A Second Soul: Age at Immigration, Language, and Cultural Assimilation*

Jaime Arellano-Bover† Kobi Mizrahi‡ Shmuel San§

February 28, 2025

PRELIMINARY DRAFT, COMMENTS WELCOME

Abstract

This paper studies the long-run cultural assimilation of immigrant children, focusing on age-at-arrival effects and the role of local language proficiency. Using Israeli administrative records, our analysis follows Former Soviet Union Jews who migrated to Israel immediately following the 1989 unexpected lifting of Soviet emigration restrictions—a setting which we argue lends a plausibly causal interpretation to age-at-arrival effects. To study Hebrew knowledge, we introduce a revealed-preference measure of language acquisition: the language in which a person *chooses* to take the university admissions standardized test. Given the differing fertility norms between the USSR and Israel, we assess cultural assimilation through intermarriage with natives, age at first child, and completed fertility. We find that even small differences in arrival age between 7 and 17 can have large impacts in language acquisition and long-run integration. Specifically, age at arrival affects immigrant-native gaps in out-migration probabilities, residential segregation, intermarriage, and fertility behaviors, including total number of children. We conclude that exposure to Israel's high-fertility norms increases immigrants' completed fertility. Lastly, we quantify the crucial mediating role of Hebrew proficiency in shaping long-term assimilation outcomes.

*Jaime Arellano-Bover gratefully acknowledges funding from a Modigliani Research Grant by the UniCredit Foundation.

†Yale University, IZA, CESifo. Email: **jaime.arellano-bover@yale.edu**

‡Princeton University. Email: **kmizrahi@princeton.edu**

§Hebrew University of Jerusalem. Email: **muly.san@mail.huji.ac.il**

1 Introduction

Recent trends in immigration and population aging across developed countries have brought immigration policy and immigrants' integration to the forefront of the policy and political debate. Immigration has the potential to increase aggregate productivity (Burchardi et al., 2020) and rejuvenate aging societies.[1] However, natives' anti-immigration sentiments are oftentimes mostly driven by cultural mismatch concerns (Tabellini, 2020; Alesina and Tabellini, 2024). In this context, it is important to improve our understanding on determinants of cultural integration and assimilation in large migration episodes.

In this paper, we analyze age-at-arrival effects on the long-term cultural assimilation of immigrants who arrive to their destination country as children. As opposed to adults, immigrant children are in the midst of human capital development and identity formation. Age at migration might be a key determinant of cultural assimilation to the extent that children of different ages arrive at different developmental, educational, and socialization milestones. However, identifying age-at-arrival effects is associated with a series of challenges which include the endogeneity of migration decisions, selection driven by out-migration, and data limitations in tracking long-term outcomes. Moreover, while language acquisition is a plausibly important driver of integration, it is typically unobserved in longitudinal administrative datasets.

We overcome these empirical challenges studying Former Soviet Union (FSU) Jews who migrated to Israel shortly after the unexpected lifting of Soviet emigration restrictions in 1989. We argue for the exogeneity of the age at arrival of immigrant children given the pent-up demand to leave the FSU and desire to escape persecution (Abramitzky et al., 2022). We can track child immigrants in Israeli administrative data for up to 29 years after arrival, observing out-migration, residential sorting, intermarriage, and fertility outcomes. FSU Jews were very different from Israeli natives and faced significant cultural barriers (Remennick, 2007), leaving ample scope for variation in long-term cultural assimilation. As FSU migrants generally did not speak Hebrew, language presented an important hurdle to integration. Our data include a unique, high-stakes revealed-preference measure of Hebrew knowledge at young adulthood—the language in which a person chooses to take the university admissions standardized test—allowing us to quantify the role of language acquisition in cultural assimilation.

Our empirical approach consists of comparing the long-term outcomes of FSU immigrant children who arrived in Israel at different ages between 1990–1991. Benchmarking age-at-arrival differences to natives of the same birth cohorts allows us to control for common time effects in the outcomes of interest. Based on the historical context and supporting balance tests, we argue for a causal interpretation of age-at-arrival differentials.[2] Additionally, we put forward an alternative, intra-family research design based on comparing

[1] See, for example, reports by Peri (2020) and Gokhale (2024).

[2] The bulk of the post-1989 FSU migration wave to Israel occurred between 1990–1999 (see Figure A1). The exogeneity of age at arrival is more plausible for the early arrivals we study, which can be thought of as refugees, while later waves can be thought of as economic migrants (Abramitzky et al., 2022) and for whom typical selection concerns regarding the timing of migration are more likely.

siblings who arrived in Israel at different ages.

A key advantage of our data and setting is the availability of a revealed-preference measure of child immigrants' Hebrew knowledge in young adulthood. Students applying for higher education programs in Israel take a standardized test called Psychometric Entrance Test (PET), typically between ages 18–25. Crucially, students can take the test in Hebrew or in Russian (as well as Arabic, English, and French) and this choice is reflected in our data. Given the high stakes and that students can freely choose, we interpret the choice to take the test in Hebrew as a revealed-preference measure of Hebrew knowledge. We can observe this measure for those who take the university entrance test, which represent around 47% of our population of interest.

Our first set of empirical results quantify age-at-arrival effects on our measure of Hebrew language acquisition. We find a strong pattern of age-at-arrival effects on the probability of taking the PET test in Hebrew. FSU immigrants who arrived at age 7 are as likely as natives to take the test in Hebrew, whereas practically none of the ones who arrived at age 17 do so. The drop in the probability of Hebrew between ages 7–17 is strongly *non-linear*, with most of the drop occurring during a few critical years, between ages of arrival 10–14. Thus, our evidence suggests that even small differences in the age at arrival between ages 10–14 can have meaningful, long-lasting consequences for language integration.

Our data allow us to study an administrative measure of out-migration—i.e., leaving Israel and settling residence elsewhere—for immigrants and natives alike. We argue that out-migration is a meaningful summary measure of (lack of) integration. Moreover, as most FSU child immigrants who eventually leave Israel are highly educated, recent policy debates have worried about such "brain drain," which has clear consequences for the fiscal effects of immigration.[3] The immigrant-native gap in the probability of out-migration by age 35 is significantly larger for older arrivals relative to younger ones. The out-migration gap between age-17 and age-7 arrivals is roughly as large as the gap between natives and age-7 arrivals (both are about six percentage points).

Next, we study residential sorting as a measure of integration, comparing the cities of residence at age 35 of FSU children who arrived at different ages. We characterize cities by the share of their population who are FSU immigrants, building on literature that studies residential segregation in immigrant enclaves (e.g., Eriksson and Ward, 2019). We find significant age-at-arrival gradients whereby those who arrived in Israel at ages 16–17 lived by age 35 in cities with FSU population shares that were on average 2 percentage points higher than those who arrived at age 7.

Matching with a native in the marriage market is a meaningful dimension of integration which our administrative data allow us to precisely analyze. We find a steep gradient between arrival age and the probability of matching with a native spouse. For instance, the differential probability of marrying a native for FSU children who arrived at age 7 is about -0.40, while the corresponding one for those arrived at age 17 is around -0.65.

Our last set of cultural assimilation outcomes relate to fertility behavior. The reasons

[3]See, for instance, Jeffay (2016).

are twofold. First, fertility has intrinsic interest in the context of the relationship between immigration and demographic decline. Second, the cultural norms between the FSU and Israel were very different—relative to the FSU, the Israeli norm is for women to have their first child at an older age, but have a greater number of children overall.[4] We find age-at-arrival effects that point towards assimilation in fertility norms in both of these dimensions. Relative to FSU immigrants who arrived age 17, those who arrived at younger ages had their first child later and had a greater number of kids by age 35.

Specifically, for women, the effect on total number of children of arriving in Israel at age 7 instead of age 17 closes around 25% of the gap between natives and immigrants who arrived at age 17. When going beyond the mean and examining the effects at different parts of the total number of children distribution, we find that the steepest age-at-arrival gradient is present in the probability of having three children. This is noteworthy as the total fertility rate in the late 1980s was about two in the FSU and about three in Israel.

Presumably, Hebrew language acquisition could be a key mediator of age-at-arrival effects on cultural assimilation outcomes. Moving to a less segregated city and matching with a native-born spouse could intuitively be easier and more rewarding for FSU immigrants who reached young adulthood with a proficient level of Hebrew, relative to those who did not. While it is not obvious whether Hebrew knowledge could have direct effects on assimilation in fertility behavior once we condition on having a native spouse, it could still have indirect effects through the effects on the probability of having such a marriage market match to begin with.

Observing our revealed preference measure of Hebrew knowledge thus presents a valuable opportunity to rigorously explore such language mediating effects. We are currently working on a model that will allow us to quantify all direct and indirect mediating effects of Hebrew, while allowing for equilibrium effects in the partners market. Here, we present preliminary evidence of mediation effects by estimating age-at-arrival profiles in cultural assimilation that net out the choice to take the PET test in Hebrew. Results from this exercise show that accounting for Hebrew knowledge indeed flattens age-at-arrival gradients, especially for out-migration probabilities, residential segregation, probability of a native spouse, and number of children.

Contribution to the literature

This paper contributes to the literature on immigrants' cultural assimilation (Abramitzky et al., 2020) and papers that document age-at-arrival effects on the long-run integration of child immigrants. Many such works mainly (but not exclusively) focus on labor market outcomes (Friedberg, 1992; Bleakley and Chin, 2004; Alexander and Ward, 2018; Connolly et al., 2023; Åslund et al., 2023; Aloni and Avivi, 2024; Kerr et al., 2024). Instead, Bleakley and Chin (2010) is closest to this paper in that they use cross-sectional US 2000 Census data to relate age-at-arrival to English acquisition, intermarriage, fertility, and geographical sorting.

[4] Among OECD countries, Israel has, by far, the highest total fertility rate (equal to 2.9 according to the UN).

Relative to this existing literature, this study is unique in that we can leverage policy-induced exogenous age at arrival for a wide support of arrival ages, track a variety of cultural assimilation outcomes in long-term administrative data, and crucially, observe a high-stakes, revealed-preference measure of language acquisition in administrative data. This last point is relevant as language is typically either observed only in cross-sectional survey/census data, in a self-reported way (e.g., Bleakley and Chin, 2004, 2010; Kerr et al., 2024), or altogether unobserved in most administrative datasets (e.g. Åslund et al., 2023; Connolly et al., 2023). While language as a mediator has been proposed before in an instrumental variables context (Bleakley and Chin, 2004, 2010), we will be able to carry out a detailed mediation analysis that teases out direct and indirect effects in the causal chain going from age at arrival, language, the partner market, and fertility.

Additionally, this paper contributes to a body of work studying the relationship between immigration and fertility (Adserà et al., 2012; Adserà and Ferrer, 2015). An unusual feature of our setting is the fact that migrants' origin country (FSU) had lower fertility than the destination country (Israel), implying that assimilation points in the direction of greater number of children. Similarly, Mussino et al. (2021) study age-at-arrival effects on fertility assimilation of immigrants in Sweden from low-fertility countries. However, this and related studies could face endogenous selection into age at arrival in a way that we circumvent. Other papers have studied immigrants' fertility in Israel, using birth records, survey, and census data, without focusing on age-at-arrival effects of child immigrants (Nahmias, 2004; Okun and Kagya, 2012).

The remainder of this paper is structured as follows. Section 2 provides an overview of the relevant historical and institutional context. Section 3 describes the data. Section 4 lays out our empirical model and identification assumptions. Section 5 presents the baseline results on age-at-arrival effects, while Section 6 provides evidence on the mediating role of Hebrew knowledge. Section 7 concludes.

2 Historical and Institutional Context

2.1 FSU migration to Israel

A mass exodus of FSU Jews began in 1989 following the unexpected lifting of Soviet emigration restrictions. Most of them migrated to Israel—which encouraged FSU Jews to do so and granted them citizenship on arrival—while others went to Germany and the US. Between 1989–1999, around 840,000 FSU Jews migrated to Israel. While more educated than native Israelis, these immigrants faced large native-migrant earnings gaps upon arrival on Israel, which eventually closed after three decades (Arellano-Bover and San, 2024).

Abramitzky et al. (2022) argue that FSU migrants who arrived in Israel between 1989–1992 can be described as refugees, in contrast to those who arrived from 1993 onward which they describe as economic migrants. Following this interpretation, our empirical analyses focus on the early 1990–1991 arrivals. These arrivals were more likely to migrate driven by persecution, and the spike in arrivals during those early years (Figure A1) is suggestive of a pent-up desire to leave the FSU. We later argue that these features are useful to identify year-of-arrival effects for those who arrived as children. The intuition behind this is that 1990–1991 families left whenever they got the chance, rather than at a carefully chosen time that potentially took into consideration what was the best age of migration for their children.

2.2 Cultural differences between FSU immigrants and Israeli natives

FSU immigrants arriving in Israel faced significant cultural differences with respect to existing residents. Language presented a large barrier as the vast majority of FSU immigrants did not speak Hebrew. Moreover, Soviet policies had for decades suppressed Jewish cultural and religious life which resulted in FSU Jews not following many Judaism practices that are commonplace in Israel. Remennick (2007) provides a detailed description of resulting cultural clashes between FSU and incumbent Israelis.

2.3 Fertility norms

Israeli norms favor large families, to a degree that is unparalleled among rich countries. It has, by far, the highest total fertility rate (TFR) among OECD countries, equal to 2.9 in 2024 according to the UN. Comparing Israel to the FSU yields striking results. Also according to the UN, from 1985–1990, the TFR in Israel was 3.07 while TFRs for what is now Russia and Ukraine were 2.12 and 1.95, respectively. As such, when thinking about fertility and number of children, we expect FSU migrants' cultural assimilation to work in the direction of having more children. This makes the FSU migration to Israel an insightful setting to study assimilation in fertility patterns as in most context the opposite is true, with immigrants' origin countries featuring greater fertility than their destination countries (Tønnessen and Mussino, 2020; Mussino et al., 2021).

While Israeli women had significantly more children than FSU women, the average age at first birth is and was *higher* in Israel than in the FSU. According to UN statistics, in 2008/2009, the mean age at first birth was 27 in Israel compared to 24.6 and 25.8 for Russia and Ukraine, respectively. As such, we expect cultural assimilation in this direction to push FSU immigrants women to have their first child at later ages.

Overall, prevailing fertility norms in Israel and the FSU suggest a two-dimensional assimilation pattern. For FSU immigrants, assimilating into Israeli culture would on the one hand imply postponing parenthood, and on the other hand building larger families in the long run.

2.4 The Psychometric Entrance Test and Revealed Hebrew Knowledge

The Psychometric Entrance Test (PET) is a standardized test that is used for Israeli higher education admissions, typically taken between ages 18–25. Crucially, PET test-takers can choose whether to take it in Hebrew or Russian (as well as Arabic, French, and English). In our empirical analysis, we interpret the decision to take the test in Hebrew as a revealed preference measure of Hebrew knowledge. This measure has two main advantages. The first is that, as opposed to self-reported measures of language knowledge typically available in survey and census data, this is a high-stakes decision with real-life consequences. Although binary, we expect it to carry high information content. Second, while immigrants' language proficiency is rarely observed in large-scale administrative datasets, the Israeli institutional and data context allow us to precisely observe this measure for the entire population of FSU immigrants (and natives) who take the PET (which accounts to close to 50% of the entire sample in our setting).

3 Data

We use population-level administrative data from the Israeli Population Registry between the years 1989–2019. The data allows us to observe place of birth, date of migration to Israel for those born abroad, marriage links, parent-child links, and location of residence (in 1995 and from 2000 onwards). Crucially, we can link these data to PET test-taking records, including the language in which the test was taken. Moreover, we have access to data on the self-reported level of education and occupation that FSU immigrants declared upon arrival in Israel. Lastly, we use administrative records on a time-varying measure on Israeli *resident* status to construct an out-migration variable, available for immigrants and native-born alike.[5] This is an unusually good feature of these data as individual-level information on out-migration is typically missing from large-scale administrative datasets or has to be inferred from someone "dropping out" from the data (Dustmann and Görlach, 2015).

Our main population of interest are persons who were born in the FSU and arrived in Israel in 1990 or 1991 and were between 7 and 17 years of age at the time. We focus on FSU children arrived in 1990 or 1991 because for these early arrival waves, age-at-arrival is plausibly exogenous for the reasons mentioned in Sections 2 and 4. We use age 17 as the maximum age cutoff to focus on those who arrived as minors. We use the age 7 as the minimum age cutoff because this allows us to study outcomes at age 35 for all children in our data.

Throughout the analysis, we compare the outcomes of these FSU child immigrants with natives of the same birth cohorts (i.e., birth years 1973–1984). Including natives has a dual purpose: comparing age-at-arrival effects to the natives' benchmark and accounting for secular time effects in the outcomes of interest separately from age-at-arrival effects. As a native comparison group, we focus on people who satisfy the following conditions: being born in Israel between 1973–1984, being a non-Ultra Orthodox Jew, and having parents who were not born in the FSU. Overall, our sample is composed of around 627,000 individuals, out of which approximately 296,000 are PET test-takers.

Stayers sample. We focus our analysis of long-term outcomes such as residential location, marriage, and fertility on the subset of individuals—both FSU-born and Israel-born—who

[5] In particular, the resident measure is constructed by the Israeli Central Bureau of Statistics as a function of time living in Israel over the past several years.

are residents of Israel at age 35.[6] In other words, those for whom our out-migration dummy variable is equal to zero. Focusing on this subsample ensures that the age-at-arrival effects we estimate are not driven by differential sample attrition. Moreover, this implies that our findings on long-term outcomes should be interpreted as age-at-arrival effects conditional on staying in Israel until age 35 (Dustmann and Görlach, 2015). 95% of natives and 87% of FSU immigrants from the overall sample appear in the sample of stayers.[7]

Siblings sample. We conduct robustness tests that consist of intra-family comparisons via regression models that include mother fixed effects. For such analyses, we use the subset of our overall sample composed of individuals who have at least one sibling of the same sex.[8]

4 Framework: Age-at-Arrival Effects

We capture age-at-arrival effects by estimating versions of the the following linear regression model among the sample of FSU child-arrivals and comparison natives of the same birth cohorts:

$$y_i = \sum_{k=7}^{17} \gamma_k \left(\mathbb{1}\{A_i = k\} \cdot M_i\right) + X_i'\beta + \varepsilon_i, \tag{1}$$

where M_i is a dummy variable equal to one for FSU immigrants, $\mathbb{1}\{A_i = k\}$ is a dummy variable equal to one if person i arrived in Israel at age k. The vector X_i includes birth year fixed effects that are common for immigrants and natives and account for time trends in y_i.

We estimate equation (1) for a variety of outcome variables y_i which fall into three broad groups. First, a dummy variable equal to one if person i chose to take the PET in Hebrew. This variable is defined for the subsample of PET test-takers (roughly half of the overall sample) and is typically measured between ages 18–25. Second, an out-migration dummy variable equal to one if person i is not a resident of Israel at age 35. Third, outcomes measured when person i is age 35 such as immigrant share in the city of residence, intermarriage, age at first child, and number of children. We study this last set of outcomes conditional on the out-migration dummy being equal to zero.

The parameters $\boldsymbol{\Gamma} \equiv \{\gamma_k\}_{k=7}^{17}$ represent the non-parametric conditional expectation function of outcome y_i, relative to natives, as a function of age at arrival in Israel A_i, adjusting for time trends β. The age-at-arrival profile $\boldsymbol{\Gamma}$ has a causal interpretation under an assumption of no systematic differences in unobservable characteristics by age at arrival A_i:

$$\mathbb{E}\left[\varepsilon_i | A_i = k, X_i\right] = \mathbb{E}\left[\varepsilon_i | A_i \in [7,17], X_i\right] = 0 \quad \forall \quad k = 7 \ldots 17. \tag{2}$$

In many contexts this assumption is unlikely to hold as migrant households likely in-

[6] As categorized by the Israeli Central Bureau of Statistics.

[7] While we lack information on the destination of those who emigrate, anecdotal accounts suggest that the most popular countries for FSU-born Israelis are the US, Canada, and Germany.

[8] The sibling(s) must also satisfy the sample selection conditions described above regarding age at arrival, year of arrival, and year of birth for FSU immigrants and natives.

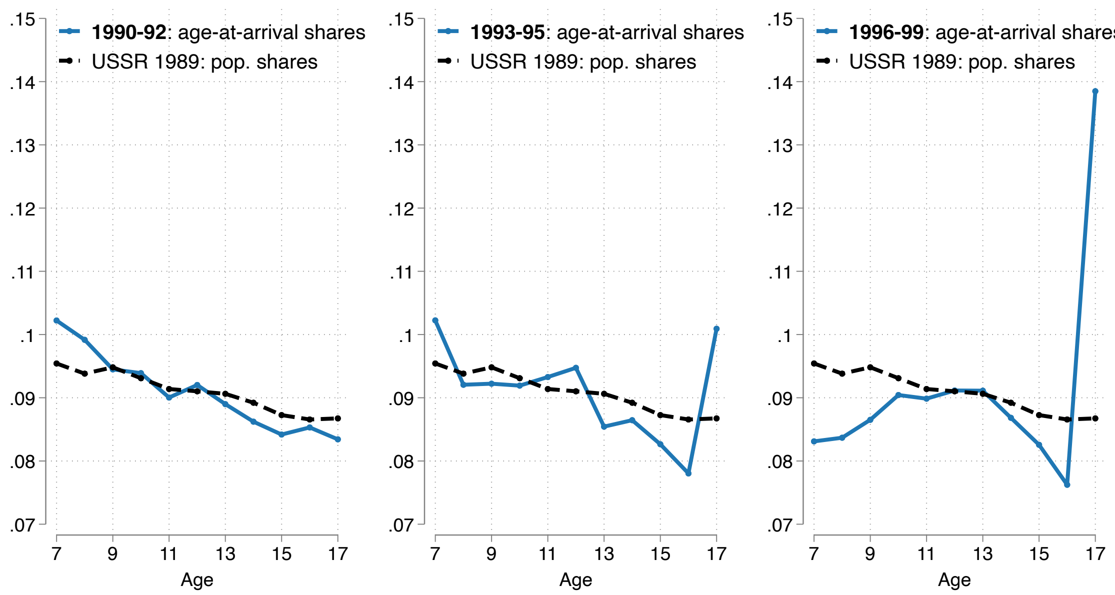
ternalize that the experience of international migration will affect children of different ages differently, and that the long-term prospects of children are also affected by age at immigration (Aloni and Avivi, 2024). As a result, children whose families decided to migrate at different ages will likely have different unobserved characteristics that potentially impact language learning and cultural integration outcomes.

However, our context is one of immigrants who can best be thought of as refugees fleeing persecution in the USSR, who left the country whenever a window of opportunity arose (Abramitzky et al., 2022). The large spike in 1990–1991 arrival numbers that followed the lifting of Soviet emigration restrictions in 1989 and preceded more stable arrival numbers throughout the 1990s (Figure A1), suggests pent-up demand to leave the USSR. It thus seems a plausible assumption that most of the immigrants in our sample left as soon as they could, with little considerations of age-at-arrival effects for their children. In this context, assumption (2) is more likely to hold. Sections 4.1 and 4.2 provide two pieces of evidence that further suggest this is a reasonable assumption.

4.1 Comparison of child age distributions

Figure 1 compares the age distribution of children in 1989 USSR to the age distribution of FSU child immigrants arriving in Israel in 1990–92, 1993–95, and 1996–99. The goal of this comparison is to illustrate the selective migration is likely less of a concern for the early arrival waves compared to the later ones.

Figure 1: Age-at-arrival distribution by arrival cohort



Notes: Each panel represents a different arrival cohort: 1990–1992, 1993–1995, and 1996–1999. The solid line in each panel represents the age-at-arrival distribution of FSU immigrants who arrived between ages 7–17 (as share of total 7–17 year-old arrivals). The dashed line, equal across panels, represents the USSR age distribution of 7–17 year-olds in 1989 (as share of total 7–17 year-olds). Source for the USSR population is UN Population Division (2024).

The age distribution of 1990–92 child arrivals (which are the arrival cohorts Abramitzky et al. (2022) classify as refugees) is very similar to the overall Soviet age distribution. However, for the subsequent arrival cohorts, these distributions start to look quite distinct. Assuming that USSR distribution represents the distribution of "potential migrants," these results would suggest that FSU immigrants in the initial period were representative of the overall pool of potential migrants, lessening worries of selective migration and differences in unobserved characteristics of children arrived at different ages.

4.2 Balance: Parents' characteristics upon arrival in Israel

While assumption (2) is inherently untestable, we provide supportive evidence by documenting balance in observable, predetermined characteristics. To do that, we leverage information from two ancillary pieces of information: FSU immigrants reporting of their level of education and occupation in the Soviet Union upon arrival to Israel, and the 1995 Israeli Census. Using these data, we show that

$$\mathbb{E}\left[Z_i|A_i = k, M_i = 1\right] = \mathbb{E}\left[Z_i|A_i \in [7, 17], M_i = 1\right] \quad \forall \quad k = 7\ldots17 \tag{3}$$

largely holds for eight variables Z_i: father's and mother's occupation, education, age at child's birth, and 1995 city of residence FSU share.

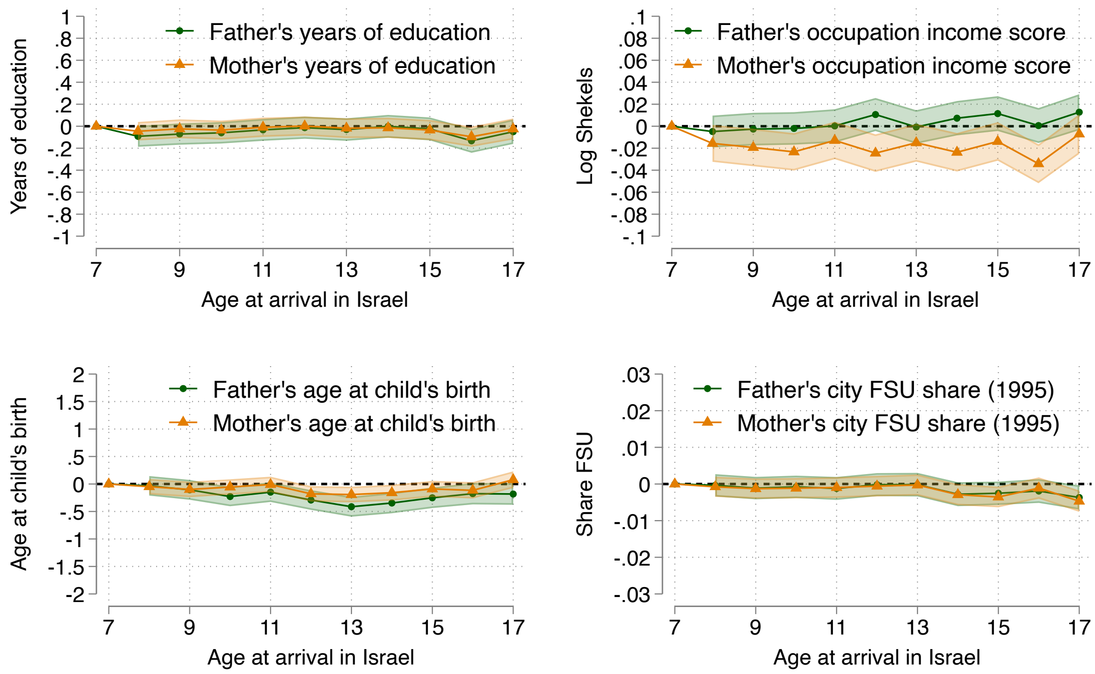
In particular, Figure 2 provides estimates of δ_k in the following linear regression, estimated among our sample of FSU child immigrants:

$$Z_i = \delta_0 + \sum_{k=8}^{17} \delta_k \cdot \mathbb{1}\{A_i = k\} + \eta_i, \tag{4}$$

where 7 is the omitted age-at-arrival category and Z_i represents i's parents' characteristics upon arrival in Israel (or in 1995 in the case of FSU city share).[9] We summarize the information contained by occupation using an income score (average income of a given occupation in Israel).

[9]The year 1995 is the first one in which we can observe city of residence, thanks to a merge between the Population Registry and the 1995 Israeli Census—the first census after the onset of the FSU immigration wave. We view balance on 1995 place of residence as a more stringent test, compared to the (unfeasible) test of balance on place of residence upon arrival in Israel. The former test implicitly shows that (i) parents of children of different ages were similar upon arrival in Israel, *and* (ii) their migration behavior during their first few years in Israel was also similar.

Figure 2: Balance: Parental education, occupation, age at birth, and city FSU share, by age at arrival



Notes: Point estimates and 95% confidence intervals of parameters δ_k in equation (4). Upper-left subfigure: outcome variables are father's and mother's years of education. Average years of education for $A_i = 7$ are 13.5 and 13.6 for fathers and mothers, respectively. Upper-right subfigure: outcome variables are father's and mother's occupational income score, in logs. Bottom-left subfigure: outcome variables are father's and mother's age at child's birth. Average age at birth for $A_i = 7$ are 28.9 and 26.1 for fathers and mothers, respectively. Bottom-right subfigure: outcome variables are the FSU population share in father's and mother's city of residence in 1995. Average FSU city share for $A_i = 7$ are 0.16 for both fathers and mothers. Parental education and occupation measured at the time of arrival in Israel.

Figure 2 upper-left panel shows that the education levels of the parents of children arriving in Israel at different ages were extremely similar to each other, both for fathers and mothers. Relative to the age-7 arrivals benchmark, we can rule out differences in years of education larger than 0.2 in absolute value.

The results for occupational income score on Figure 2 upper-right panel are similarly reassuring. Fathers' differentials are not statistically different from each other. While some of the mothers' age-specific estimates are statistically different from the age-7 benchmark, they are small in magnitude and do not follow any clear pattern as a function of age at arrival.

Parental age at child's birth was also similar across the age-at-arrival distribution. This is especially important since one of our main fertility results for child-arrivals is on age at first child, and this could presumably be transmitted by family norms across generations. The bottom-left panel of Figure 2 shows that there is no trend in parental age at birth. Although the differences for those arrived between ages 12–14 are statistically significant, these are small in magnitude and 15–17 estimates are again indistinguishable again from age-7 arrivals.

Lastly, the bottom-right panel of Figure 2 shows that the 1995 residential choices of FSU parents, measured by city FSU share, were indistinguishable from each other as a function of children's age at arrival.

Overall, together with Figure 1, we interpret the evidence in Figure 2 as being consistent with assumption (2). Particularly, the flat profiles in Figure 2 for age at first child and FSU city share stand in sharp contrast with the corresponding profiles we document in Section 5 when measuring the exact same outcomes for the child immigrants themselves.

4.3 Sibling comparisons

As a robustness test, we will estimate different versions of the following equation which additionally features mother fixed effects:

$$y_i = \sum_{k=7}^{17} \gamma_k \left(\mathbb{1}\{A_i = k\} \cdot M_i \right) + X_i' \beta + \theta_{m(i)} + \varepsilon_i, \tag{5}$$

where A_i, M_i, and X_i are defined as in equation (1), $m(i)$ indexes the mother of individual i, and $\theta_{m(i)}$ are mother fixed effects.

As such, this approach identifies age-at-arrival effects γ_k through intra-family comparisons. That is, by comparing siblings who arrived in Israel as kids but did so at different ages. The identification assumptions in this case are less strict, as assumption (2) only needs to hold within families (Alexander and Ward, 2018).

5 Baseline Results

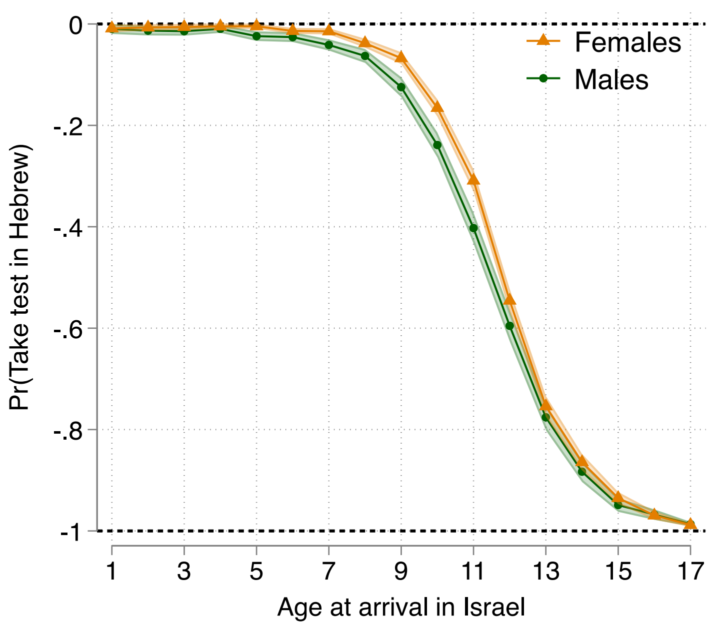
This section presents baseline results from estimating equation (1) when the outcome variable is (1) revealed-preference Hebrew knowledge at young adulthood, and (2) cultural assimilation outcomes at age 35. Age-at-arrival effects on Hebrew knowledge are estimated within the sample of PET test-takers, out-migration results are estimated in the full sample, and results on the remainder cultural assimilation outcomes are estimated on the sample of stayers.

5.1 Language acquisition by young adulthood

Figure 3 shows estimates of γ_k parameters in a version of equation (1) augmented to cover ages of arrival 1–17, when y_i is equal to a dummy variable equal to one if person i took the PET standardized test in Hebrew (instead of Russian or other available languages).[10]

[10] We are able to cover ages of arrival 1–17 for the Hebrew language outcome as the PET is typically taken between ages 18–25. The other outcomes we study are instead measured at age 35.

Figure 3: Test-taking in Hebrew: Immigrant-native gap by age at arrival



Notes: Point estimates and 95% confidence intervals (robust standard errors) of parameters γ_k in a version of equation (1) augmented to cover ages of arrival 1–17, when outcome variable is a dummy equal to one if person i chose to take the PET university entrance standardized test in Hebrew. Estimated among the sample of PET test-takers. The probability of taking the PET test in Hebrew among natives is equal to 0.995, both for men and women.

There are three main takeaways. First, there is a strong assimilation pattern as immigrants who arrived in Israel at age 7 are as likely as natives to take the test in Hebrew, while those who arrived at age 17 have practically zero probability of doing so.

Second, the age-at-arrival profile is non-linear, with most of the drop in probability of Hebrew test-taking occurring between arrival ages 10–14. There are a few critical ages around early adolescence for which language acquisition is highly sensitive to age at arrival, whereas the specific age at arrival is not so meaningful conditional on arriving before age 8 or after age 15. This is consistent with patterns documented by Bleakley and Chin (2004, 2010) in US Census data showing a flat language profile from age-at-arrival 0–7 and a decline thereafter.

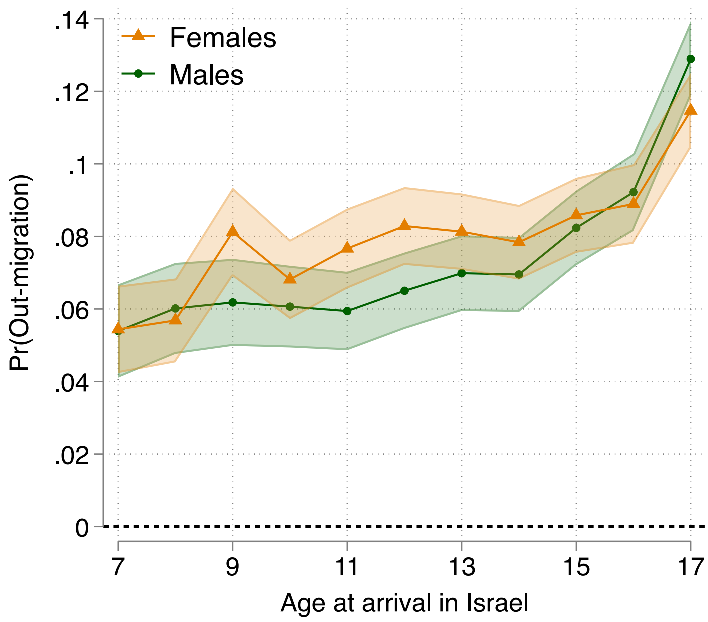
Third, a clear gender gap emerges by which girls are significantly more likely than boys to take the PET test in Hebrew, for all arrival ages. The gap is particularly salient for those arriving between the critical ages of 9–12. For instance, among those who arrived at age 11, boys were 37 percentage points less likely than natives to take the exam in Hebrew while girls were 28 percentage points less likely—a 24% differential. This is strong evidence for immigrant girls learning the second language faster than immigrant boys. Perhaps this aligns with conventional wisdom, yet systematic empirical evidence on this phenomenon is sparse (see van der Slik et al., 2015).

Figure A2 shows that these age-at-arrival effects on language proficiency are robust to limiting attention to the sample of stayers. Figure A3 shows that effects are also similar when estimating γ_k in equation (5) which includes mother fixed effects.

5.2 Out-migration

Figure 4 shows estimates of γ_k parameters in equation (1) when the outcome variable is a dummy equal to one if person i is no longer a resident of Israel at age 35. Among our sample, 6.3% of native men and 4.1% of native women are non-residents at age 35. Figure 4 illustrates that the immigrant-native gap features a strong, positive age-at-arrival gradient. FSU immigrants who arrived in Israel at age 7 are about 5 percentage points more likely to emigrate than natives. Instead, among those who arrived between ages 16 and 17, the gap amounts to 9 and 11-13 percentage points, respectively.

Figure 4: Out-migration: Immigrant-native gap by age at arrival



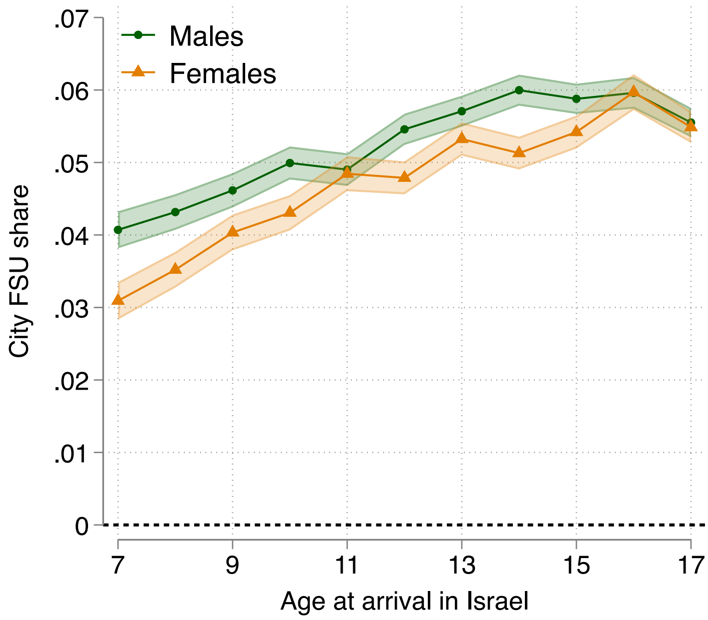
Notes: Point estimates and 95% confidence intervals (robust standard errors) of parameters γ_k in equation (1) when outcome variable is a dummy equal to one if person i migrated out of Israel by age 35. Average out-migration probabilities among natives are 0.063 for men and 0.041 for women.

From the individual's perspective, this result arguably illustrates how those who arrive at younger ages better integrate into Israeli society, as they are less likely to make the ultimate revealed preference measure of (lack of) assimilation—leaving. From an aggregate perspective, these findings carry important implications for our understanding of the life-cycle fiscal impacts of immigration (Dustmann and Frattini, 2014), since child-arrivals in our sample who outmigrate obtain much of their education in Israel, yet leave before their peak working years.

5.3 Geographical Sorting

Figure 5 shows age-at-arrival effects on geographical sorting and segregation. The outcome variable is the FSU-immigrants population share of the city where a person resides at age 35. The positive estimates throughout show that FSU child arrivals, compared to natives and regardless of age at arrival, reside by age 35 in Israeli cities with higher shares of FSU immigrants. However, the slope in Figure 5 illustrates statistically significant age-at-arrival effects. Those who arrived in Israel at ages 16–17 lived by age 35 in cities that had FSU share differentials of 5 to 6 percentage points. Instead, those who arrived in Israel at age 7 were residing by age 35 in cities with differentials of 3 to 4 percentage points. For reference, the average FSU city share among natives is equal to 0.08. The age-at-arrival profiles are positively sloped for both genders, but steeper for women relative to men.

Figure 5: FSU city share: Immigrant-native gap by age at arrival



Notes: Point estimates and 95% confidence intervals (robust standard errors) of parameters γ_k in equation (1) when outcome variable is the FSU immigrants' population share in the city of residence of person i by age 35. Estimated among the sample of stayers. Average FSU city share among natives is 0.082 for men and 0.080 for women.

5.4 Spouses

Figure 6 shows age-at-arrival profiles on the probability of marrying a native. In particular, the figure shows estimates of γ_k in equation (1) when y_i is a dummy equal to one if person i has, by age 35, married an Israeli-born person.[11]

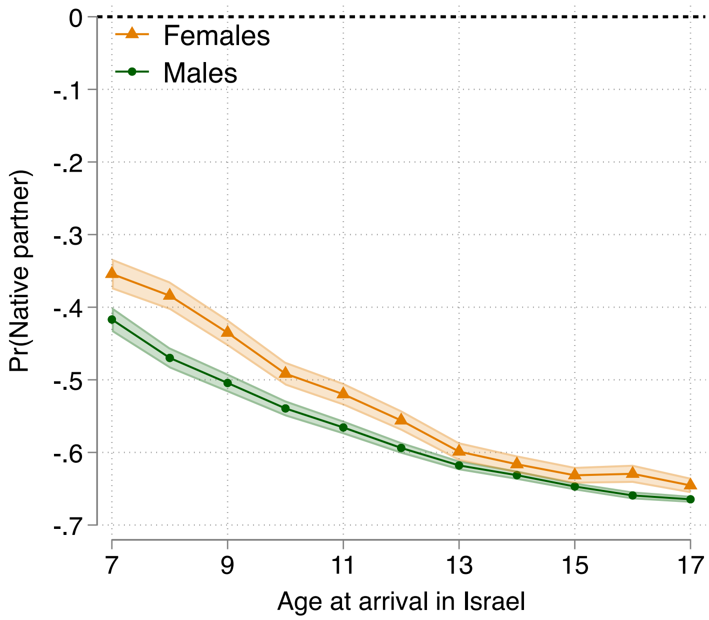
We see a sharp age-at-arrival profile that narrows the gap with natives for FSU children who arrived at younger ages. For instance, the differential probability of marrying a native for FSU children who arrived at age 7 is between -0.35 and -0.40, while the corresponding one for those arrived at age 17 is around -0.65. As benchmark, 63% of native men and 75% of native women are married to a native by age 35.

In contrast to the profile for Hebrew knowledge, these age-at-arrival profiles on the probability of a native partner are quite linear throughout the age-at-arrival distribution,

[11]Note that, as in our sample description in Section 3, this dummy is equal to one only if the marriage is to an Israeli-born person whose parents are not born in the FSU.

although they flatten out for ages at arrival 13 and higher.

Figure 6: Native spouse probability: Immigrant-native gap by age at arrival



Notes: Point estimates and 95% confidence intervals (robust standard errors) of parameters γ_k in equation (1) when outcome variable is a dummy equal to one if person i is married to a native person by age 35, and equal to zero if married to a non-native, or single. Estimated among the sample of stayers. Probability of being married to a native by age 35 among natives is equal to 0.63 for men and 0.75 for women (without conditioning on being married).

Note that the intermarriage results in Figure 6 do not condition on being married by age 35 (the outcome variable is equal to zero for those that marry other immigrants, as well as for those who are unmarried by age 35). Figure A4 shows age-at-arrival effects on the probability of being single by age 35. The immigrant-native gap in the probability of being single is non-existent for women, except among those who arrived at ages 16 and 17. Immigrant, men, instead are more likely than native men to be single, with a slight positive age-at-arrival gradient, possibly indicating that (lack of) assimilation could play a part in explaining the gap with native men.

5.5 Fertility

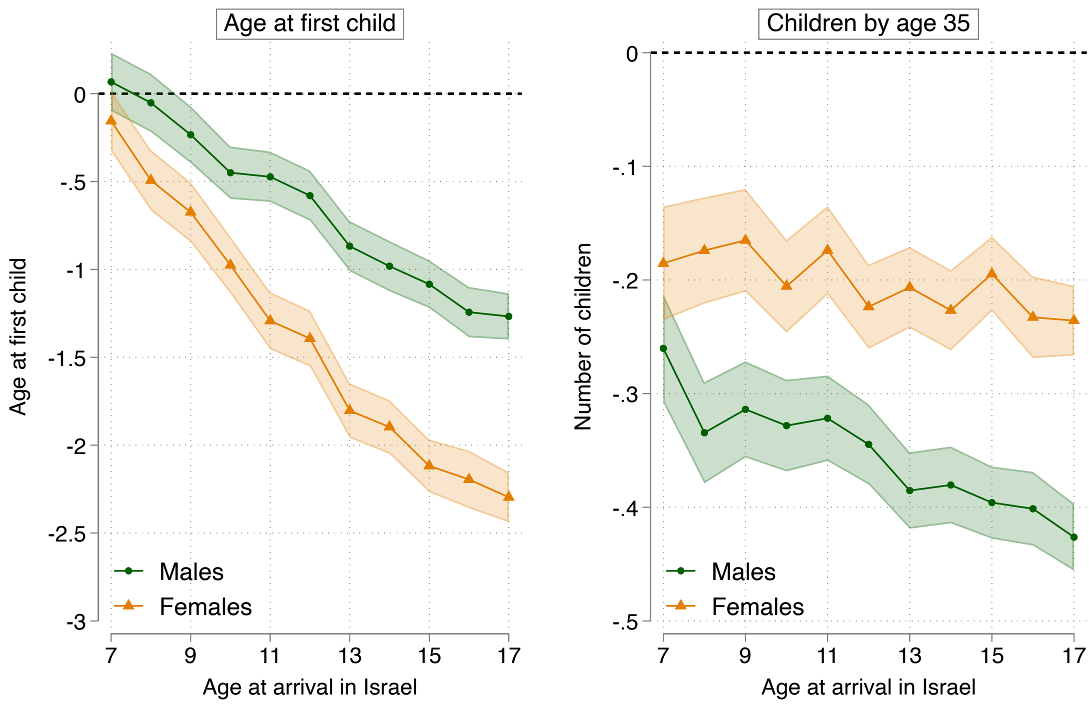
As outlined in Section 2.3, the Soviet norm compared to the Israeli one was to start having children at a younger age, but having a lower number of children in total. As such, assimilation would predict that FSU immigrants, as a function of time living in Israel and exposure to local norms, have their first child at older ages but have more children over their lifetimes.

Figure 7 shows age-at-arrival effects that broadly align with these predictions. The left panel shows a strong age-at-arrival gradient when estimating equation (1) using age at first child as outcome variable. This gradient is particularly steep for women. FSU women who arrived in Israel at age 7 had their first child, on average, a quarter of a year before native

Israelis of their same birth cohort. Instead, FSU women who arrived at age 17 had their first child 2.25 years before natives.

A similar pattern arises for men. Those who arrived from the FSU at age 7 had, on average, their first child at the same age as natives. A linear, negative gradient implies that those who arrived at age 17 had their first child 1.25 years before natives did.

Figure 7: Age at first child and total number of children: Immigrant-native gap by age at arrival



Notes: Point estimates and 95% confidence intervals (robust standard errors) of parameters γ_k in equation (1) when outcome variable is the age at first child (left panel) and total number of children by age 35 (right panel). Estimated among the sample of stayers. Average age at first child among natives is 29.9 for men and 28.1 for women. Results on age at first child condition on having at least one child. Average number of children by age 35 among natives is 1.56 for men and 2.02 for women. Results on number of children do not condition on having at least one.

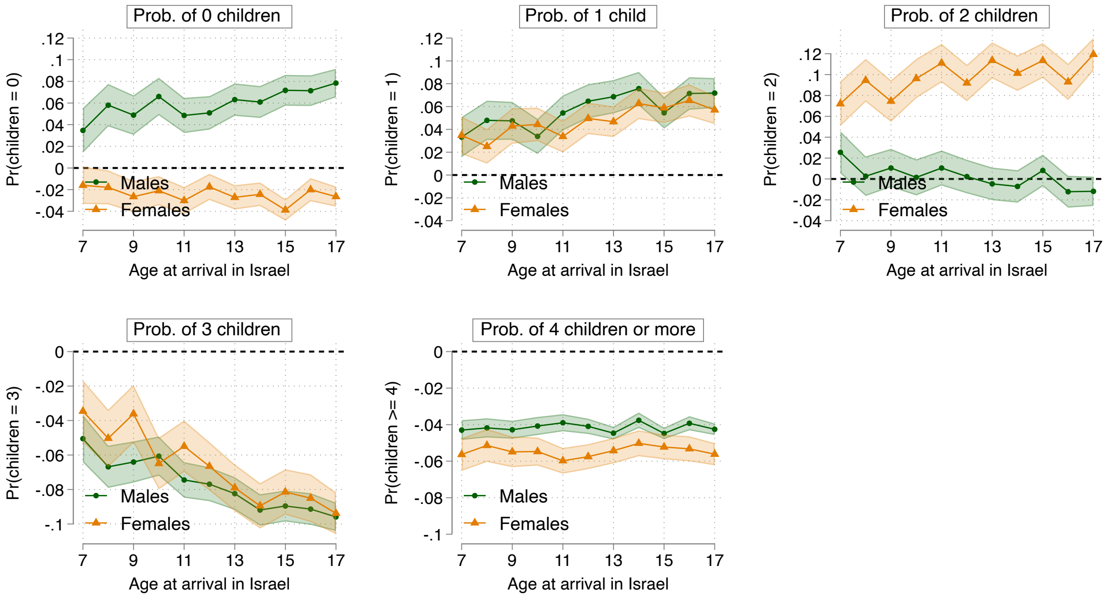
The right panel in Figure 7 shows that the negative immigrant-native gap in number of children narrows for younger arrival ages, especially so among males. For men, those arrived at age 17 have -0.41 fewer children than natives by age 35, while the corresponding gap for those arrived at age 7 is -0.25.

The age-at-arrival gradient for women in Figure 7 is flatter and somewhat noisier than for men, but there is still a statistically significant negative gradient. When estimating a linear slope instead of age-at-arrival fixed effects, the estimate is equal to -0.0060 (SE = 0.0019). This implies that the effect of arriving at age 7 instead of age 17 closes around 25% of the gap between natives and immigrants who arrived at age 17.

In Figure 8 we unpack age-at-arrival effects across the total number of children distribution. In particular, each of the panels in Figure 8 below shows age-at-arrival effects on the probability of having 0, 1, 2, 3, and 4 or more children by age 35.

We see the results on the probability of having three children and the probability of having four or more children as the most relevant for cultural assimilation. Recall from Section 2.3 that the total fertility rate in what is now Russia and Ukraine was close to two in the late 1980s, while in Israel it was around three.

Figure 8: Total number of children distribution: Immigrant-native gap by age at arrival



Notes: Point estimates and 95% confidence intervals (robust standard errors) of parameters γ_k in equation (1) when outcome variable is a dummy equal to one if a person has n children by age 35, where n is equal to 0, 1, 2, 3, or 4+. Estimated among the sample of stayers. The probabilities among male natives for having 0, 1, 2, 3, or 4+ children by age 35 are 0.27, 0.19, 0.33, 0.16, and 0.05, respectively. The probabilities among female natives for having 0, 1, 2, 3, or 4+ children by age 35 are 0.16, 0.14, 0.35, 0.26, and 0.09, respectively.

The bottom-left panel in Figure 8 shows a stark age-at-arrival gradient on the probability of having three children by age 35, both for men and women. The baseline probabilities for natives are 0.16 and 0.26 for males and females, respectively. Relative to this baseline, FSU immigrants who arrived at age 17 had a lower probability of about 0.09. For those who arrived at age 7, the gap effectively halves to between -0.04 and -0.05.

While we see evidence of assimilation on the probability of having three children, the bottom-right panel of Figure 8 shows no such evidence for the probability of having four or more children. About 5 percent and 9 percent of native men and women in our sample have four children by age 35. There is a clear immigrant-native gap, with immigrants having lower probabilities of 4+ children by between 4 and 5 percentage points. Crucially, however, this gap is quite constant across the age-at-arrival support. It thus seems that any assimilation effects on fertility behavior that occur between ages of arrival 7–17 do not reach the probability of having four children or more.

5.6 Robustness

5.6.1 Intra-family comparisons

Tables A1 and A2 show estimates from equation (5), comparing unconditional age-at-arrival profiles with age-at-arrival profiles that condition on mother fixed effects. This analysis estimates age-at-arrival profiles exclusively comparing siblings of the same sex who arrived in Israel from the FSU at different ages. At such, it relaxes our identification assumption (2). The results are reassuring as the estimates of γ with and without mother fixed effects are largely similar.

5.6.2 Main results by age 39

Appendix B includes figures showing our main results when instead of measuring long-term outcomes at age 35, we do so at age 39. The benefit of using age 39 is mainly that we have a better picture of completed fertility than when using age 35. The drawback is that we are constrained to analyze age-at-arrival effects between ages 11–17, rather than 7–17 as we do for age-35 outcomes. In any case, the 11–17 age-at-arrival effects estimated using age-39 outcomes are very similar to those using age-35.

6 Mediation Role of Hebrew Knowledge

To gauge the mediating role of Hebrew knowledge in cultural assimilation effects, we estimate different versions of the following linear regression models:

$$y_i = \gamma \left(A_i \cdot M_i\right) + \delta M_i + X_i'\beta + \varepsilon_i, \tag{6}$$

and:

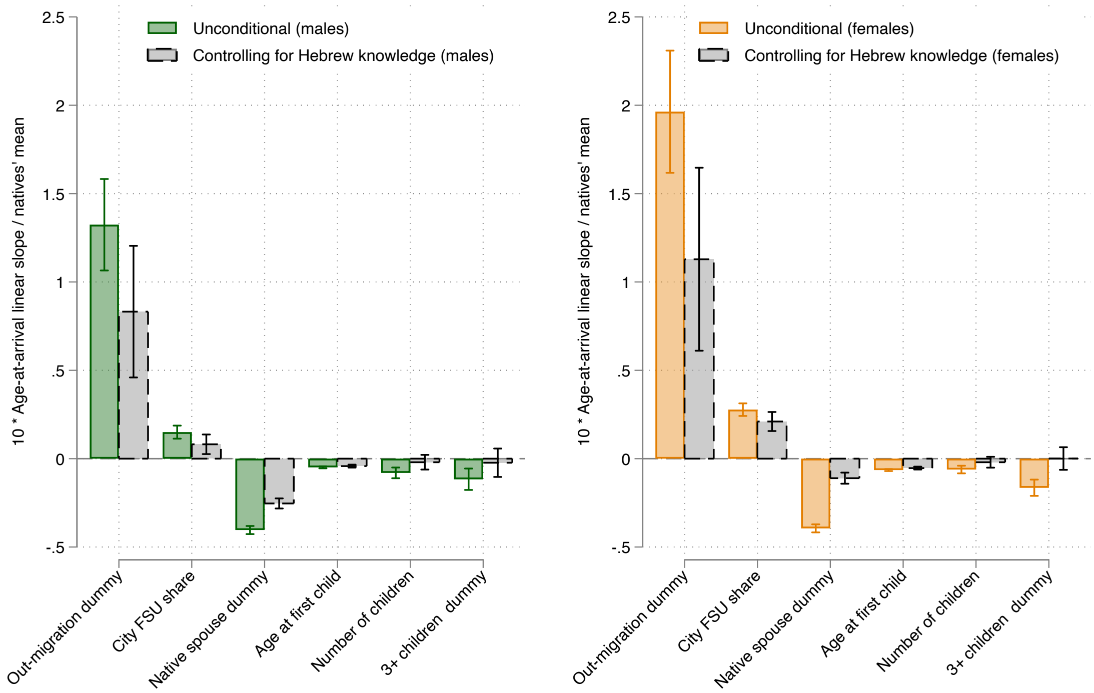
$$y_i = \gamma^H \left(A_i \cdot M_i\right) + X_i'\beta^H + \delta_0 M_i + \delta_1 H_i + \delta_2 H_i \cdot M_i + \nu_i, \tag{7}$$

where y_i, M_i, and X_i are defined as in equation (1), and H_i is a dummy variable equal to one if person i took the PET test in Hebrew. Given that we only observe H_i among PET test-takers, in this section we estimate γ in equation (6) and γ^H in equation (7) on that subsample.

While γ represents unconditional linear age-at-arrival effects, the parameter γ^H instead adjusts for the fact that FSU immigrants who arrived younger are much more likely to learn Hebrew than those who arrived older. To the extent that the age-at-arrival profile γ^H is flatter than the profile γ, this would be consistent with Hebrew knowledge being a mediator of age-at-arrival cultural assimilation effects.

Figure 9 below plots estimates and 95% confidence intervals of γ and γ^H from equations (6) and (7), for different outcome variables y_i. In particular, to ease the comparison of magnitudes across outcomes, the figure represents $\frac{10\hat{\gamma}}{\bar{y}_{\text{natives}}}$ and $\frac{10\hat{\gamma}^H}{\bar{y}_{\text{natives}}}$ for each of six outcome variables, where $\bar{y}_{\text{natives}}$ is the gender-specific mean of each outcome variable among natives. As such, the magnitudes in Figure 9 can be interpreted as the effect of a 10-years younger arrival age in Israel, normalized by the outcome mean among natives.

Figure 9: Hebrew knowledge mediation: Age-at-arrival profiles, unconditional and controlling for Hebrew test-taking



Notes: Point estimates and 95% confidence intervals (robust standard errors) of $\frac{10\gamma}{\bar{y}_{\text{natives}}}$ and $\frac{10\gamma^H}{\bar{y}_{\text{natives}}}$, where γ and γ^H are parameters in equations (6), and (7) and $\bar{y}_{\text{natives}}$ is the gender-specific mean of the outcome variable among natives. Normalization is such that the figure is measured in units of gender-specific native means and captures the effect of a 10-year difference in age at arrival (i.e., from age 7 to 17). Outcome variables are indicated on the horizontal axis and all outcomes are measured by age 35.

The main takeaway from Figure 9 is that, across cultural assimilation outcomes, adjusting for Hebrew knowledge meaningfully moderates age-at-arrival gradients. Age-at-arrival effects on the probability of out-migration, FSU city share, and the probability of a native spouse are substantially reduced, in some cases by 50 percent or more. When looking at fertility outcomes such as number of children and the probability of having three or more children, estimates of γ^H are precisely estimated zeroes, in spite of unconditional age gradients when not controlling for Hebrew. Estimates $\hat{\gamma}^H$ for age at first child are also smaller than $\hat{\gamma}$, but the difference in magnitude is not very big.

Overall, we interpret these results as indicating that the stark age-at-arrival patterns on Hebrew language learning documented in Figure 3 play an important mediator role in long-term cultural assimilation outcomes. This suggests that, in contexts where policy makers might wish to predict the long-term assimilation prospects of child immigrants, knowledge of the local language could be a substitute for younger ages at arrival.

7 Conclusion

This paper estimates age-at-arrival effects on the long-term cultural assimilation of child immigrants, leveraging a unique historical context providing arguably exogenous variation in age at immigration, together with rich population-level administrative data that allows us to track immigrants from the moment of arrival for up to 29 years afterwards. Moreover, we can use a novel, high-stakes, revealed-preference measure of language acquisition in administrative data—the language chosen to take the university entrance standardized test.

Our granular estimates indicate that, indeed, small differences in the age at arrival of immigrant children can have long-lasting integration effects. This is the case for language acquisition, out-migration, residential segregation, intermarriage, and fertility. We are currently working on a model that will quantify the mediating role of language in terms of direct and indirect effects on other assimilation outcomes.

In the FSU-Israel context, immigrants moved from a low- to high-fertility country. Our findings on fertility effects are relevant for current policy debates and demographic concerns across many developed countries. While the general consensus is that economic incentives to enhance fertility have been unsuccessful,[12] this paper can be interpreted as evidence of how exposure to a cultural norm of having many children *can* increase fertility.

From an immigration perspective, we present strong causal evidence that children who arrive at younger ages exhibit greater levels of cultural integration in the long run and that local language knowledge explains a meaningful fraction of such age-at-arrival effects. To the extent that different immigration systems reward different traits when admitting foreign migrants, governments who are concerned about cultural mismatch and aging populations could consider policies rewarding the arrival of immigrant families with young children, or with children who are older but are knowledgeable of the local language.

References

Abramitzky, R., T. Baseler, and I. Sin (2022). Persecution and migrant self-selection: Evidence from the collapse of the Communist Bloc. Working paper, National Bureau of Economic Research.

Abramitzky, R., L. Boustan, and K. Eriksson (2020). Do immigrants assimilate more slowly today than in the past? *American Economic Review: Insights 2*(1), 125–141.

Adserà, A. and A. Ferrer (2015). Immigrants and demography: Marriage, divorce, and fertility. In *Handbook of the Economics of International Migration*, Volume 1, pp. 315–374. Elsevier.

Adserà, A., A. M. Ferrer, W. Sigle-Rushton, and B. Wilson (2012). Fertility patterns of child migrants: Age at migration and ancestry in comparative perspective. *The Annals of the American Academy of Political and Social Science 643*(1), 160–189.

Alesina, A. and M. Tabellini (2024). The political effects of immigration: Culture or Economics? *Journal of Economic Literature 62*(1), 5–46.

[12]See Dulaney (2024) for a recent journalistic article on the topic.

Alexander, R. and Z. Ward (2018). Age at arrival and assimilation during the age of mass migration. *The Journal of Economic History 78*(3), 904–937.

Aloni, T. and H. Avivi (2024). One land, many promises: Assessing the consequences of unequal childhood location effects. Mimeo, New York University and Princeton University.

Arellano-Bover, J. and S. San (2024). The role of firms and job mobility in the assimilation of immigrants: Former Soviet Union Jews in Israel 1990–2019. Mimeo, Yale University and The Hebrew University of Jerusalem.

Åslund, O., L. Liljeberg, and S. Roman (2023). The long-term integration of refugee children: Swedish experiences after the Yugoslav Wars. Working paper, IFAU.

Bleakley, H. and A. Chin (2004). Language skills and earnings: Evidence from childhood immigrants. *Review of Economics and Statistics 86*(2), 481–496.

Bleakley, H. and A. Chin (2010). Age at arrival, English proficiency, and social assimilation among US immigrants. *American Economic Journal: Applied Economics 2*(1), 165–192.

Burchardi, K. B., T. Chaney, T. A. Hassan, L. Tarquinio, and S. J. Terry (2020). Immigration, innovation, and growth. Working paper, National Bureau of Economic Research.

Connolly, M., C. Haeck, and A. M. L. Bourdais-Coffey (2023). Age at immigration and the intergenerational income mobility of the 1.5 generation. Working Paper 23-03, Research Group on Human Capital, ESG UQAM.

Dulaney, C. (2024). Europe tries perks to encourage families to have more children, but it's not working. https://www.wsj.com/world/birthrate-children-fertility-europe-perks-family-04aa13a0. Accessed: 2025-02-25.

Dustmann, C. and T. Frattini (2014). The fiscal effects of immigration to the UK. *The Economic Journal 124*(580), F593–F643.

Dustmann, C. and J.-S. Görlach (2015). Selective out-migration and the estimation of immigrants' earnings profiles. In *Handbook of the Economics of International Migration*, Volume 1, pp. 489–533. Elsevier.

Eriksson, K. and Z. Ward (2019). The residential segregation of immigrants in the United States from 1850 to 1940. *The Journal of Economic History 79*(4), 989–1026.

Friedberg, R. M. (1992). The labor market assimilation of immigrants in the United States: The role of age at arrival. Mimeo, Brown University.

Gokhale, J. (2024, March). U.S. demographic projections: With and without immigration. Wharton Budget Model, University of Pennsylvania.

Jeffay, N. (2016). 'Alienation' Leading to a Russian Exodus from Israel. https://www.thejc.com/news/israel/alienation-leading-to-a-russian-exodus-from-israel-rtsg7lvo. Accessed: 2025-02-25.

Kerr, S. P., W. R. Kerr, and K. E. Smith (2024). Age at immigrant arrival and career mobility: Evidence from Vietnamese refugee migration and the Amerasian Homecoming Act. Technical report, National Bureau of Economic Research.

Mussino, E., B. Wilson, and G. Andersson (2021). The fertility of immigrants from low-fertility settings: Adaptation in the quantum and tempo of childbearing? *Demography 58*(6), 2169–2191.

Nahmias, P. (2004). Fertility behaviour of recent immigrants to Israel: A comparative analysis of immigrants from Ethiopia and the former Soviet Union. *Demographic Research 10*, 83–120.

Okun, B. S. and S. Kagya (2012). Fertility change among post-1989 immigrants to Israel from the former Soviet Union. *International Migration Review 46*(4), 792–827.

Peri, G. (2020). Can immigration solve the demographic dilemma? Finance & Development, International Monetary Fund, March 2020, pp. 26-29.

Remennick, L. (2007). *Russian Jews on Three Continents. Identity, Integration, and Conflict*. Transaction Publishers.

Tabellini, M. (2020). Gifts of the immigrants, woes of the natives: Lessons from the age of mass migration. *The Review of Economic Studies 87*(1), 454–486.

Tønnessen, M. and E. Mussino (2020). Fertility patterns of migrants from low-fertility countries in Norway. *Demographic Research 42*, 859–874.

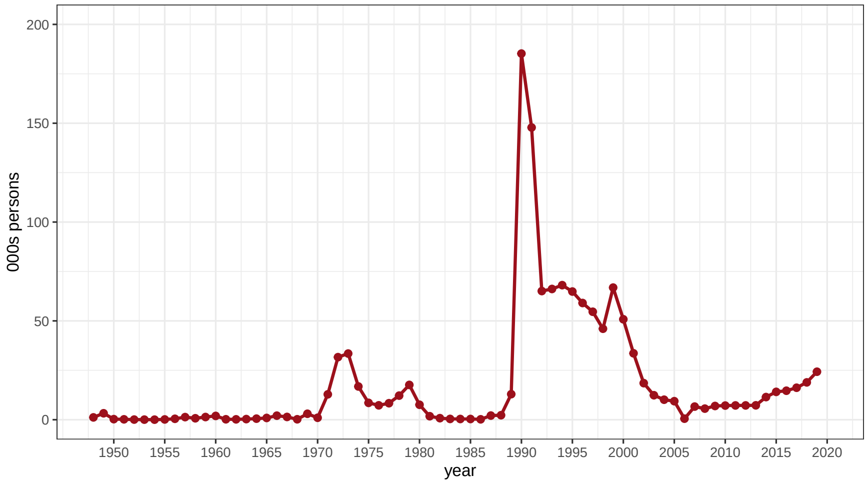
UN Population Division (2024). 2024 Revision of World Population Prospects.

van der Slik, F. W., R. W. van Hout, and J. J. Schepens (2015). The gender gap in second language acquisition: Gender differences in the acquisition of Dutch among immigrants from 88 countries with 49 mother tongues. *PLOS One 10*(11).

- SUPPLEMENTARY APPENDICES -
For Online Publication Only

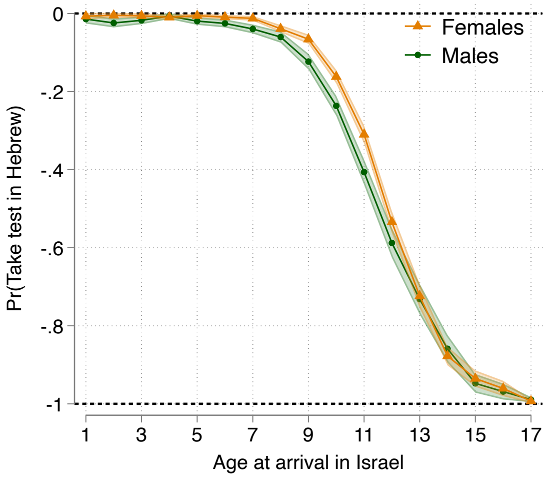
A Additional Figures and Tables

Figure A1: FSU Immigration to Israel



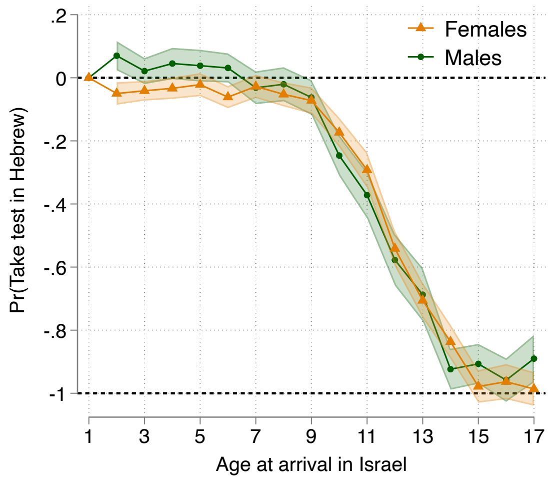
Notes: Number of immigrants arriving in Israel from the former Soviet Union, by year. Source is the Israel Central Bureau of Statistics.

Figure A2: Hebrew test-taking: Age-at-arrival effects for stayers



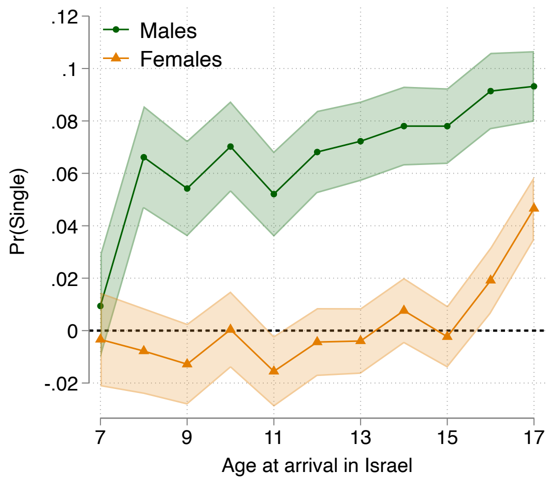
Notes: Point estimates and 95% confidence intervals (robust standard errors) of parameters γ_k in a version of equation (1) augmented to cover ages of arrival 1–17, when outcome variable is a dummy equal to one if person i chose to take the PET university entrance standardized test in Hebrew. Estimated among the sample of PET test-taker stayers. The probability of taking the PET test in Hebrew among natives is equal to 0.995, both for men and women.

Figure A3: Hebrew test-taking: Age-at-arrival effects with mother fixed effects



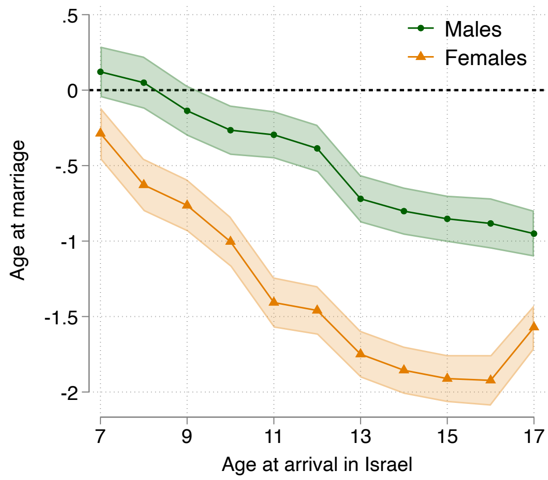
Notes: Point estimates and 95% confidence intervals (robust standard errors) of parameters γ_k in a version of equation (1) augmented to include mother fixed effects and cover ages of arrival 1–17, when outcome variable is a dummy equal to one if person i chose to take the PET university entrance standardized test in Hebrew. Estimated among the sample of PET test-takers in the siblings sample. The probability of taking the PET test in Hebrew among natives is equal to 0.995, both for men and women.

Figure A4: Single status: Immigrant-native gap by age at arrival



Notes: Point estimates and 95% confidence intervals (robust standard errors) of parameters γ_k in equation (1) when outcome variable is a dummy equal to one if person i is single (not married) by age 35, and equal to zero if married. Estimated among the sample of stayers. Probability of being single by age 35 among natives is equal to 0.26 for men and 0.17 for women.

Figure A5: Age at marriage: Immigrant-native gap by age at arrival



Notes: Point estimates and 95% confidence intervals (robust standard errors) of parameters γ_k in equation (1) when outcome variable is age at (first) marriage. Estimated among the sample of married stayers. Average age of (first) marriage among natives is equal to 28.2 for men and 26.2 for women.

Table A1: Age-at-arrival profiles, with and without mother fixed effects - Males

	Out-migration		City FSU share		Native spouse		Age at first child		Number of children		3+ children	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Age at arrival	0.0022	0.0013	0.0021	0.0017	-0.0230	-0.0292	-0.1438	-0.1834	-0.0185	-0.0035	-0.0055	-0.0022
	(0.0012)	(0.0011)	(0.0002)	(0.0002)	(0.0009)	(0.0010)	(0.0151)	(0.0172)	(0.0037)	(0.0038)	(0.0011)	(0.0012)
Mother FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
N	117,962	115,357	118,025	115,467	122,562	122,504	90,323	72,875	122,635	122,635	122,635	122,635

Notes: Point estimates and robust standard errors of linear age-at-arrival effects γ in equation (5), with and without mother fixed effects. Estimated among the siblings sample. All outcomes are measured by age 35.

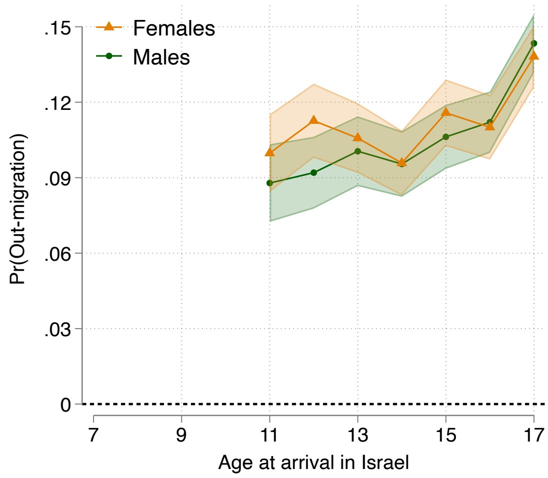
Table A2: Age-at-arrival profiles, with and without mother fixed effects - Females

	Out-migration		City FSU share		Native spouse		Age at first child		Number of children		3+ children	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Age at arrival	0.0040	0.0062	0.0027	0.0025	-0.0322	-0.0337	-0.2146	-0.1813	-0.0085	-0.0158	-0.0076	-0.0082
	(0.0012)	(0.0012)	(0.0003)	(0.0002)	(0.0015)	(0.0016)	(0.0164)	(0.0165)	(0.0042)	(0.0041)	(0.0016)	(0.0017)
Mother FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
N	112,892	111,428	112,930	111,497	115,711	115,668	97,855	86,902	115,764	115,764	115,764	115,764

Notes: Point estimates and robust standard errors of linear age-at-arrival effects γ in equation (5), with and without mother fixed effects. Estimated among the siblings sample. All outcomes are measured by age 35.

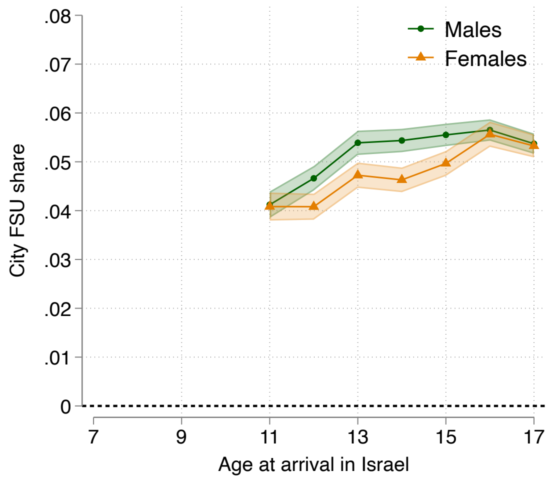
B Results for Long-term Outcomes Measured at Age 39

Figure B1: Out-migration by age 39: Immigrant-native gap by age at arrival



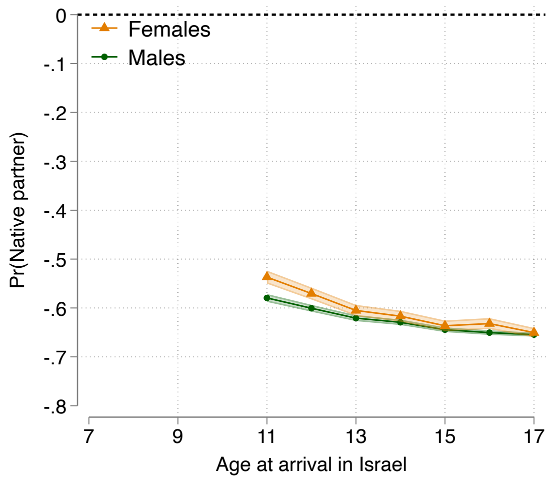
Notes: Point estimates and 95% confidence intervals (robust standard errors) of parameters γ_k in equation (1) when outcome variable is a dummy equal to one if person i migrated out of Israel by age 39. Average out-migration probabilities among natives are 0.068 for men and 0.045 for women.

Figure B2: FSU city share at age 39: Immigrant-native gap by age at arrival



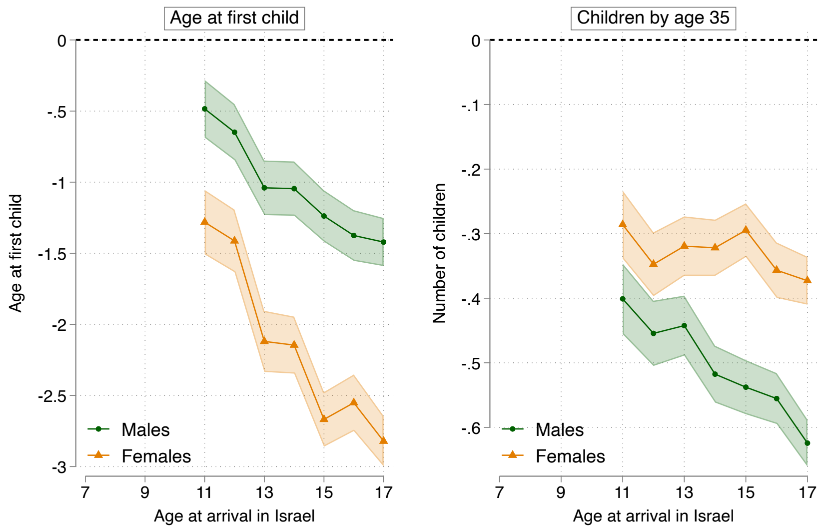
Notes: Point estimates and 95% confidence intervals (robust standard errors) of parameters γ_k in equation (1) when outcome variable is the FSU immigrants' population share in the city of residence of person i by age 39. Estimated among the sample of stayers. Average FSU city share among natives is 0.076 for men and 0.074 for women.

Figure B3: Native partner probability by age 39: Immigrant-native gap by age at arrival



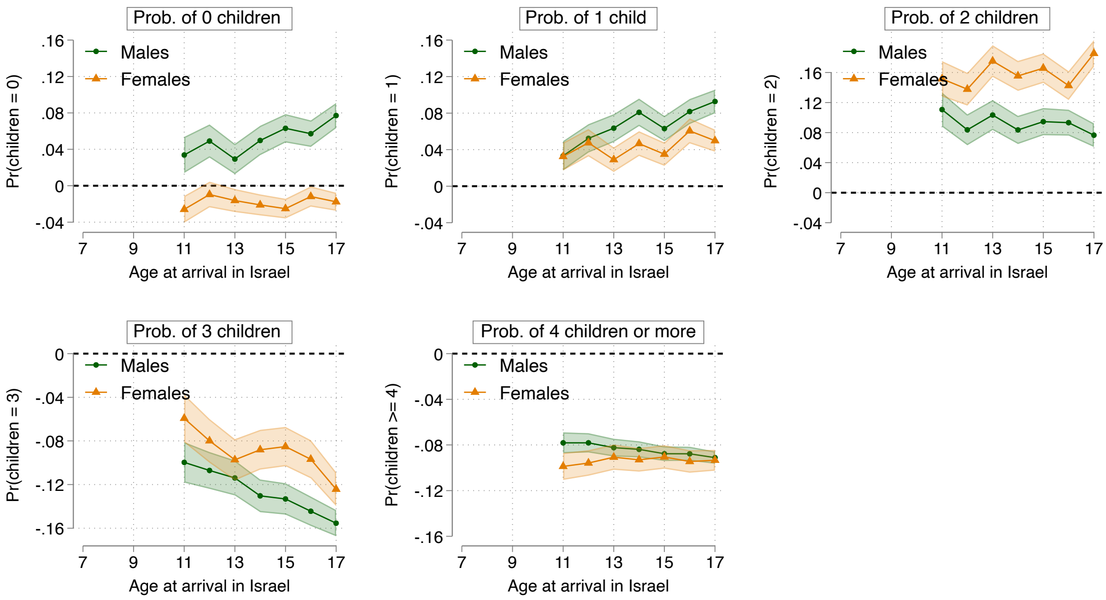
Notes: Point estimates and 95% confidence intervals (robust standard errors) of parameters γ_k in equation (1) when outcome variable is a dummy equal to one if married to a native person by age 39. Estimated among the sample of stayers. Probability of native partner among natives is equal to 0.67 for men and 0.77 for women.

Figure B4: Age at first child and number of children by age 39: Immigrant-native gap by age at arrival



Notes: Point estimates and 95% confidence intervals (robust standard errors) of parameters γ_k in equation (1) when outcome variable is the age at first child (left panel) and total number of children by age 39 (right panel). Estimated among the sample of stayers. Average age at first child among natives is 30.8 for men and 28.6 for women. Results on age at first child condition on having at least one child. Average number of children by age 39 among natives is 2.03 for men and 2.40 for women. Results on number of children do not condition on having at least one.

Figure B5: Number of children by age 39 distribution: Immigrant-native gap by age at arrival



Notes: Point estimates and 95% confidence intervals (robust standard errors) of parameters γ_k in equation (1) when outcome variable is a dummy equal to one if a person has n children by age 39, where n is equal to 0, 1, 2, 3, or 4+. Estimated among the sample of stayers. The probabilities among male natives for having 0, 1, 2, 3, or 4+ children by age 39 are 0.21, 0.10, 0.28, 0.29, and 0.11, respectively. The probabilities among female natives for having 0, 1, 2, 3, or 4+ children by age 39 are 0.13, 0.08, 0.27, 0.36, and 0.16, respectively.