firms that are 1.35 log points smaller (i.e., about three times smaller). This differential shrinks to -.84 and -.46 five and ten years after arrival, respectively. Nineteen years after arrival the differential changes sign, and twenty-five years after arrival FSU immigrants are employed at firms that are .33 log points larger.

*New firm*. The gray line with round markers in Figure 9 is the estimate of the immigrant-native assimilation statistic $MN^f(A_{it})$ when focusing on whether a firm is new or not as a firm characteristic. This statistic is estimated in specification (19) using a dummy equal to one for firms that are 5 years old or younger as an outcome variable. One year after arrival and relative to comparable natives, FSU immigrants have a .14 higher probability of being employed at a new firm. This differential is closed after 10 years in Israel. After 15 years in Israel the differential changes sign and stabilizes, with immigrants having a .01 lower probability of working at a new firm.

*Firm age*. The gray line with round markers in Figure 10 is the estimate of the immigrant-native assimilation statistic $MN^f(A_{it})$ when focusing on age as a firm characteristic. This statistic is estimated in specification (19) using firm age as an outcome variable. One year after arrival and relative to comparable natives, FSU immigrants are employed in firms that are 1.85 years younger. This differential shrinks to -1.18 and -.58 five and ten years after arrival, respectively. Seventeen years after arrival the differential changes sign, and twenty-five years after arrival FSU immigrants are employed at firms that are .79 years older.

### 8.2.2 Results: Immigrant-Immigrant Firm Characteristics Assimilation

*Pay premiums*. The blue line with triangular markers in Figure 7 is the estimate of the immigrant-immigrant assimilation statistic $MM^f(A_{it})$ when focusing on pay premiums as a firm characteristic. This statistic is estimated in two steps with specifications (18) and (20). One year after arrival and relative to themselves after twenty-five years, FSU immigrants are employed in firms with pay premiums that are smaller by .08 log points. This differential evolves linearly, shrinking to -.06, -.05, and -.02 after five, ten, and twenty years since arrival, respectively.

*Firm size*. The blue line with triangular markers in Figure 8 is the estimate of the immigrant-immigrant assimilation statistic $MM^f(A_{it})$ when focusing on size as a firm characteristic. This statistic is estimated in specification (20) using firm size (log number of employees) as an outcome variable. One year after arrival and relative to themselves after twenty-five years, FSU migrants are employed in firms that are 0.80 log points smaller. This differential evolves linearly, shrinking to -.49, -.29, and -.05 after five, ten, and twenty years since arrival, respectively.

*New firm*. The blue line with round markers in Figure 9 is the estimate of the immigrant-immigrant assimilation statistic $MM^f(A_{it})$ when focusing on whether a firm is new or not as a firm characteristic. This statistic is estimated in specification (20) using a dummy equal to one for firms that are 5 years old or younger as an outcome variable. One year after

arrival and relative to themselves after twenty-five years, FSU immigrants have a .11 higher probability of being employed at a new firm. This differential is closed after 10 years in Israel, changes sign but is close to zero between 10-20 years, before closing again at 21 years since arrival.

*Firm age*. The blue line with triangular markers in Figure 10 is the estimate of the immigrant-immigrant assimilation statistic $MM^f(A_{it})$ when focusing on age as a firm characteristic. This statistic is estimated in specification (20) using firm age as an outcome variable. One year after arrival and relative to themselves after twenty-five years, FSU immigrants are employed in firms that are .71 years younger. This differential evolves linearly, shrinking to -.56, -.42, and -.09 after five, ten, and twenty years since arrival, respectively.

Overall, results in Section 8.2 reinforce the importance of firms in labor market assimilation. For instance, firms' pay premiums account for 10–12% of the overall immigrant-native gap during the first ten years since arrival. As their time in Israel increases, immigrants gradually access higher-paying, larger, and older firms. Compared to natives, they eventually close the gap and surpass native Israelis along these dimensions after twenty years in the country.

# 9  Conclusion

We provide a systematic analysis of how do heterogeneous firms and firm-specific pay premiums contribute to the process of immigrants' labor market assimilation. We do so studying the remarkable migration episode of over one million FSU Jews to Israel in the 1990s, equipped with twenty-five years of Israeli population employer-employee matched data that identifies immigrants and year of arrival. In doing so, we contribute to two large bodies of literature that study firm heterogeneity and firm-specific wage premiums on the one hand, and immigrants' labor market assimilation on the other.

We show that as time in Israel increases, FSU immigrants gradually access higher-paying, larger, and older firms. Firm-specific pay premiums account for 10–12% of the immigrant-native salary wage gap over the first twenty years in Israel, as well as 28% of the age- and time-adjusted gap between immigrants' salary on arrival and after twenty-five years in Israel. All in all, firms and firm-specific pay premiums are a relevant component of the process by which immigrants improve their prospects in the host country and assimilate. More broadly this implies that, in addition to underlying worker productivity, labor market rents—in the way of heterogeneous firm-specific pay policies—are an important component of the immigrant-native wage differential.

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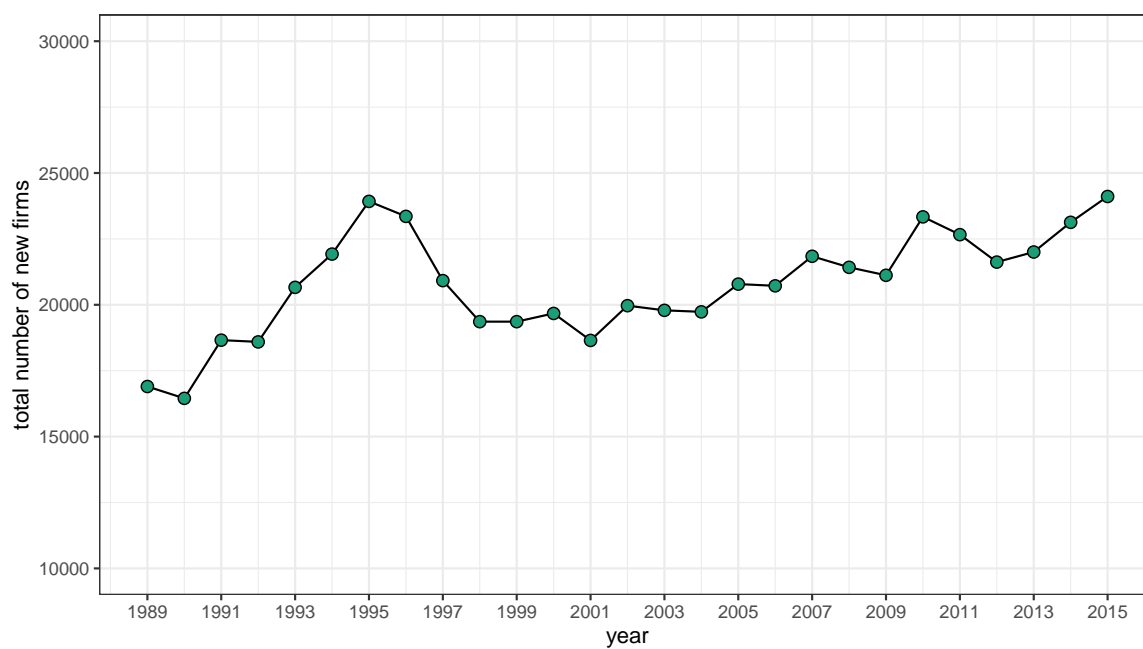
# Figures and Tables

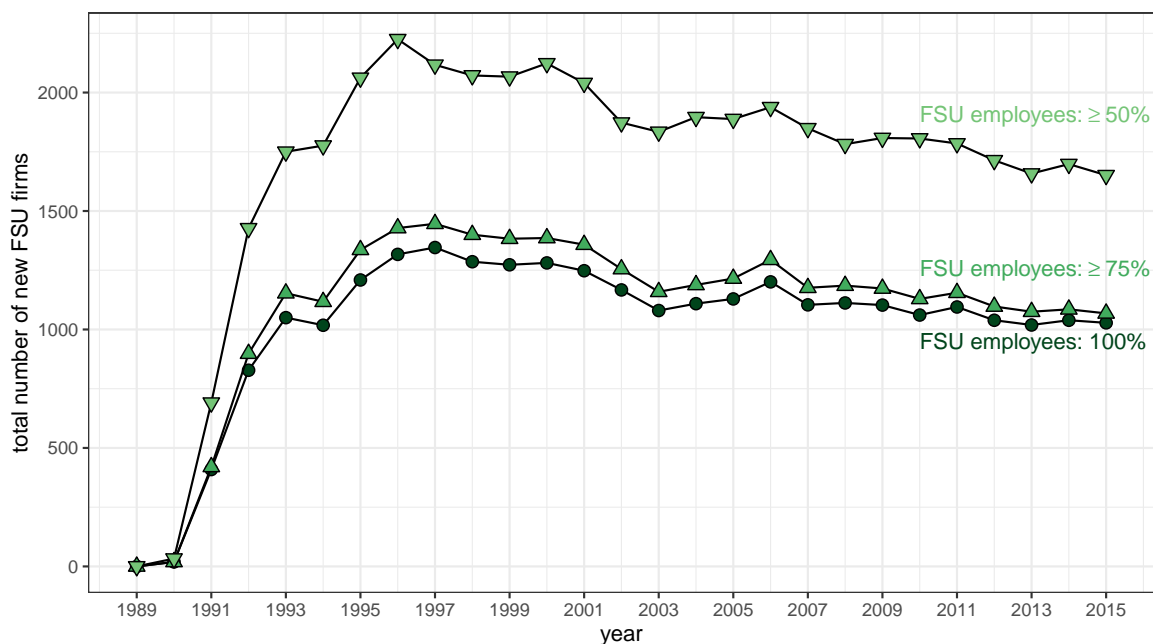**Figure 1:** Former Soviet Union (FSU) Immigration to Israel
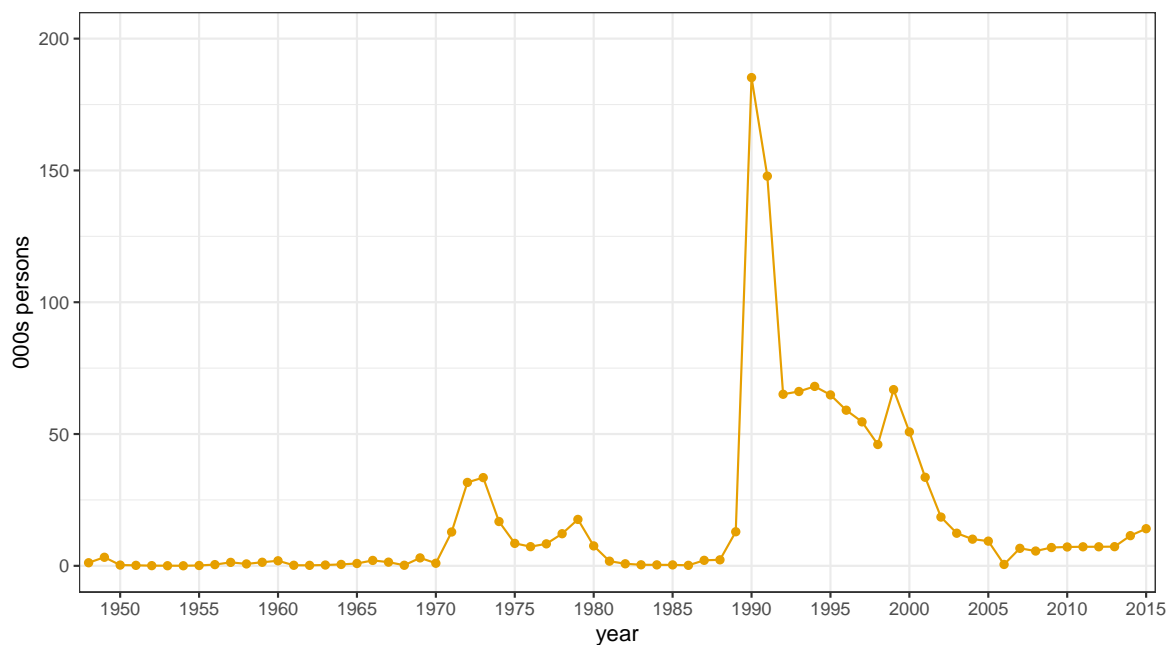


*Notes:* Source is the Israel Central Bureau of Statistics. Number of immigrants arriving to Israel from the former Soviet Union, by year.

**Figure 2:** Number of New Firm Births



*Notes:* Total number of new firm births in Israel, by year.

**Figure 3:** Number of New "FSU" Firm Births.



*Notes:* Number of new "FSU" firm births in Israel, by year, and for three alternative definitions of "FSU" firm: firms which on the year of their birth their employees are i) 100% FSU immigrants, ii) 75% or more FSU immigrants, and iii) 50% or more FSU immigrants.

**Figure 4:** Employment at New vs. Old Firms for FSU Immigrants (1990 arrival cohort)
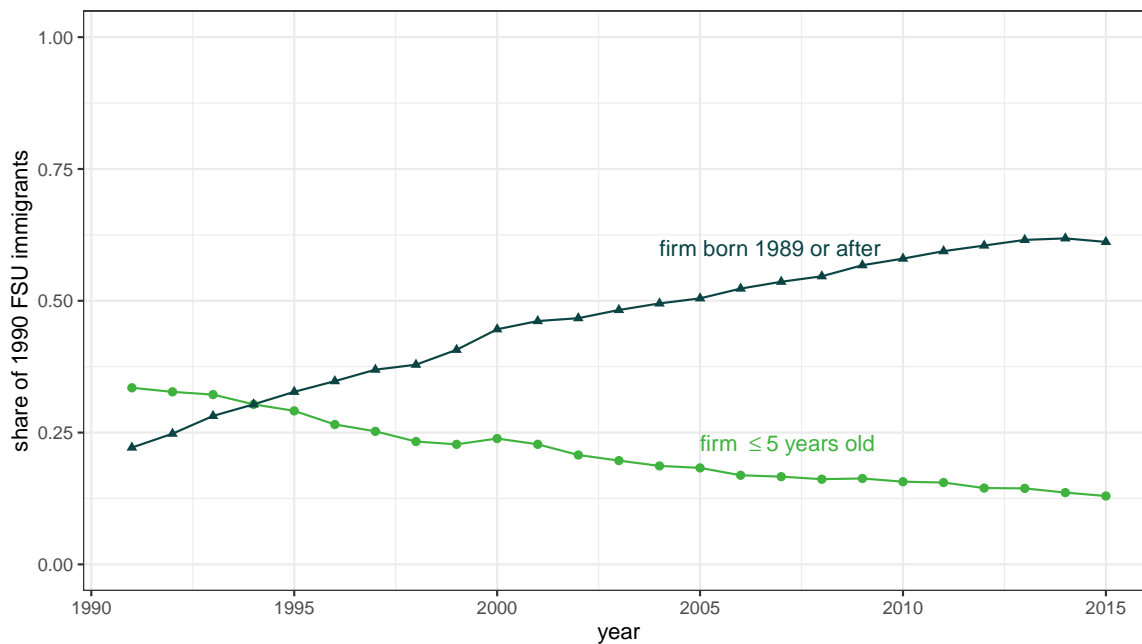


*Notes:* Sample composed of male FSU immigrants who arrived to Israel in 1990. Yearly share of those who work at i) a firm born in 1989 or after, or ii) a firm which is 5 years old or younger.

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**Figure 5:** Firm Employment Segregation of FSU Immigrants (1990 arrival cohort)
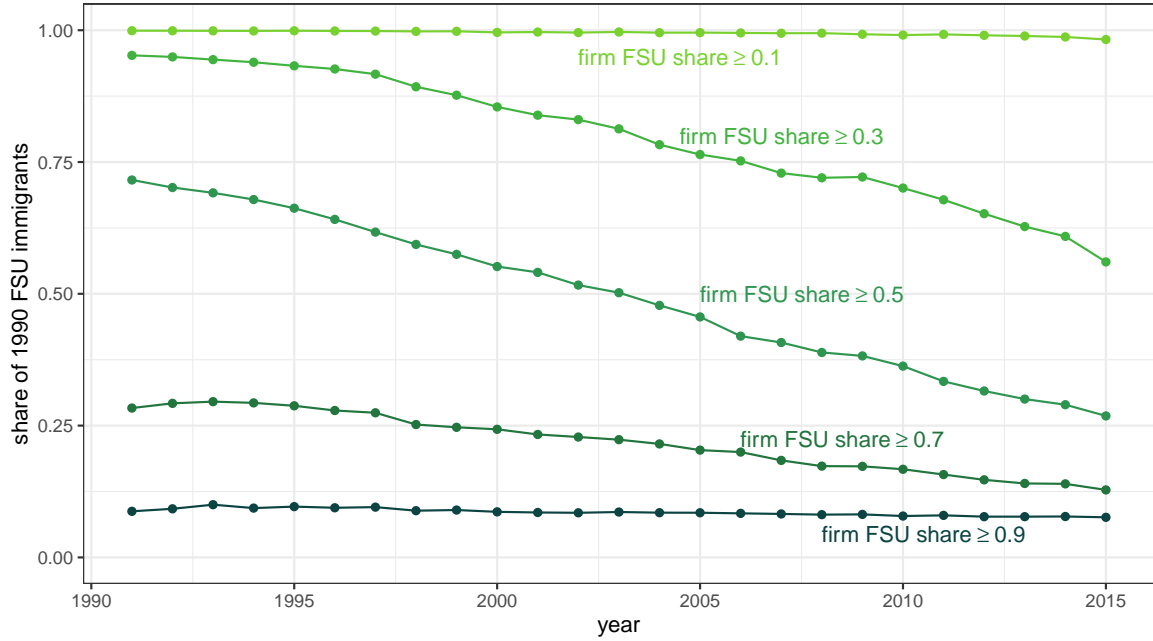


*Notes:* Sample composed of male FSU immigrants who arrived to Israel in 1990. Yearly share of those who work at a firm where the employment share of FSU immigrants is equal to $p$ or higher, for values of $p$ equal to 10%, 30%, 50%, 70% and 90%.

**Figure 6:** Assimilation: Convergence in Earnings
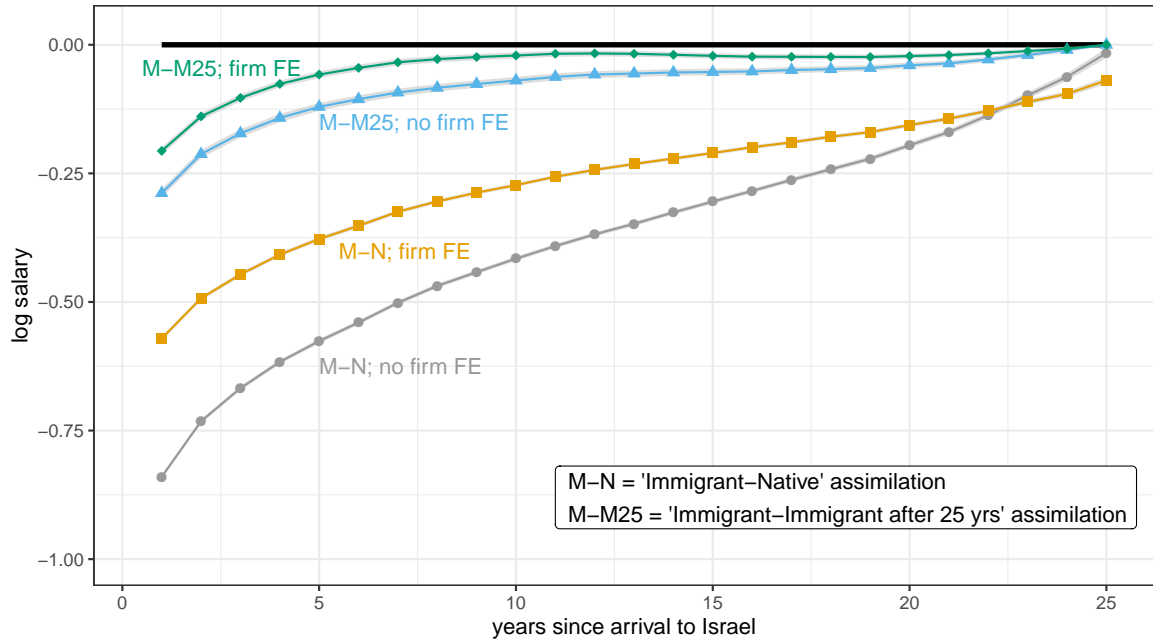


*Notes:* Point estimates an 95% confidence intervals for parameters $\beta_a$ in specifications (15), (16), (17), and (18) in the text. Standard errors clustered at the person level. Sample composed of the population of FSU immigrant male workers and a 25% random sample of native non-Arab non-ultra-Orthodox male workers.

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**Figure 7:** Assimilation: Convergence in Firm Pay Premium
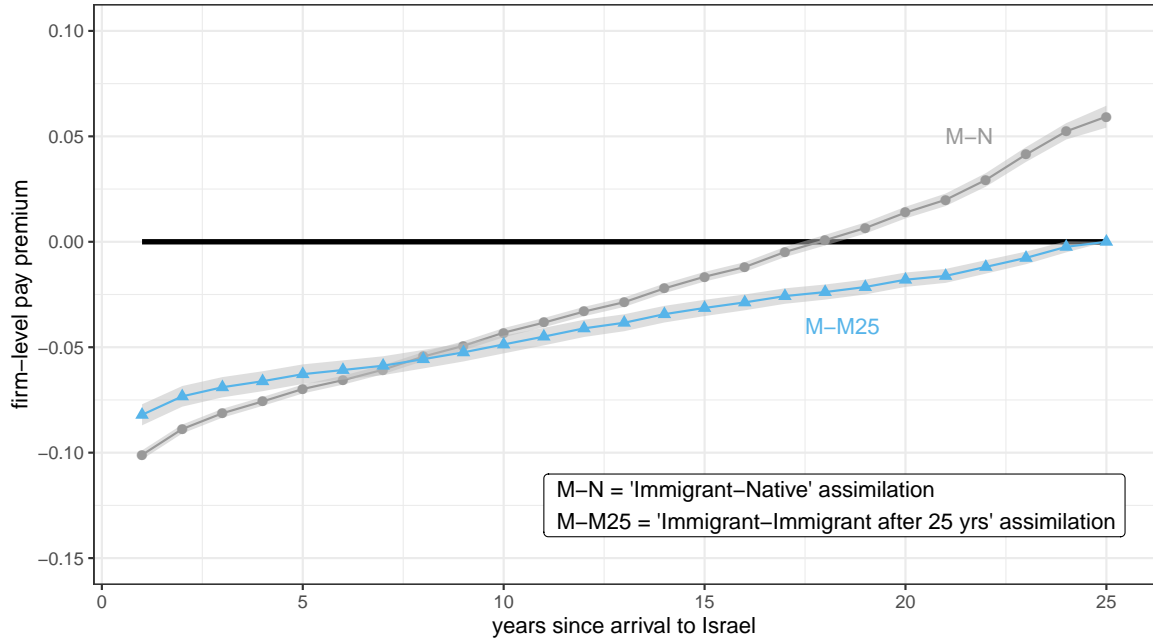


*Notes:* Point estimates an 95% confidence intervals for parameters $\beta_a$ in specifications (19) and (20) in the text. Standard errors clustered at the person level. Sample composed of the population of FSU immigrant male workers and a 25% random sample of native non-Arab non-ultra-Orthodox male workers.

**Figure 8:** Assimilation: Convergence in Firm Size



*Notes:* Point estimates an 95% confidence intervals for parameters $\beta_a$ in specifications (19) and (20) in the text. Standard errors clustered at the person level. Sample composed of the population of FSU immigrant male workers and a 25% random sample of native non-Arab non-ultra-Orthodox male workers.

**Figure 9:** Assimilation: Convergence in Firm Age (New Firm Dummy)



*Notes:* Point estimates an 95% confidence intervals for parameters $\beta_a$ in specifications (19) and (20) in the text. Standard errors clustered at the person level. Sample composed of the population of FSU immigrant male workers and a 25% random sample of native non-Arab non-ultra-Orthodox male workers.

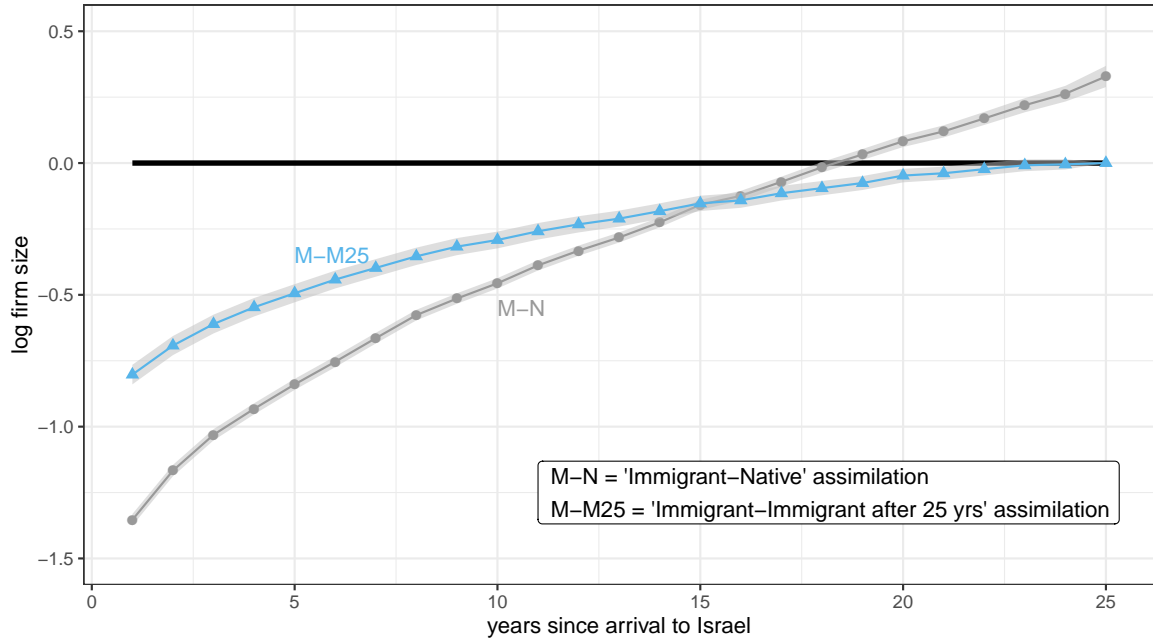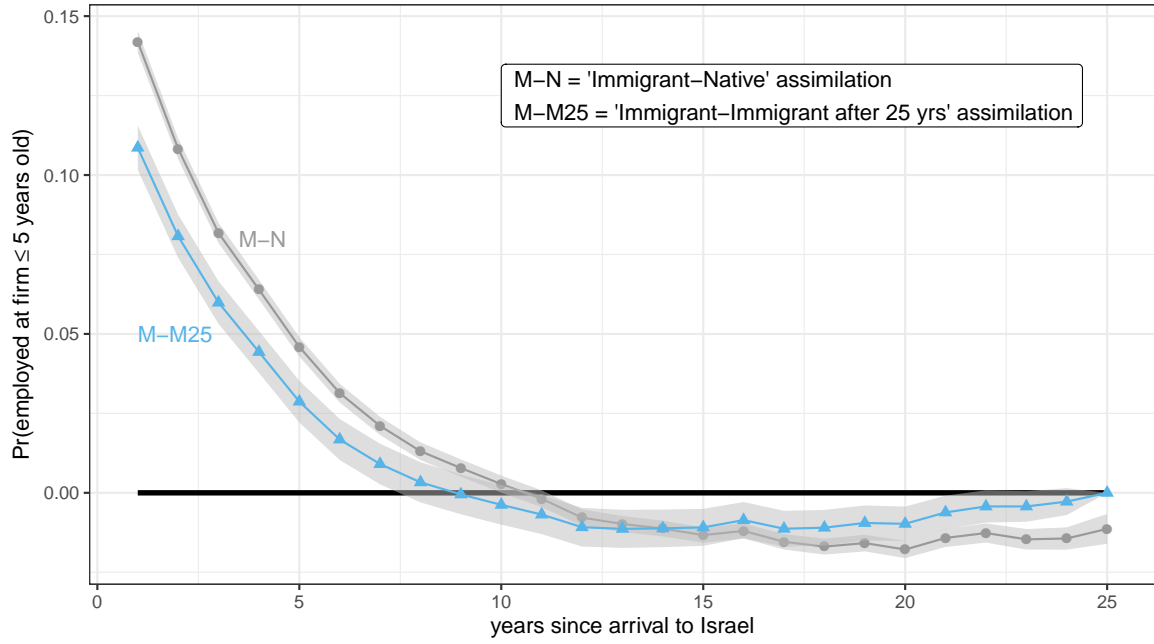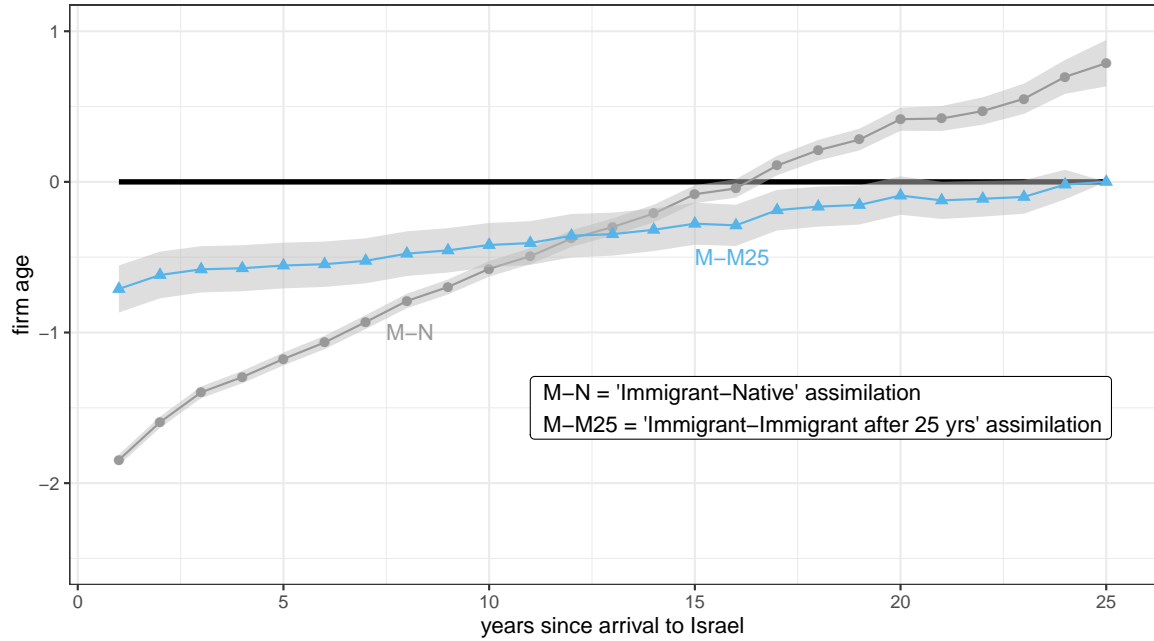**Figure 10:** Assimilation: Convergence in Firm Age (Age in Years)



*Notes:* Point estimates an 95% confidence intervals for parameters $\beta_a$ in specifications (19) and (20) in the text. Standard errors clustered at the person level. Sample composed of the population of FSU immigrant male workers and a 25% random sample of native non-Arab non-ultra-Orthodox male workers.

**Table 1:** Summary Statistics

| | Full Sample | | | Random Sample | | | Connected Sample | | |
|---|---|---|---|---|---|---|---|---|---|
| | All | Natives | Immigrants | All | Natives | Immigrants | All | Natives | Immigrants |
| **Worker-years** | | | | | | | | | |
| N | 13,771,243 | 11,166,186 | 2,605,057 | 5,405,314 | 2,800,257 | 2,605,057 | 5,329,104 | 2,733,621 | 2,595,483 |
| Immigrant dummy | 0.19 | 0.00 | 1.00 | 0.48 | 0.00 | 1.00 | 0.49 | 0.00 | 1.00 |
| Salary (2017 Shekels) | 14,479 | 15,579 | 9,767 | 12,804 | 15,630 | 9,767 | 12,834 | 15,733 | 9,780 |
| Age | 39.66 | 39.07 | 42.18 | 40.55 | 39.04 | 42.18 | 40.56 | 39.00 | 42.19 |
| Years since arrival | - | - | 11.71 | - | - | 11.71 | - | - | 11.71 |
| Immigration year | - | - | 1993.02 | - | - | 1993.02 | - | - | 1993.02 |
| Birth year | 1965.14 | 1965.74 | 1962.55 | 1964.22 | 1965.78 | 1962.55 | 1964.22 | 1965.81 | 1962.54 |
| Firm: Size | 3,519 | 3,911 | 1,838 | 2,920 | 3,927 | 1,838 | 2,962 | 4,023 | 1,845 |
| Firm: Age | 13.62 | 13.65 | 13.48 | 13.57 | 13.64 | 13.48 | 13.62 | 13.74 | 13.50 |
| Firm: Immigrant share | 0.32 | 0.27 | 0.54 | 0.40 | 0.27 | 0.54 | 0.40 | 0.28 | 0.54 |
| **Workers** | | | | | | | | | |
| N | 1,229,657 | 988,353 | 241,304 | 488,985 | 247,681 | 241,304 | 475,607 | 236,967 | 238,640 |
| Years observed | 11.20 | 11.30 | 10.80 | 11.05 | 11.31 | 10.80 | 11.20 | 11.54 | 10.88 |
| Immigrant dummy | 0.20 | 0.00 | 1.00 | 0.49 | 0.00 | 1.00 | 0.50 | 0.00 | 1.00 |
| Immigration year | - | - | 1993.29 | - | - | 1993.29 | - | - | 1993.29 |
| Birth year | 1968.91 | 1969.98 | 1964.56 | 1967.32 | 1970.01 | 1964.56 | 1967.26 | 1970.01 | 1964.52 |
| **Firms** | | | | | | | | | |
| N | 356,795 | - | - | 220,324 | - | - | 204,557 | - | - |
| Worker-years observed | 38.60 | - | - | 24.53 | - | - | 26.05 | - | - |
| Immigrant share | 0.23 | - | - | 0.34 | - | - | 0.35 | - | - |
| Avge. salary (2017 Shekels) | 9,251 | - | - | 8,688 | - | - | 8,733 | - | - |
| Firm size | 9.47 | - | - | 13.93 | - | - | 14.76 | - | - |
| Firm age | 5.13 | - | - | 5.68 | - | - | 5.64 | - | - |

*Notes*: Number of observations and sample means for worker-years, workers, and firms. Full sample: Male FSU immigrants and (non-Arab and non-ultra-Orthodox) Israeli natives who between 1991–2015 are ages 25–64 and appear in tax records earning more than 25% of the national average monthly wage (approximately 50% of the minimum wage). Random sample: All FSU immigrants from the full sample plus a randomly drawn 25% sample of natives from the full sample. Connected sample: Observations from the random sample that belong to the largest connected set of firms. Firm characteristics are computed using workers' population data without sample restrictions. Firm age computed using the year in which it first appears in tax records, which is truncated at 1983.

**Table 2:** Assimilation Estimates

| Years since arrival | Log Salary | | | | Firm FE | | Log Firm Size | | Firm Age | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| 1 | -0.840 | -0.571 | -0.288 | -0.206 | -0.101 | -0.082 | -1.354 | -0.802 | -1.846 | -0.711 |
| | ( 0.002 ) | ( 0.002 ) | ( 0.004 ) | ( 0.004 ) | ( 0.001 ) | ( 0.003 ) | ( 0.011 ) | ( 0.019 ) | ( 0.018 ) | ( 0.080 ) |
| 2 | -0.732 | -0.493 | -0.212 | -0.139 | -0.089 | -0.073 | -1.167 | -0.692 | -1.595 | -0.618 |
| | ( 0.002 ) | ( 0.002 ) | ( 0.004 ) | ( 0.004 ) | ( 0.001 ) | ( 0.002 ) | ( 0.011 ) | ( 0.018 ) | ( 0.019 ) | ( 0.079 ) |
| 3 | -0.668 | -0.447 | -0.172 | -0.103 | -0.081 | -0.069 | -1.031 | -0.611 | -1.397 | -0.581 |
| | ( 0.002 ) | ( 0.002 ) | ( 0.004 ) | ( 0.004 ) | ( 0.001 ) | ( 0.002 ) | ( 0.011 ) | ( 0.018 ) | ( 0.020 ) | ( 0.078 ) |
| 4 | -0.617 | -0.408 | -0.142 | -0.076 | -0.076 | -0.066 | -0.932 | -0.547 | -1.296 | -0.573 |
| | ( 0.002 ) | ( 0.002 ) | ( 0.004 ) | ( 0.003 ) | ( 0.001 ) | ( 0.002 ) | ( 0.011 ) | ( 0.018 ) | ( 0.021 ) | ( 0.078 ) |
| 5 | -0.576 | -0.378 | -0.121 | -0.058 | -0.070 | -0.063 | -0.840 | -0.494 | -1.176 | -0.555 |
| | ( 0.002 ) | ( 0.002 ) | ( 0.004 ) | ( 0.003 ) | ( 0.001 ) | ( 0.002 ) | ( 0.011 ) | ( 0.018 ) | ( 0.022 ) | ( 0.077 ) |
| 6 | -0.540 | -0.352 | -0.106 | -0.045 | -0.066 | -0.061 | -0.754 | -0.442 | -1.066 | -0.547 |
| | ( 0.002 ) | ( 0.002 ) | ( 0.004 ) | ( 0.003 ) | ( 0.001 ) | ( 0.002 ) | ( 0.010 ) | ( 0.017 ) | ( 0.023 ) | ( 0.077 ) |
| 7 | -0.502 | -0.325 | -0.093 | -0.034 | -0.061 | -0.059 | -0.664 | -0.398 | -0.930 | -0.524 |
| | ( 0.002 ) | ( 0.002 ) | ( 0.004 ) | ( 0.003 ) | ( 0.001 ) | ( 0.002 ) | ( 0.010 ) | ( 0.017 ) | ( 0.024 ) | ( 0.076 ) |
| 8 | -0.469 | -0.305 | -0.084 | -0.028 | -0.054 | -0.056 | -0.577 | -0.354 | -0.791 | -0.476 |
| | ( 0.002 ) | ( 0.002 ) | ( 0.004 ) | ( 0.003 ) | ( 0.001 ) | ( 0.002 ) | ( 0.010 ) | ( 0.017 ) | ( 0.024 ) | ( 0.076 ) |
| 9 | -0.442 | -0.288 | -0.076 | -0.024 | -0.049 | -0.052 | -0.514 | -0.317 | -0.698 | -0.455 |
| | ( 0.002 ) | ( 0.002 ) | ( 0.004 ) | ( 0.003 ) | ( 0.001 ) | ( 0.002 ) | ( 0.010 ) | ( 0.017 ) | ( 0.025 ) | ( 0.075 ) |
| 10 | -0.416 | -0.273 | -0.070 | -0.021 | -0.043 | -0.049 | -0.456 | -0.292 | -0.577 | -0.419 |
| | ( 0.002 ) | ( 0.002 ) | ( 0.004 ) | ( 0.003 ) | ( 0.001 ) | ( 0.002 ) | ( 0.010 ) | ( 0.016 ) | ( 0.026 ) | ( 0.075 ) |
| 11 | -0.391 | -0.257 | -0.062 | -0.017 | -0.038 | -0.045 | -0.388 | -0.259 | -0.493 | -0.406 |
| | ( 0.002 ) | ( 0.002 ) | ( 0.004 ) | ( 0.003 ) | ( 0.001 ) | ( 0.002 ) | ( 0.010 ) | ( 0.016 ) | ( 0.027 ) | ( 0.074 ) |
| 12 | -0.368 | -0.243 | -0.058 | -0.017 | -0.033 | -0.041 | -0.332 | -0.233 | -0.376 | -0.357 |
| | ( 0.002 ) | ( 0.002 ) | ( 0.003 ) | ( 0.003 ) | ( 0.001 ) | ( 0.002 ) | ( 0.010 ) | ( 0.016 ) | ( 0.028 ) | ( 0.073 ) |
| 13 | -0.348 | -0.232 | -0.056 | -0.018 | -0.029 | -0.038 | -0.282 | -0.211 | -0.300 | -0.347 |
| | ( 0.002 ) | ( 0.002 ) | ( 0.003 ) | ( 0.003 ) | ( 0.001 ) | ( 0.002 ) | ( 0.010 ) | ( 0.015 ) | ( 0.029 ) | ( 0.073 ) |
| 14 | -0.326 | -0.221 | -0.054 | -0.019 | -0.022 | -0.034 | -0.225 | -0.183 | -0.211 | -0.318 |
| | ( 0.002 ) | ( 0.002 ) | ( 0.003 ) | ( 0.003 ) | ( 0.001 ) | ( 0.002 ) | ( 0.010 ) | ( 0.015 ) | ( 0.030 ) | ( 0.072 ) |
| 15 | -0.305 | -0.210 | -0.053 | -0.022 | -0.017 | -0.031 | -0.158 | -0.153 | -0.082 | -0.278 |
| | ( 0.002 ) | ( 0.002 ) | ( 0.003 ) | ( 0.003 ) | ( 0.001 ) | ( 0.002 ) | ( 0.010 ) | ( 0.015 ) | ( 0.030 ) | ( 0.071 ) |
| 16 | -0.284 | -0.199 | -0.052 | -0.023 | -0.012 | -0.029 | -0.124 | -0.141 | -0.043 | -0.289 |
| | ( 0.002 ) | ( 0.002 ) | ( 0.003 ) | ( 0.003 ) | ( 0.001 ) | ( 0.002 ) | ( 0.010 ) | ( 0.014 ) | ( 0.031 ) | ( 0.070 ) |
| 17 | -0.263 | -0.190 | -0.049 | -0.023 | -0.005 | -0.026 | -0.071 | -0.115 | 0.109 | -0.188 |
| | ( 0.002 ) | ( 0.002 ) | ( 0.003 ) | ( 0.003 ) | ( 0.001 ) | ( 0.002 ) | ( 0.010 ) | ( 0.014 ) | ( 0.033 ) | ( 0.069 ) |
| 18 | -0.242 | -0.179 | -0.047 | -0.024 | 8e-04 | -0.024 | -0.016 | -0.095 | 0.210 | -0.164 |
| | ( 0.002 ) | ( 0.002 ) | ( 0.003 ) | ( 0.003 ) | ( 0.001 ) | ( 0.002 ) | ( 0.010 ) | ( 0.014 ) | ( 0.035 ) | ( 0.068 ) |
| 19 | -0.222 | -0.170 | -0.045 | -0.024 | 0.007 | -0.021 | 0.033 | -0.076 | 0.281 | -0.153 |
| | ( 0.003 ) | ( 0.002 ) | ( 0.003 ) | ( 0.002 ) | ( 0.001 ) | ( 0.002 ) | ( 0.011 ) | ( 0.014 ) | ( 0.037 ) | ( 0.066 ) |
| 20 | -0.195 | -0.156 | -0.040 | -0.022 | 0.014 | -0.018 | 0.082 | -0.048 | 0.416 | -0.091 |
| | ( 0.003 ) | ( 0.002 ) | ( 0.003 ) | ( 0.002 ) | ( 0.001 ) | ( 0.002 ) | ( 0.011 ) | ( 0.013 ) | ( 0.039 ) | ( 0.065 ) |
| 21 | -0.170 | -0.144 | -0.036 | -0.020 | 0.020 | -0.016 | 0.120 | -0.039 | 0.421 | -0.123 |
| | ( 0.003 ) | ( 0.002 ) | ( 0.003 ) | ( 0.002 ) | ( 0.002 ) | ( 0.002 ) | ( 0.012 ) | ( 0.013 ) | ( 0.042 ) | ( 0.063 ) |
| 22 | -0.137 | -0.128 | -0.029 | -0.017 | 0.029 | -0.012 | 0.169 | -0.023 | 0.470 | -0.112 |
| | ( 0.003 ) | ( 0.002 ) | ( 0.003 ) | ( 0.002 ) | ( 0.002 ) | ( 0.002 ) | ( 0.013 ) | ( 0.012 ) | ( 0.046 ) | ( 0.061 ) |
| 23 | -0.099 | -0.111 | -0.020 | -0.012 | 0.041 | -0.008 | 0.219 | -0.009 | 0.552 | -0.100 |
| | ( 0.003 ) | ( 0.002 ) | ( 0.002 ) | ( 0.002 ) | ( 0.002 ) | ( 0.002 ) | ( 0.014 ) | ( 0.011 ) | ( 0.051 ) | ( 0.057 ) |
| 24 | -0.062 | -0.096 | -0.010 | -0.008 | 0.052 | -0.002 | 0.263 | -0.005 | 0.697 | -0.018 |
| | ( 0.004 ) | ( 0.003 ) | ( 0.002 ) | ( 0.002 ) | ( 0.002 ) | ( 0.001 ) | ( 0.015 ) | ( 0.010 ) | ( 0.057 ) | ( 0.050 ) |
| 25 | -0.016 | -0.069 | 0.000 | 0.000 | 0.059 | 0.000 | 0.328 | 0.000 | 0.788 | 0.000 |
| | ( 0.005 ) | ( 0.003 ) | ( - ) | ( - ) | ( 0.003 ) | ( - ) | ( 0.021 ) | ( - ) | ( 0.079 ) | ( - ) |
| Person FE | no | no | yes | yes | no | yes | no | yes | no | yes |
| Firm FE | no | yes | no | yes | no | no | no | no | no | no |
| SE Clusters (persons) | 475,607 | 475,607 | 475,607 | 475,607 | 475,607 | 475,607 | 475,607 | 475,607 | 475,607 | 475,607 |
| N (person × year) | 5,329,104 | 5,329,104 | 5,329,104 | 5,329,104 | 5,329,104 | 5,329,104 | 5,329,104 | 5,329,104 | 5,329,104 | 5,329,104 |

*Notes*: OLS point estimates and standard errors of parameters $\beta_a$ in specifications (15)–(20) in the text. Standard errors clustered at the person level. Columns (1)–(4) show estimates corresponding to Figure 6. Columns (5)–(6) show estimates corresponding to Figure 7. Columns (7)–(8) show estimates corresponding to Figure 8. Columns (9)–(10) show estimates corresponding to Figure 10. Sample composed of the population of FSU immigrant male workers and a 25% random sample of native non-Arab non-ultra-Orthodox male workers.
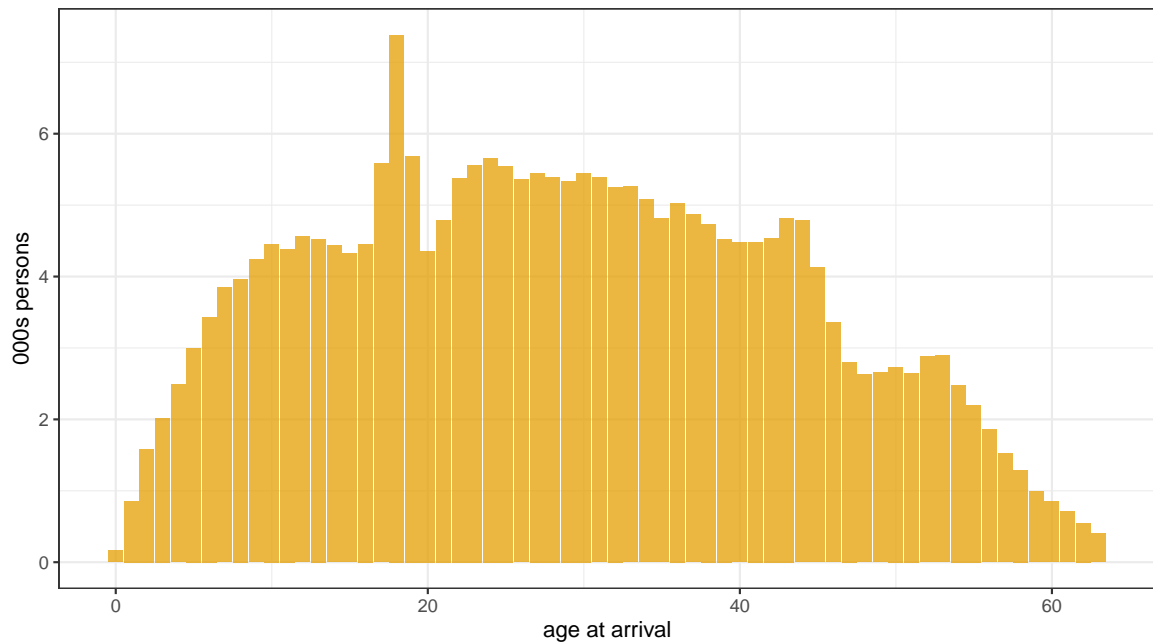
# A   Appendix Figures

**Figure A1:** Immigration to Israel: 1948–2017
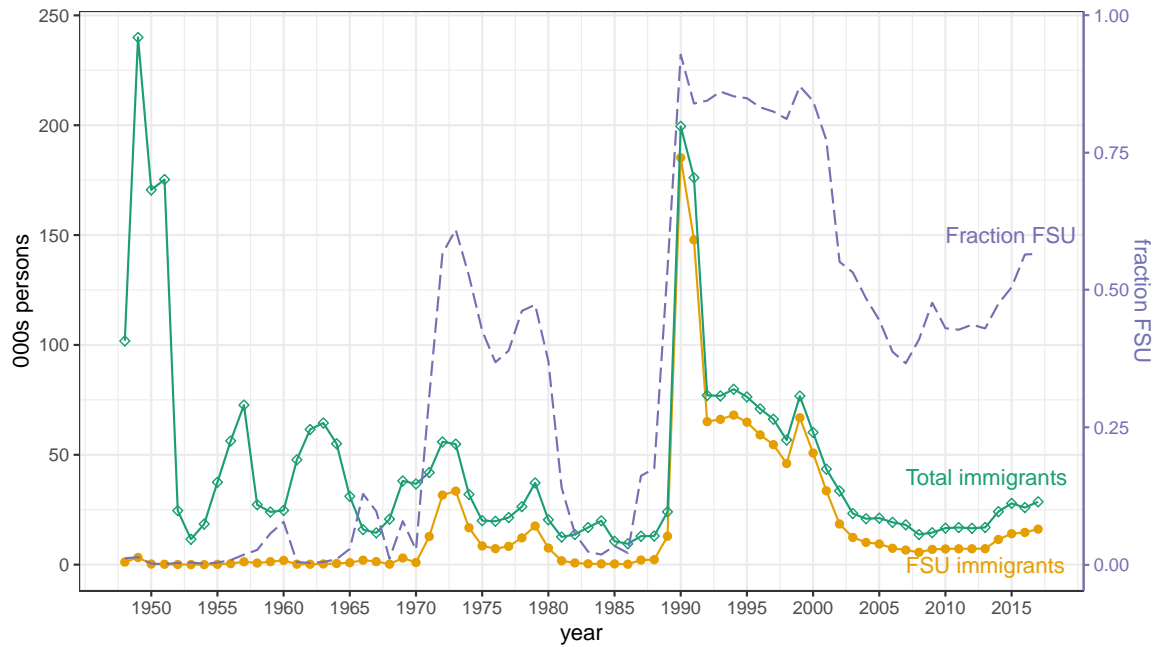


*Notes:* Source is the Israel Central Bureau of Statistics. Total number of immigrants arriving to Israel, and those arriving from the former Soviet Union, by year. Dashed line is the fraction of total immigrants who are FSU immigrants.

**Figure A2:** FSU Immigrants' Age at Arrival to Israel



*Notes:* Distribution of age at arrival to Israel for FSU immigrants in our sample: Male FSU immigrants who arrived to Israel between 1990–1999, were ages 25–64 at some point between 1991–2015, and were employed at some point between 1991–2015.