Age at Immigration and the Adult Attainments of Child Migrants to the United States

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Abstract: Age at arrival matters for schooling outcomes in a way predicted by child development theory: The chances of being a high school dropout increase significantly each year for children who arrive after the age of eight. We document this process for immigrants from a number of regions relative to appropriate comparison regions. Using instrumental variables we find that the variation in education outcomes associated with variation in age at arrival influences adult outcomes that reflect values important to the American mainstream, notably English language proficiency and intermarriage. We conclude that children experience migration differently from adults depending upon the timing of migration, and we show that migration during the early years of child development influences educational outcomes. We also find that the variation in education induced by the interaction of migration and age at arrival changes the capacity of children to become fully integrated into the American mainstream as adults.

Keywords: Immigration, children, education, intermarriage, language proficiency, age at arrival

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Introduction

Terms like "assimilation" and "integration," defined as the process by which immigrants become full-fledged members of their host societies, inform a wide variety of public policy discussions about immigration in many rich countries (Fukuyama 2006; Portes and Rumbaut 2006). But these terms refer not only to the capacity to make one's own way in the labor market and through the social hierarchies of the host society; they also refer, as originally described by Gordon (1964) and discussed more recently by Akerlof and Kranton (2000, 2010), to unqualified membership that is signaled by the absence of social barriers, to participation in mainstream institutions, intermarriage, and ultimately identity.

In their analysis of identity formation, Akerlof and Kranton do not take up the analysis of immigration, simply stating that "[to] some extent individuals may choose not only their actions but their identity. Social categories are more or less ascriptive; but people often have some choice over who they are. ... [F]or example, immigrants can decide whether to assimilate" (Akerlof and Kranton 2010, 19). But exactly in what sense and to what degree can immigrants choose whether to assimilate? What are the constraints on this choice? And given these limits, what degree of assimilation can reasonably be expected?

These questions motivate our analysis of the adult social outcomes of child migrants to the United States, a relatively neglected aspect of the immigration literature. Our approach engages a well-established literature on the labor market and social adaptation of adult migrants with an equally developed literature on child development. The impact of migration on children is a litmus test of the capacity to integrate, because there is arguably more scope for child migrants to become fully assimilated over the course of their lifetimes. A focus on child migrants is further justified by the growing research and public policy attention dealing with the influence

of early child development on adult outcomes, as summarized, for example, by Knudsen and associates (2006). Our analysis is based on the hypothesis that both the age of arrival in the United States and regional origins of child migrants influence their long-term integration prospects.

The next section of the paper draws implications from the Akerlof and Kranton model for the empirical analysis of migration and links their theory to the child development literature. We draw from the existing literature to suggest that the long-term integration prospects of child migrants are significantly worse for those who arrive in the country after about nine years of age. Our hypothesis is that age at arrival implies an exogenous variation in the costs of adapting to the American mainstream. This is reflected in the fact that children who arrive after age eight obtain less education, which will have long-term implications for adult behaviors like English language proficiency and intermarriage.

Section 3 specifies our empirical model and justifies the use of an instrumental variables estimator. The analysis examines the limits to integration prospects by relating adult social outcomes to a relevant counterfactual and clarifies the causal influence education choices have on adult assimilation. In particular, we use the experiences of Canadians and, in a more limited way, Puerto Ricans, as the basis for comparison. For different reasons these groups represent backgrounds familiar with American society. Canadian migrants face lower costs to assimilation, and in some sense the degree to which they adapt to the American mainstream represents a best-case scenario by which to judge the behavior of other groups.

Section 4 describes the data and the outcome measures used to portray economic and cultural assimilation. The analysis uses 2000 census micro-data files and focuses on adults ages 35 to 54 who migrated to the United States before age 18. The outcomes we examine are English

language proficiency, marriage, intermarriage, and fertility. We also emphasize the role of educational attainment, particularly high school graduation. The descriptive results show that the chances of being a high school dropout are related to age at arrival in a way consistent with sensitive periods in child development. Sections 5 and 6 summarize the econometric results, and document the extent to which adult outcomes are related to variations in educational attainment resulting from age at arrival.

Our three major conclusions are summarized in the final section. First, the broad messages of the child development literature ring true in an analysis of the educational attainment of child migrants. There are important variations in schooling according to whether a child arrived in the United States before the age of eight. This result suggests that there is a sensitive period during middle childhood as children make the transition from "learning to read" to "reading to learn" that has consequences for their subsequent success in the schooling system. Second, the variation in educational attainment induced by age at arrival has significant implications for the adult behaviors we associate with integration into the American mainstream. Third, in deriving these results it is important to recognize the social boundaries that some groups are unable to cross. Our inferences are developed relative to clearly articulated counterfactuals that in some sense represent the best-case scenarios for the degree of integration that can be reasonably expected given the prevailing boundaries in American society, but over which opinions may vary.

Theory and the Framework for Empirical Analysis

Akerlof and Kranton (2010, 2000) suggest that individual behavior is influenced by utility derived from preferences that vary with the social setting. There is a gain to well-being when actions conform to the norms and ideals that typify the social category to which an

individual belongs, and a loss when they do not. As such, behavior and well-being will be determined not just by the standard economic calculus associated with preferences specific to the individual, but also by gains and losses associated with identity. In the long run, individuals might be able to choose their identity, but the extent to which this is possible also depends on the nature of the social categories to which they belong. Akerlof and Kranton (2010, 23) state: "In a society where social categories are defined by race, family background, and ethnicity, for example, it may be virtually impossible for an individual to adopt a new identity."

Although there is no further consideration of immigration in their analysis, the first point to note in operationalizing their model is that empirical analysis should focus on individual actions.[1] Studies addressing diversity, cohesion, and identity are often based on self-reported responses to survey questions about the extent to which respondents feel they "belong" to the community, the pride the respondents have as a result, or the importance respondents ascribe to mainstream membership. As useful as it may be to examine belonging and identity directly, the empirical implementation of "Identity Economics" requires attention to actions and behaviors that influence utility.

This raises a second point. If empirical analysis needs to be based on actions and behaviors relative to some ideal type, then both the specific behaviors of interest and the relevant counterfactual must be clearly articulated. Relevant counterfactuals are seldom made explicit, however. Phrases like "assimilation," "integration," and "reasonable accommodation" all involve some unspecified ideal type; otherwise how do we know when assimilation or integration is achieved, and how do we know what the limit of "reasonable" accommodation would be?

The third issue that needs to be addressed concerns the costs of changing behavior and choosing an identity. This is the main focus of our analysis. It may be appropriate to suggest that

immigrants have a capacity to choose their identities, but the costs of doing so vary. In particular, this is more likely a longer-term process that plays out over, as much as within, a generation. The costs of changing identity will be lower for the children of immigrants than the parents both because their preferences and knowledge of the mainstream are more open to influences outside of the family and the origin culture, and also because social investments—through the education system—are more effective. Therefore, the dynamics of identity formation may be observed most effectively by focusing on child migrants, with particular attention to the role of age at arrival.

A late age at arrival implies a higher cost of changing identity because of challenges in adapting to and benefiting from schooling. This change in cost is also associated with changes in the capacity to learn a new language as age at first exposure increases. Consequently, children arriving at younger ages are likely to obtain more education than their older counterparts; educational attainment is a key indicator of human and social capital that determines adult outcomes. Framing the discussion in terms of children is more likely to be relevant for public policy: There is more scope for a social return in teaching a second language to children than to adults.

This perspective is motivated by the literature on child development and the empirical literature on language acquisition, which suggests that the ability to acquire a language, or more specifically a second language, deteriorates with age. The theory—the so-called "critical period hypothesis"—implies there is no age-dependent relationship in language outcomes if the age at first exposure to the new language is before the onset of a distinct threshold; thereafter, there is a change either in level or rate, with the capacity to learn the language deteriorating.[2]

The empirical literature on second-language acquisition is based on individual case studies, small-scale experimental or laboratory studies, or analyses of large surveys or censuses. The focus of individual and laboratory studies is usually on some particular aspect of language skills.[3] In the case of immigrants and second-language acquisition, this often, though not exclusively, refers to accent. Linguistic outcomes are more broadly measured in studies using survey data.[4]

An Instrumental Variable Estimation Strategy

Our empirical analysis is framed with these issues in mind. Educational attainment is central in determining the adult outcomes of children and the extent to which they integrate, or choose to integrate, into the mainstream of their host society. It influences ultimate language proficiency, and directly—as well as indirectly through the impact on language—marital choices and other outcomes. But educational attainment varies for a host of reasons. Some of these are individual specific, as young people assess their own abilities and motivations and weigh the marginal costs of continued schooling against the marginal benefits. Educational attainment is also influenced by the incentives embodied in their community of origin, and by public policy as reflected in the structure and efficacy of schools.

As result, the influence of education on identity cannot be determined directly. However, to the extent that there are variations in educational attainment associated with age at arrival that are exogenous to the individual, they can be used to estimate the causal impact of education on the outcomes of interest. This is the maintained assumption in our analysis, reflecting at its root the fact that children did not have a choice in the migration decision.

In accordance with the definition of child in the United Nations' Convention on the Rights of the Child, we focus on migrants who arrived before the age of 18 and examine variations in

their adult outcomes according to their age at arrival in the United States. A late age at arrival implies higher integration costs because of more formidable adaptation challenges and fewer years to benefit from school investments. This will be a particular concern for children from non-Anglophone countries who must learn English.

Bleakley and Chin (2010; 2004) offer clear evidence that, when compared to an appropriate counterfactual, language skills deteriorate distinctly only for immigrants from non-English-speaking countries who arrive in the host country after the age of nine. They argue that this pattern is consistent with the critical-period hypothesis.[5] These authors are careful to point out that the critical period should be identified by the difference in outcomes between immigrants from non-English-speaking countries and those from English-speaking countries. Both groups share the broader challenges associated with adjusting to a new social environment, but only the former face the additional challenge of learning a new language. The difference in outcomes between the two groups allows for the identification of the language effect on integration outcomes.

For similar reasons we focus on Canadians, who despite being foreign born, generally share a similar cultural heritage and language with Americans.[6] Simpson (2000) discusses the experiences of Canadians who moved to the United States for a variety of reasons. Even as they struggled with their change in identity, his respondents described their Canadian attachment in, at best, vague terms. Although anecdotal and based on particular case studies, Simpson's claims are consistent with the overall portrait painted in comparative public opinion polls of the two countries. Corak (2009) finds that with the possible exception of the role of government, Canadians and Americans share similar ideals on issues dealing with individual responsibility, social mobility, and what it means to lead a good life.

Our analytical objective is to use the source of variation in education outcomes associated with arriving before age nine and relative to the Canadian counterfactual to identify the impact education has on adult outcomes that we associated with choices related to identity. More education should lead to positive integration outcomes subject to the constraints imposed upon the group to which one belongs. There are two empirical prerequisites to this possibility. The first step in this argument is to examine the degree to which education outcomes vary with age at arrival in a way predicted by child development theory. The second step is to document the extent to which age at arrival is correlated with the adult outcomes of interest. Accordingly we use an instrumental variables strategy to correctly estimate the impact of educational attainment on adult outcomes.

We use two-stage least squares to obtain unbiased estimates of the impact of education on several indicators of integration. The first-stage equation in the model is given by equation (1) where the dependent variable, Z_i, is a measure of educational attainment.

$$Z_i = b_0 + b_1(\text{Age at arrival before 9})_i \times 1(\text{Not Canada})_i + \qquad (1)$$
$$b_2(\text{Age at arrival before 9})_i + b_3 1(\text{Not Canada})_i + \mathbf{X}'_i \boldsymbol{b}_4 + \nu_i$$

The variable (age at arrival before 9) is derived from information on the reported age at arrival, and is equal to zero if the individual came to the United States at age eight or younger, but incrementally increases by one for each age at arrival beyond the age of eight: that is, for each of the individuals in the sample it is $max(0, \text{Age at arrival}_i - 8)$. For ease of exposition we also refer to this variable as simply "arriving young." It is intended to reflect the hypothesis we draw from the child development literature: that the environment during the middle childhood years—from about age eight to age ten—, as reading and language skills are cemented and are used to expand

the child's cognitive skills, have particular bearing in setting the stage for ultimate success in schooling. Following Bleakley and Chin (2010), the model is a parsimonious representation of the impact of a sensitive period in child development, with no influence of age at arrival on education outcomes up to the age of eight, and then a linear change after this threshold. Our view is that this variable potentially represents the consequences of adjusting to a new social/linguistic/schooling environment for all children.

Our main interest is in the coefficient, b_1, the interaction term between arriving young and not originating in the control country, which is represented in equation (1) by the indicator function 1(Not Canada). This coefficient reveals the degree to which the pattern in education outcomes differs from the country we consider to be the best-case scenario for a particular group. The vector $\mathbf{X}'_i$ is a set of other individual-specific controls that vary with the specification of our model. In all of our specifications, this vector contains indicator variables for country of origin, and in some specifications it also includes indicator variables for each of six stages of development associated with the age at which the child arrived in the United States.[7] Finally, ν_i is a random error uncorrelated with the included terms.

The second stage regression is,

$$Y_i = \beta_0 + \beta_1 Z_i + \beta_2(\text{Age at arrival before 9})_i + \beta_3 1(\text{Not Canada})_i + \mathbf{X}'_i \boldsymbol{\beta}_4 + \varepsilon_i \quad (2)$$

where Y_i represents an adult outcome. The excluded instrument is the interaction between the variable denoting arrived young and an indicator for immigrating from a country other than Canada. The statistical significance, sign, and magnitude of β_1 is of main interest, which

indicates the impact on adult integration outcomes of the variation in educational attainment due to age at arrival.

Data, Definition of Outcomes, and Descriptive Statistics

We use the 2000 U.S. Census 5 percent public use file for empirical estimation. The very large sample sizes provided permit an analysis for important subgroups and according to the country of origin. Table 1 summarizes the unweighted frequency counts according to the categories of greatest interest. The analytical sample consists of all individuals born outside of the United States who report arriving in the country before the age of 18, and who also state that they are between 35 and 55 years old at the time of the census.[8] Canadians make up about five percent of the total sample, with Mexicans the largest group by a substantial margin. The analysis makes no use of immigrants who came to the United States from the group referred to in Table 1 as the "Rest of the world" because of the heterogeneity of these source countries and sample size limitations at specific ages of arrival.

Census data permit an analysis by specific arrival ages, which is important for our analytical goals. The data have at least 4,900 observations for each age at arrival from newborn to 17. Unlike previous censuses, the age at arrival in the 2000 census is measured in exact years. The information displayed in Figure 1 is intended as illustrative of our more detailed analysis. It presents the average proportion of the sample that lacks at least a high school diploma for each possible age at arrival, from newborn to 17. The chances of not having a high school diploma for a group of 35- to 55-year-old residents is about 15 percent if they arrived before the age of five, but close to or above 40 percent if they arrived at age 14 or older. For men, the chances of dropping out of high school increase, for the most part, throughout the age-at-arrival distribution, though at different rates after age five, and again after age 10. For women there is a non-age-

dependent relationship conditional on arrival before five years of age. That said, there is a clear change in the slope of the relationship after age 10. All of this is a description of the raw data forming the basis of our study, and is not to be understood as a causal story or evidence for or against a critical period. These data certainly reflect compositional and cohort effects, and it is not clear that the broad patterns are generally applicable.

The suggestion, however, is that education outcomes may vary systematically with age at arrival in a way consistent with the child development literature, which is important because arrival age may potentially represent exogenous variation in schooling completed—the main social institution influencing longer-term outcomes. But education outcomes also vary across regions of origin, as illustrated in Table 2. This table reports the sample proportion without a high school diploma and two additional measures of educational attainment: an indicator for having obtained a college degree, and the total years of schooling. Child migrants from Canada actually have slightly lower levels of educational attainment compared with those from the United Kingdom, Australia, and New Zealand, and child migrants from the Rest of Europe achieve less schooling than both groups. Similarly, Puerto Ricans do not attain as much education as migrants from Latin America but attain more than Mexican child immigrants.

We conduct separate analyses in order to compare each of these groups to Canadians. Taken as a whole, these comparisons progressively represent a greater social distance that must be traveled: those from Anglo-Saxon countries sharing an ethnic identification with Canadians and having facility in English; those from other European countries and not as fluent in English ; Puerto Ricans, American citizens exposed to English on the island and representing a Hispanic group that is most likely identified with America; and finally Mexicans and those from other Latin American countries, who are the farthest culturally from the American mainstream.

We examine several adult outcomes that are available in the census and that we maintain are associated with social aspects of identity. These are English language proficiency, marriage, fertility, and (conditional on marriage) the national origins and linguistic capacities of the spouse. Summary statistics for these measures are presented in Table 3 separately for men and women. The indicator of English language ability is derived from questions associated with self-reported ability to speak English (Questions 11a and 11c of the 2000 census long form). We create a measure identical to that used by Bleakley and Chin (2010), a four-point scale ranging from 0 to 3, with the highest value associated with those responding in Question 11a that they speak no language other than English at home, or, if they do speak another language at home, that they report in Question 11c speaking English "very well." Those who speak another language at home, but who report speaking "well" are assigned a score of 2; those reporting "not well" a value of 1; and finally those reporting "not at all" a value of zero.

We also create an indicator variable of whether an individual falls into the most proficient category or not. Both this indicator variable and the index varying from 0 to 3 are summarized in the table, but the former is our main variable of interest in the econometric analysis. Not surprisingly, individuals from Canada as well as those from the United Kingdom/Australia/New Zealand as a group reported the highest facility with the English language, with more than 97 percent achieving the highest score. About 70 percent of Puerto Ricans fall into this category. Those from Latin America exceed this reference point, but Mexicans fall significantly below.

The remaining social outcomes relate to marital and fertility choices, and are intended to indicate the social distance that individuals have traveled, with the progressive movement from having a spouse from the same country, to having a spouse who is an immigrant, and finally to having a spouse with whom English is spoken as the home language. The spouse indicators are

conditional on being married, an outcome examined independently along with fertility. It should be noted that from the census we observe only the number of children currently present in the household rather than the total fertility rate. Choice of spouse is probably the clearest indication of behavior as well as barriers to adopting mainstream norms available in our data. Only 7.4 percent of female migrants from Canada and 8.0 percent of male migrants from that country are married to a partner also from Canada, while over 50 percent of women and about 43 percent of men from Puerto Rico are married to another Puerto Rican. Similarly, in the Canadian case close to 80 percent of migrants speak exclusively English with their spouses, but this is the case for only 11 percent or so Puerto Ricans and even fewer Mexicans.

Estimation Results: The Impact of Age at Arrival on Education and Adult Outcomes

Figures 2 through 4 sharpen the intuition of our empirical model. For the sake of brevity, they focus on just one of the education outcomes for each region of origin: the proportion of individuals without a high school diploma. Figures 2 and 3 present the high school dropout rate for each region; Figure 4 presents the differences in the high school dropout rate between Canada and each of the groups.

There is no strong age-dependent relationship in dropping out of high school in Canada and the other English speaking regions, with the possible exception of an increase for those of Canadian origin at an arrival age of 15 and older. The educational attainment of child migrants from the United Kingdom, Australia, and New Zealand is similar to that of Canadians and, if anything, slightly better. This suggests that their capacity to develop the human and social capital from the U.S. education system, potentially influential for long-term integration, matches the best-case scenario for child migrants from English-speaking countries. This is not the case for migrant youth from other European countries. For them, there is a clear age-at-arrival dependent

relationship in high school dropout rates, and when compared to Canada this difference grows markedly after an arrival age beyond 10. The high school completion patterns are similar for child migrants from Latin American countries other than Mexico.

It is clear that the levels in the dropout rate are much higher for Puerto Ricans and Mexicans, for whom there is a clear linear relationship to age at arrival. This said, in the case of Mexico the rate of increase seems to change, being somewhat more muted before an age at arrival between nine and 10. Relative to their Puerto Rican counterparts, Mexicans do no worse in terms of dropping out of high school for ages of arrival up to 10, but then fare progressively worse at older ages.

The differences depicted in Figure 4 foreshadow the estimation results for the interaction term in equation (1), which are presented in Table 4. The table entries are least squares estimates of b_1 for each of 12 different specifications: one comparison between Canada and all other countries, and five additional comparisons to each region. Two separate models are reported for each of these comparisons according to whether the stage of development at the age of arrival is controlled. Columns (1) in the table present results in which the stage-of-development indicators are not used; columns (2) show results in which they are used. The outcomes for three different measures of educational attainment are also presented.[9]

The high school dropout results tell a story similar to the other measures. These estimates are based on linear probability models of being a high school dropout, and on the basis of the estimates in panel 1 column (2) suggest that for every year of arrival after age eight the chances of being a high school dropout increase by about 2 percentage points per year relative to migrants from Canada. In the Canada–U.K./Australia/New Zealand comparison the interaction term is statistically significant but substantively smaller, the dropout rate falling by 0.7

percentage points per year for arrival after eight years of age, and the point estimate is not statistically significant for the other measures of attainment. This is a reasonable result given the similarities in the background of these individuals to the counterfactual country. In contrast, the estimated coefficient is twice this magnitude for Europeans of a non-Anglophone background, and higher still for those from Puerto Rico and especially Mexico. Child migrants from other Latin American countries do better than these two latter groups, experiencing a rate of increase above the Canadian rate that is similar to that of Europeans.

Table 5 presents the estimated values for β_1 in equation (2) using two-stage least squares. The results in panel 1 suggest that the variation in the chances of obtaining a high school diploma due to variations in age at arrival have a clear impact on the adult outcomes of child migrants, relative to the counterfactual. The chances of reporting a high level of proficiency in English fall by about 1.7 percentage points per year for each year of arrival beyond age eight. In a similar way, fertility is higher for migrant women, and migrants are more likely to marry someone who is an immigrant, someone who is from the same country, and someone who is less likely to be an English speaker. There are no major impacts of variations in high school graduation induced by age at arrival on the outcomes for those from United Kingdom, Australia, and New Zealand. The pattern of results in panel 1 is mirrored for all other regions in panels 3 through 6, with the possible exception of the chances that both spouses of Mexican origin speak English, which is not statistically significant.

Robustness and Alternative Specifications

There are a number of possible threats to the internal validity of our research design: alternative specifications of the instrument, self-selection on parental altruism, and alternative counterfactuals. Therefore, we undertook a series of alternative estimations using different

specifications of the instrument (based on a series of fixed effects for each of six stages of development upon arrival), and did not find substantively different results.[10]

The possibility that parents may time their migration decisions taking into account the impact on their children is an important consideration, because it may imply that the findings are driven not by age at arrival but by changes in unobserved characteristics of the home environment that vary across the age-at-arrival distribution. That is to say, parents who are particularly sensitive to their child's well-being may be aware that migration later in a child's life will have long-term negative consequences, and will therefore migrate earlier. The implication is that the children who arrive at younger ages will likely be from self-selected families with unobserved characteristics—like strong parenting skills, altruism, and access to information—that will benefit the child throughout his or her lifetime. Thus, if adult outcomes of children who arrive before age 9 are observed to be better than those of older immigrant youth, the difference may have less to do with the specific age at arrival than with other parental resources.

The distribution of our sample by age at arrival does not display a tendency for a disproportionate fraction of the sample to migrate at an earlier age, and there is certainly no heaping of the sample just before the age of nine or so. The distribution across arrival ages is relatively uniform at just over 2,000 observations per arrival age for both males and females. In fact, larger proportions are recorded to be arriving after 15 years of age. In large part this is due to migrants from Mexico. For example, just over 8,000 males are recorded to have arrived in the United States at 17 years of age, but this falls to just over 4,000 when Mexicans are excluded from the calculations. A similar pattern occurs for females. Many young Mexicans are arriving in the country after having completed their education decisions with the intention of participating in the labor market.

Consequently we re-estimate the instrumental variables models with two-stage least squares but using a sample of individuals who arrived at age 14 or younger. In large measure the results are robust to the sample restriction, and observable differences tend to reinforce the main findings (such as Puerto Rican men being in a marital union in which both partners speak English becoming statistically significant). This includes the results for Mexicans. The only exception to this is the loss of statistical significance for men from other Latin American countries for all coefficients except English language proficiency, which likely results from the smaller sample size.

Finally, the specific choice of a counterfactual reflects an assumption about social boundaries and the degree to which the mainstream society places constraints on the capacity of immigrants to change their behaviors. In our mind this is an issue open to discussion, reflecting perceptions about the underlying barriers and expectations of adjustment. For example, if ethnic origin matters for ultimate outcomes associated with marriage and intermarriage, then it may be inappropriate to use Canadians, who do not face these constraints, as the reference case. With this in mind we re-examine our findings by focusing on Mexicans, who might face particular challenges, and by using Puerto Ricans as the relevant counterfactual.

Puerto Ricans are U.S. citizens by birth and are exposed to English on the island, albeit to a highly variable extent. In this respect, their integration experiences represent a best-case scenario vis-à-vis Latin American migrants of comparable socioeconomic origins.[11] Figure 5 illustrates the difference in the proportions of high school dropouts by age of arrival between Mexicans and other Latin Americans relative to Puerto Ricans. Compared to their Puerto Rican counterparts, Mexicans do no differently in terms of dropping out of high school for ages of arrival up to 10, but then progressively worse at older ages. Overall, Latin Americans have lower dropout rates

than Puerto Ricans, and the gap widens during the early years, but this advantage stops and and narrows for ages of arrival beyond nine or 10.

Table 6 presents the second-stage estimation results of the interaction term for the Mexican-Puerto Rican comparison, along the lines of Table 5, for both the full sample and the subsample of individuals younger than 15 upon arrival. The results show that relative to Puerto Ricans the variation in educational attainment induced by age at arrival is associated with a lower likelihood of speaking English proficiently and higher fertility rates. The results for the other outcomes are mixed and in some measure are driven by the older, and likely self-selected, subset of Mexicans who likely have no exposure to the American education system. Compared to Puerto Ricans, the variation in education induced by age-at-arrival effects does not play a major role in determining outcomes.

Conclusion

The basis for our analysis is the suggestion drawn from the child development literature: that migration has the potential to affect children differently than adults. We relate this hypothesis to the capacity of children to become fully identified with the American mainstream, placing the emphasis on English language proficiency and intermarriage.

Child migrants have a lower psychic cost of crossing social boundaries and adopting a new identity, and at the same time they can potentially reap greater material and social benefits from doing so. In order to understand this adjustment it is important, however, to appreciate that the process of child development proceeds through a series of sensitive periods, each corresponding to the development of specific physical, behavioral, and cognitive skills in response to the stimuli of the prevailing environment, and each in turn creating the preconditions for success in subsequent periods. Migrant children are no different from other children in this

regard, but they are possibly subject to more important challenges depending upon their region of origin.

Our empirical analysis examines individuals who migrated to the United States before the age of 18 and begins by documenting the relationship between their age at arrival and their educational attainment. We focus this first stage of our analysis on education because this social institution is the main public policy tool influencing social outlook and adult capacities: The process of immigrant integration occurs in the first instance through the schooling system. Age at arrival matters for schooling outcomes in a way predicted by child development theory: The chances of being a high school dropout increase significantly each year for children who arrive after age eight. We document this process for youth immigrants from a number of regions relative to appropriate comparison regions.

Our use of instrumental variables methods suggests that the variation in education outcomes due to age-at-arrival differences is significant for certain adult outcomes that can be associated with values important to the American mainstream. Arriving in the United States after eight years of age leads to variations in educational attainment that influence how well children speak English in adulthood and whom they marry. For example, relative to their Canadian counterparts, child migrants from non-English-speaking European countries are much less likely to report speaking English very well, much less likely to be married to an English-speaking person, and much more likely to be married to someone from the same country of origin. We find similar patterns for Puerto Ricans, Mexicans, and those from other Latin American countries.

There is a clear interaction between the stage of development upon arrival and the education system that has consequences for the ultimate outlook of child migrants. In this sense

migration impacts children differently according to their age. This implies that immigration policy has implications for the challenges faced by the education system. But our results are also conditional upon a recognition that the capacity of migrants to choose their identity depends upon the degree to which the social categories to which they belong are ascriptive: Identity outcomes are in some sense the result of the interaction between individual choices and the capacity of the norms and ideals of the mainstream to also change and adapt. By focusing on particular counterfactuals, our findings reflect particular assumptions on the degree of change that reasonably can be expected. The appropriate balance between individual adaptation and reasonable social accommodation is a topic that merits further discussion.

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Notes

[1] Corak (2011) offers a more detailed discussion of the Akerlof-Kranton model of identity formation for the empirical study of immigration from which the following paragraphs draw.

[2] Pinker (1994, 293 see also 290) describes the reasons for this as being a particular pattern of discrete changes in capabilities, and suggests "[m]aturational changes in the brain, such as the decline in metabolic rate and number of neurons during the early school-age years, and the bottoming out of the number of synapses and metabolic rate around puberty, are plausible causes." But the specific pattern he summarizes is only one of several suggested in the literature. Birdsong (2006) and many of the essays in Birdsong (1999) offer an overview. Some researchers place the so-called critical period as early as five or six years of age, others as late as 12 to 15. In some perspectives, puberty is associated with the stage at which declines in second-language competencies end, but in others puberty is associated with the stage at which it begins (Birdsong 2006, 18-19). Neither is it clear when the onset of puberty should be measured—some suggesting as early as 10 years of age or even younger, others 15—nor whether it has been constant over time. The associated empirical literature does not offer a clear consensus, perhaps because of differences in study designs.

[3] Johnson and Newport (1989) is an often-cited example of an influential case study. See Flege (1999) and Flege et al. (1995) for a discussion and other examples.

[4] Of relevance for our analysis is the research using self-reported information on how well respondents to the U.S. Census speak English, notably Bleakley and Chin (2010; 2004),

Chiswick and Miller (2008), Gonzalez (2003), and Hakuta et al. (2003). All of these authors find that the ability to speak English well deteriorates as the age at arrival increases.

[5] Bleakley and Chin (2004) use the 1990 Census and report that the distinct threshold is age 12 at arrival. In these data, age at arrival is reported only in three-year bands. This span of time might lead them to confuse a continuous possibly non-linear decline in language competence with a discrete change, but Bleakley and Chin (2010) use the 2000 Census, which reports age at arrival in individual years. They continue to suggest that there is a critical period, though it is dated at nine years of age, as opposed to 12 in the earlier study.

[6] The important exception involves Canadians with a French-speaking background. Historically these groups were a significant source of migration to both New England and, even further in the past, Louisiana. English speakers dominate the flows from Canada to the United States during the time periods we analyze.

[7] These are: (1) newborns and infants to about one year of age; (2) preschoolers, which we define to include two-, three-, and four-year-olds; (3) early childhood, consisting of five-, six-, and seven-year-olds, when learning to read and behavioral comportment represent key developmental tasks; (4) middle childhood, including eight-, nine-, and 10-year-olds, when the majority of children make the transition from "learning to read" to "reading to learn"; (5) early adolescence, which includes the onset of puberty from ages 11 through 13; and finally (6) late adolescence, from ages 14 to 17, when most youth are enrolled in high school.

[8] The details of the sample selection rules as well as many supplementary results are described in the full working paper available online as Beck, Corak, Tienda (2012).

[9] The estimates also control for gender, but to assess the robustness of the findings we also estimated separate models for men and women. These do not show major differences from those reported in the text.

[10] These results and others are reported in the working-paper version of this paper (Beck, Corak, and Tienda 2012).

[11] An important caveat is the prevalence of return migration, which can signal limited identification with the U.S. mainstream.

TABLE 1
Sample Sizes and Proportions by Regions of Origin: Men and Women 35 to 55 Years Old in 2000 Who Arrived in the United States Before Age 18

	Men		Women	
	Unweighted Sample Size	Percent	Unweighted Sample Size	Percent
Canada	2,610	4.4	3,178	5.2
United Kingdom, Australia, New Zealand	1,655	2.8	1,941	3.2
Rest of Europe	9,755	16.5	10,680	17.4
Puerto Rico	5,187	8.8	5,997	9.8
Mexico	19,269	32.5	15,643	25.5
Other Latin America	9,340	15.8	11,187	18.3
Rest of World				
English Speaking	2,039	3.4	2,902	4.7
Non-English Speaking	9,397	15.9	9,766	15.9
Total	59,252	100	61,294	100

Source: Authors' calculations from the 5 percent file of the 2000 U.S. Census (Ruggles et al. 2010 *Integrated Public Use Microdata Series: Version 5.0*)

TABLE 2
Education Outcomes by Region of Origin: Men and Women 35 to 55 Years Old in 2000 Who Arrived in the United States Before Age 18

	Sample Size	High School Dropout (%)	College (%)	Mean Years of School Completed
1. Women				
Canada	3,178	7.1	30.4	13.8
U.K., Australia, New Zealand	1,941	5.2	33.6	14.1
Rest of Europe	10,680	14.7	24.3	13.1
Puerto Rico	5,997	38.8	9.8	11.5
Mexico	15,643	58.9	5.0	9.4
Rest of Latin America	11,187	20.8	22.5	12.9
2. Men				
Canada	2,610	9.1	31.5	13.8
U.K., Australia, New Zealand	1,655	5.0	34.6	14.2
Rest of Europe	9,755	15.4	28.5	13.4
Puerto Rico	5,187	42.4	10.4	11.3
Mexico	19,269	64.7	4.5	9.0
Rest of Latin America	9,342	21.2	24.0	12.9

Source: Authors' calculations based upon extracts from the 5 percent file of the 2000 U.S. Census as described in the text. Sample size is the unweighted sample count. Derivations in the other columns are based upon weighted sample counts.

TABLE 3
Summary Statistics for Adult Social Outcomes by Region of Origin: Men and Women
(Means or Percentages)

	Language Outcomes			Family and Marital Outcomes				
	Sample Size	English Language Proficiency[a] $\bar{x}$	High English Proficiency (%)	Number of Own Children in Household $\bar{x}$	Married (%)	Spouses Speak English at Home (%)	Immigrant Spouse (%)	Same Country Spouse (%)
1. Women								
Canada	3,178	2.97	97.4	1.09	67.8	79.6	12.5	7.4
U.K., Australia, New Zealand	1,941	2.98	98.8	1.09	67.7	88.4	17.1	7.1
Rest of Europe	10,680	2.84	86.9	1.18	72.5	34.3	43.7	34.3
Puerto Rico	5,997	2.58	69.8	1.32	53.2	11.1	66.5	53.3
Mexico	15,643	2.04	43.8	2.21	72.3	3.6	78.3	73.8
Rest of Latin America	11,187	2.61	72.5	1.51	62.2	10.3	69.0	46.0
2. Men								
Canada	2,610	2.96	97.3	1.02	68.4	79.2	14.7	8.0
U.K., Australia, New Zealand	1,655	2.98	98.8	0.95	64.4	85.5	18.2	8.5
Rest of Europe	9,755	2.85	87.3	1.15	72.8	41.9	34.8	24.8
Puerto Rico	5,187	2.62	71.5	1.09	61.4	11.7	56.7	42.8
Mexico	19,269	2.08	41.0	2.05	78.8	3.9	76.6	73.0
Rest of Latin America	9,340	2.67	75.4	1.28	67.5	11.6	65.9	44.5

Source: Authors' calculations based upon extracts from the 5 percent file of the 2000 U.S. Census as described in the text. Sample size is the unweighted sample count. Derivations in the other columns are based upon weighted sample counts.
[a] Proficiency scale has a minimum of zero and a maximum of 3.

TABLE 4
Least Squares Regression Results of the First Stage Model of Schooling Outcomes: Canada as the Counterfactual
(standard errors)

	High School Dropout		University Degree		Years of Schooling	
	(1)	(2)	(1)	(2)	(1)	(2)
1. All other countries (observations = *******)						
Arrived Young × Not from Canada	**0.0199**	**0.0211**	**-0.0106**	**-0.0120**	**-0.2029**	**-0.2124**
	(0.0018)	(0.0018)	(0.0025)	(0.0025)	(0.0154)	(0.0155)
Adjusted R-squared	0.2829	0.2836	0.1420	0.1426	0.3031	0.3040
2. United Kingdom, Australia, New Zealand (observations = 9,384)						
Arrived Young × Not from Canada	**-0.0070**	**-0.0070**	-0.0015	-0.0014	0.0279	0.0284
	(0.0023)	(0.0023)	(0.0038)	(0.0038)	(0.0211)	(0.0211)
Adjusted R-squared	0.0091	0.0093	0.0038	0.0046	0.0062	0.0069
3. Other European countries (observations = 26,223)						
Arrived Young × Not from Canada	**0.0151**	**0.0148**	**-0.0128**	**-0.0136**	**-0.1489**	**-0.1491**
	(0.0020)	(0.0020)	(0.0027)	(0.0027)	(0.0171)	(0.0171)
Adjusted R-squared	0.1001	0.1003	0.0392	0.0399	0.1142	0.1145
4. Puerto Rico (observations = 16,972)						
Arrived Young × Not from Canada	**0.0196**	**0.0210**	**-0.0064**	**-0.0070**	**-0.1810**	**-0.1903**
	(0.0023)	(0.0023)	(0.0026)	(0.0026)	(0.0184)	(0.0185)
Adjusted R-squared	0.1400	0.1455	0.0706	0.0720	0.1542	0.1592
5. Mexico (observations = 40,700)						
Arrived Young × Not from Canada	**0.0402**	**0.0448**	**-0.0099**	**-0.0118**	**-0.3981**	**-0.4327**
	(0.0019)	(0.0020)	(0.0025)	(0.0026)	(0.0166)	(0.0170)
Adjusted R-squared	0.2433	0.2464	0.1196	0.1211	0.2282	0.2313
6. Other Latin American countries (observations = 26,315)						
Arrived Young × Not from Canada	**0.0126**	**0.0121**	**-0.0138**	**-0.0158**	**-0.1236**	**-0.1277**
	(0.0020)	(0.0020)	(0.0027)	(0.0027)	(0.0167)	(0.0170)
Adjusted R-squared	0.1250	0.1251	0.0423	0.0433	0.1250	0.1256
Age at Arrival Fixed Effects	No	Yes	No	Yes	No	Yes
Place of Birth Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Note: Arrived young is defined as max (0, Age at Arrival – 8); that is, it takes the value of zero if the age at arrival is eight or younger and then increments by one for each age at arrival beyond eight years. All models also include controls for age in adulthood and age squared, and an indicator variable equal to one if the individual is a woman.
Columns (1) and (2) refer to results from separate least squares estimations. The first refers to a model that does not have a set of indicator variables for developmental stage at arrival; the second includes these five categories (which are described in the text) with those arriving as newborns to two years of age as the reference group. All models include a constant and a fixed effect for the country of birth, with the excluded category being either Canada or Puerto Rico. Each of the four panels represents a different sample.
Standard errors are enclosed in parentheses, **boldface** indicates statistical significance with a marginal significance level of at least 0.05, regular font at a level of at least 0.10, and shaded indicates not statistically significant at 0.10.

TABLE 5
Two-Stage Least Squares Results of the Impact of Being a High School Dropout on Social Outcomes: Canada as the Counterfactual, Men and Women
(standard errors)

	Sample Size (sample size conditional on being married)	English Speaker	Number of Children	Married	Immigrant Spouse	Spouses Speak English at Home	Same Country Spouse
1. All other countries							
Men	59,252 (41,099)	**-1.572**	0.917	-0.110	**1.352**	**-0.584**	**1.284**
		(0.198)	(0.481)	(0.166)	(0.284)	(0.216)	(0.237)
Women	61,294 (40,160)	**-1.777**	**1.562**	0.224	**1.145**	**-0.860**	**1.074**
		(0.202)	(0.448)	(0.165)	(0.206)	(0.191)	(0.177)
Both	120,546 (81,259)	**-1.671**	**1.305**	0.084	**1.237**	**-0.746**	**1.164**
		(0.140)	(0.328)	(0.117)	(0.168)	(0.142)	(0.142)
2. United Kingdom, Australia, New Zealand							
Men	4,265 (2,821)	**-0.604**	2.47	0.944	-0.620	-0.104	-0.394
		(0.294)	(2.01)	(0.747)	(0.621)	(0.515)	(0.493)
Women	5,119 (3,432)	-0.403	-2.28	-0.859	-0.154	0.138	0.983
		(0.295)	(2.24)	(0.909)	(0.617)	(0.577)	(0.576)
Both	9,384 (6,253)	**-0.529**	-0.057	-0.0281	-0.350	0.0218	0.365
		(0.224)	(1.39)	(0.541)	(0.442)	(0.391)	(0.331)
3. Other European countries							
Men	12,365 (8,786)	**-1.487**	0.758	-0.0899	**2.60**	**-3.02**	**2.14**
		(0.306)	(0.877)	(0.304)	(1.04)	(1.16)	(0.816)
Women	13,858 (9,789)	**-1.241**	0.313	0.409	**1.32**	**-1.68**	**1.25**
		(0.208)	(0.558)	(0.230)	(0.309)	(0.368)	(0.273)
Both	26,223 (18,575)	**-1.325**	0.502	0.219	**1.70**	**-2.12**	**1.50**
		(0.184)	(0.481)	(0.182)	(0.0342)	(0.402)	(0.286)
4. Puerto Rico							
Men	7,797 (4,897)	**-1.593**	-0.300	**-0.382**	**0.759**	-0.239	**0.654**
		(0.211)	(0.440)	(0.167)	(0.192)	(0.161)	(0.165)
Women	9,175 (5,203)	**-3.193**	0.917	0.100	**1.118**	**-0.627**	**0.917**
		(0.607)	(0.635)	(0.250)	(0.310)	(0.248)	(0.270)
Both	16,972 (10,100)	**-2.216**	0.301	-0.167	**0.881**	**-0.396**	**0.739**
		(0.239)	(0.356)	(0.139)	(0.160)	(0.130)	(0.140)
5. Mexico							
Men	21,879 (15,998)	**-1.273**	**1.164**	0.014	**0.673**	0.008	**0.751**
		(0.091)	(0.262)	(0.086)	(0.109)	(0.106)	(0.094)
Women	18,821 (12,972)	**-1.302**	**1.284**	0.102	**0.434**	-0.049	**0.518**
		(0.075)	(0.211)	(0.077)	(0.079)	(0.079)	(0.071)
Both	40,700 (28,970)	**-1.292**	**1.273**	0.075	**0.547**	-0.029	**0.625**
		(0.059)	(0.167)	(0.058)	(0.065)	(0.064)	(0.057)
6. Other Latin American countries							
Men	11,950 (7,849)	**-2.556**	-0.430	-0.631	**3.107**	-0.735	**2.526**
		(0.650)	(0.948)	(0.382)	(1.487)	(0.580)	(1.159)
Women	14,365 (8,815)	**-2.635**	**1.791**	0.068	**2.027**	**-1.023**	**1.545**
		(0.539)	(0.826)	(0.297)	(0.636)	(0.414)	(0.491)
Both	26,315 (16,664)	**-2.604**	**0.935**	-0.231	**2.447**	**-0.929**	**1.927**
		(0.416)	(0.605)	(0.229)	(0.651)	(0.342)	(0.502)
Age at Arrival Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes
Place of Birth Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes

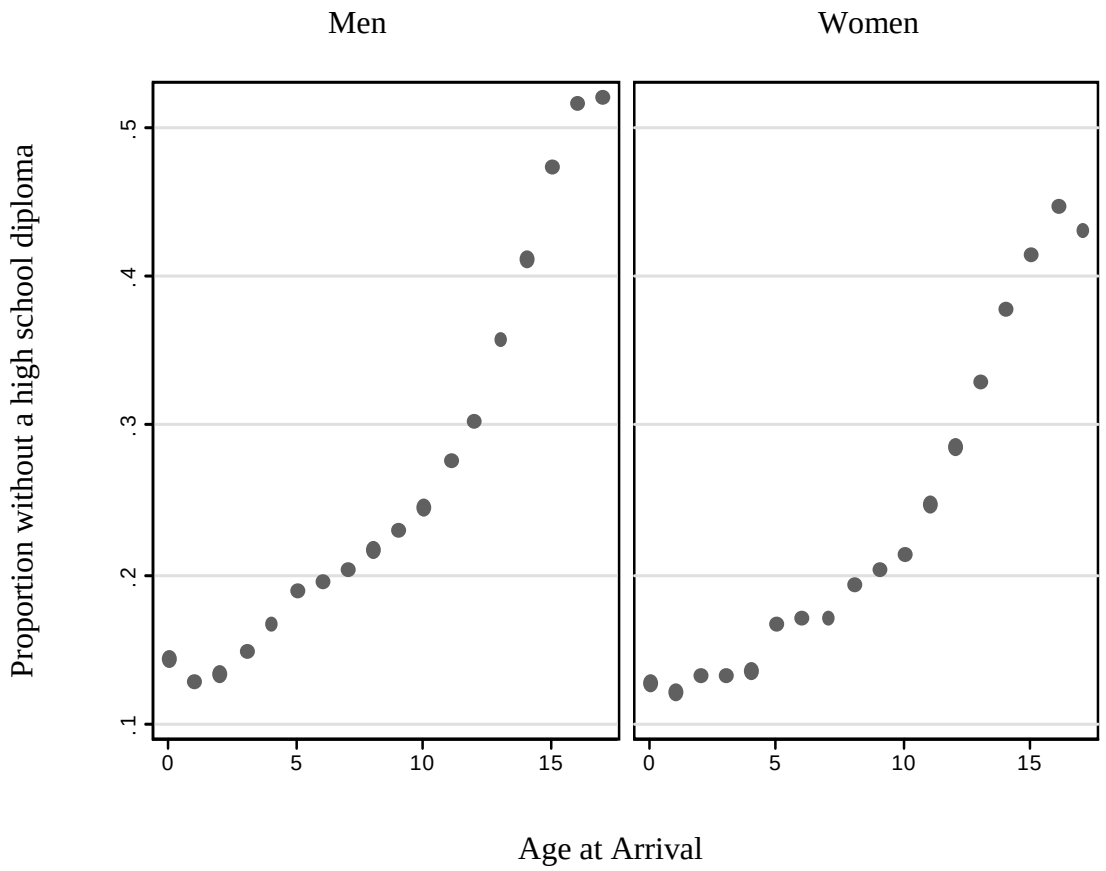
Note: Arrived young is defined as max (0, Age at Arrival – 8); that is, it takes the value of zero if the age at arrival is eight or younger and then increments by one for each age at arrival beyond eight years. All models also include controls for age in adulthood and age squared, and an indicator variable equal to one if the individual is a woman.
All models include a constant and a fixed effect for the country of birth, with the excluded category being either Canada or Puerto Rico. Each of the four panels represents a different sample.
Standard errors are enclosed in parentheses, **boldface** indicates statistical significance with a marginal significance level of at least 0.05, regular font at a level of at least 0.10, and shaded indicates not statistically significant at 0.10.

TABLE 6
Instrumental Variables Regression Results of the Impact of Being a High School Dropout on Social Outcomes: Men and Women, Mexico, Using Puerto Rico as the Counterfactual

	Sample Size (sample size conditional on being married)	English Speaker	Number of Children	Married	Immigrant Spouse	Spouses Speak English at Home	Same Country Spouse
1. Full sample							
Men	24,456 (17,355)	**-0.697**	**3.15**	**0.573**	**0.564**	**0.305**	**0.926**
		(0.128)	(0.526)	(0.147)	(0.204)	(0.131)	(0.246)
Women	21,640 (13,893)	**-0.331**	**1.42**	0.140	**0.236**	**0.196**	**0.457**
		(0.066)	(0.217)	(0.075)	(0.0916)	(0.0571)	(0.101)
Both	46,096 (31,248)	**-0.470**	**2.01**	**0.292**	**0.375**	**0.234**	**0.653**
		(0.061)	(0.219)	(0.0685)	(0.0916)	(0.0584)	(0.105)
2. Subsample of those younger than 15							
Men	13,318 (8,991)	-0.364	**3.154**	0.518	0.842	0.448	0.756
		(0.232)	(1.073)	(0.279)	(0.439)	(0.274)	(0.429)
Women	13,935 (8,650)	**-0.455**	**2.140**	0.231	-0.054	**0.324**	0.287
		(0.145)	(0.510)	(0.162)	(0.155)	(0.104)	(0.170)
Both	27,253 (17,641)	**-0.409**	**2.513**	**0.336**	0.257	**0.368**	**0.456**
		(0.126)	(0.501)	(0.143)	(0.157)	(0.113)	(0.174)
Age at Arrival Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes
Place of Birth Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes

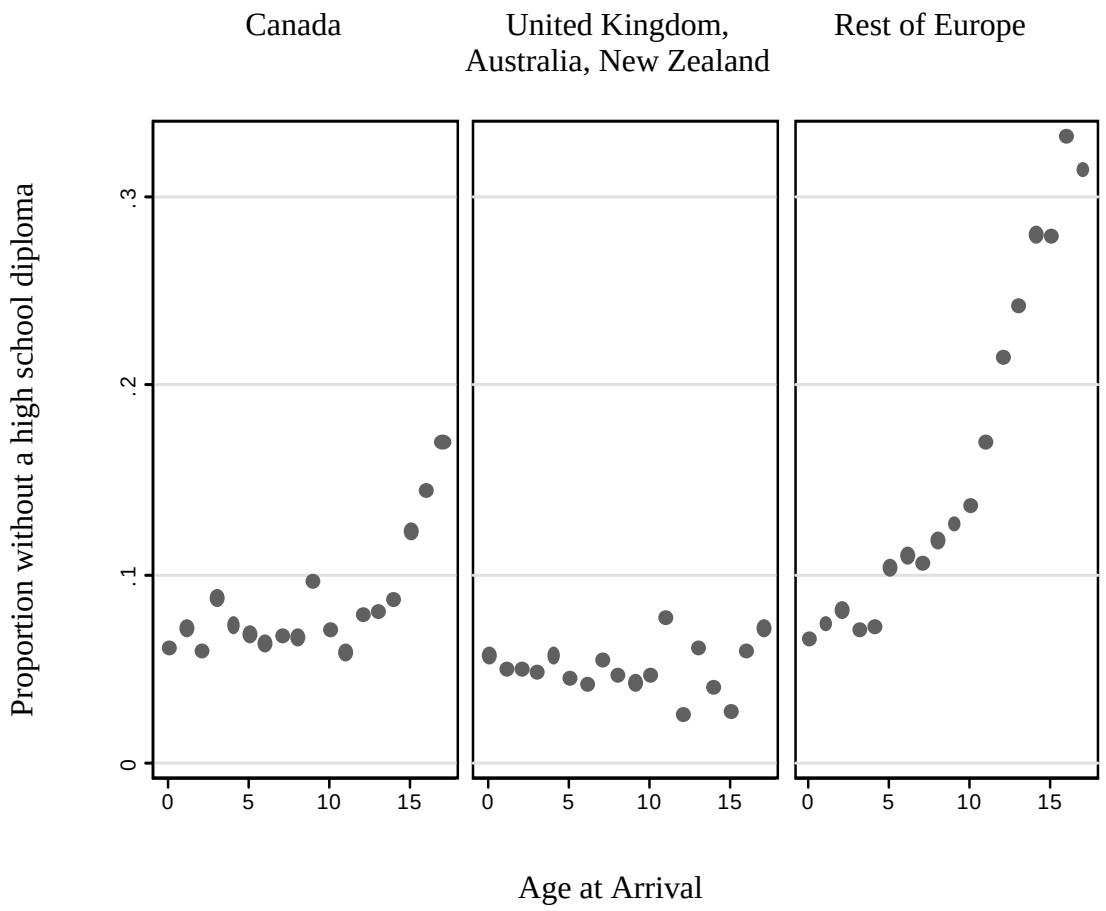
Note: Arrived young is defined as max (0, Age at Arrival – 8); that is, it takes the value of zero if the age at arrival is eight or younger and then increments by one for each age at arrival beyond eight years. All models also include controls for age in adulthood and age squared, and an indicator variable equal to one if the individual is a woman. All models include a constant and a fixed effect for the country of birth, with the excluded category being either Canada or Puerto Rico. Each of the four panels represents a different sample.
Standard errors are enclosed in parentheses, **boldface** indicates statistical significance with a marginal significance level of at least 0.05, regular font at a level of at least 0.10, and shaded indicates not statistically significant at 0.10.

FIGURE 1
Age at Arrival and the Chances of not Having a High School Diploma by Gender



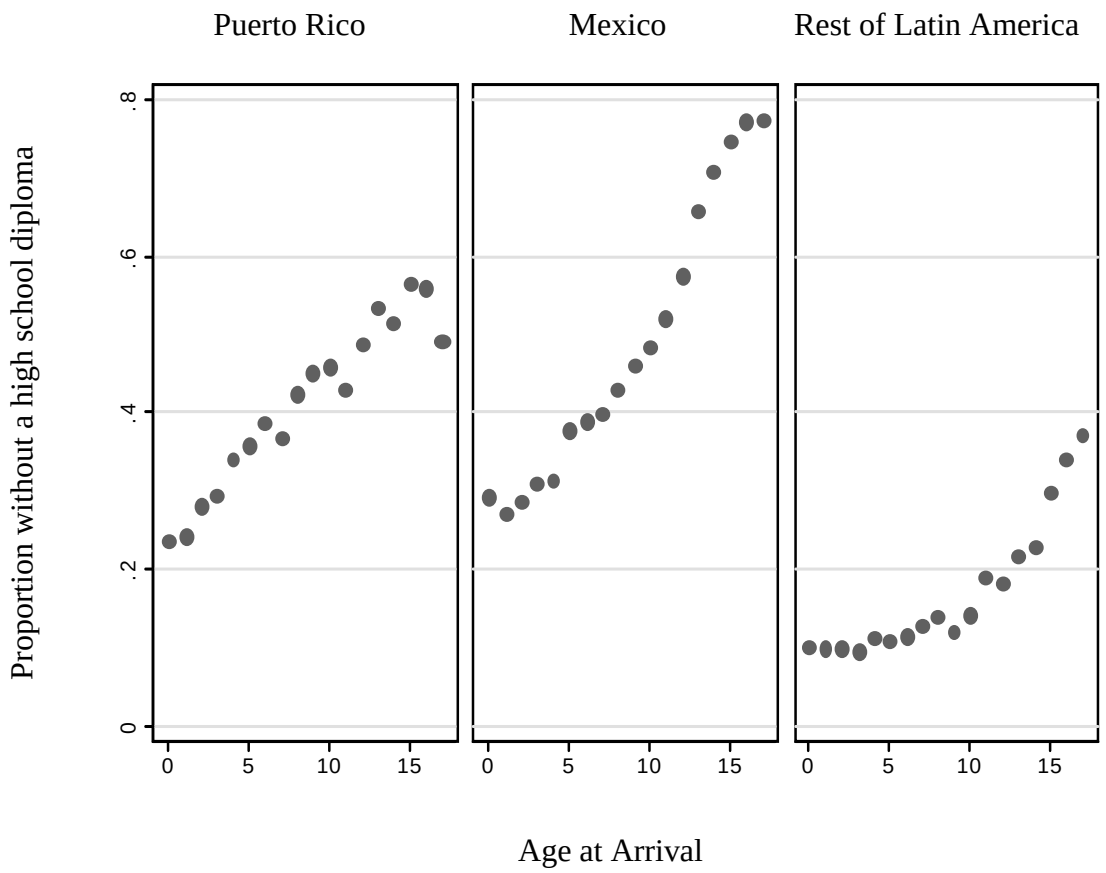
Source: Based upon calculations by the authors using U.S. Census Bureau, Census 2000 public use files. The results are for all adults 35 to 55 years old in the Census year, who were immigrants and who arrived in the country before the age of 18 years. The derivations are based on weighted data. Sample sizes are: 61,310 men, and 62,013 women.

FIGURE 2
Age at Arrival and the Chances of not Having a High School Diploma: From Canada, United Kingdom/Australia/New Zealand, and Rest of Europe



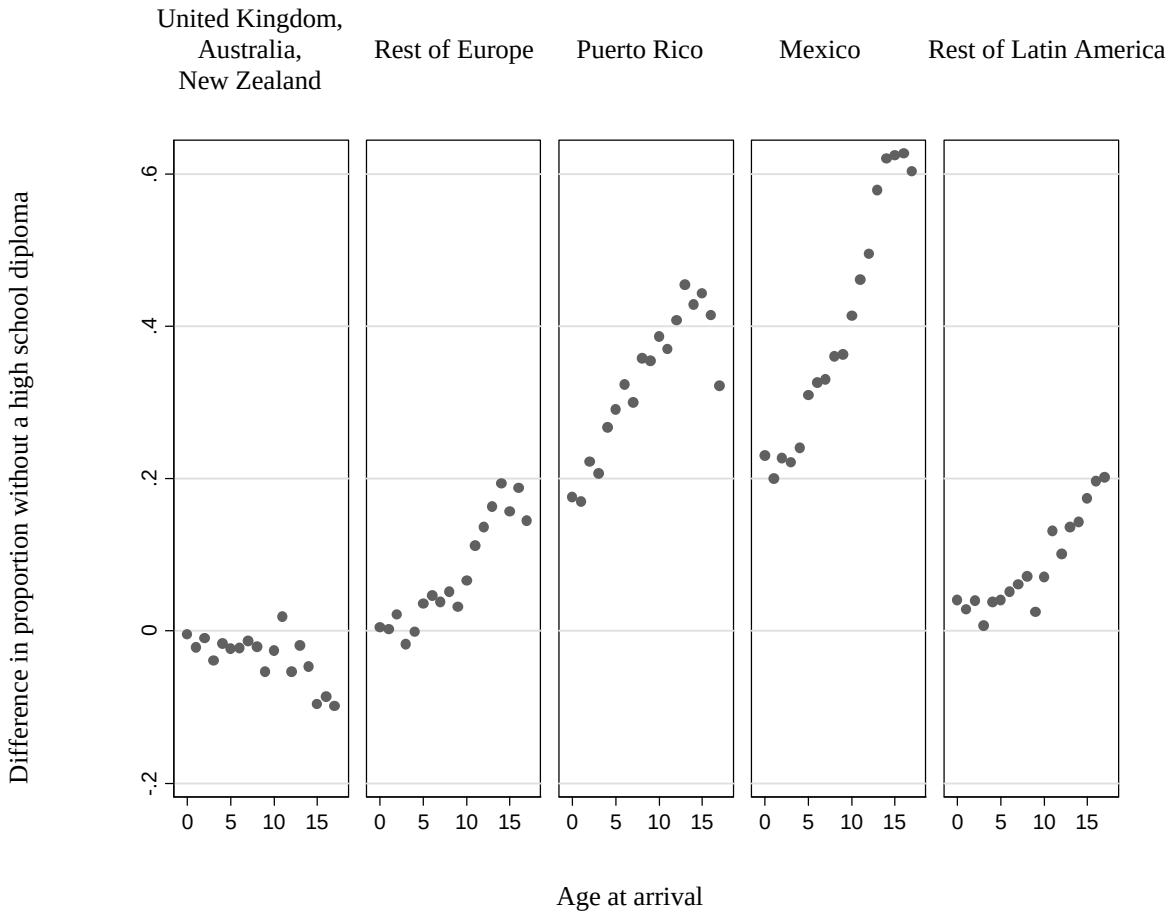
Source: Based upon calculations by the authors using U.S. Census Bureau, Census 2000 public use files. The results are for all adults 35 to 55 years old in the Census year, who were immigrants and who arrived in the country before the age of 18 years.

FIGURE 3
Age at Arrival and the Chances of not Having a High School Diploma: From Puerto Rico, Mexico, and Rest of Latin America



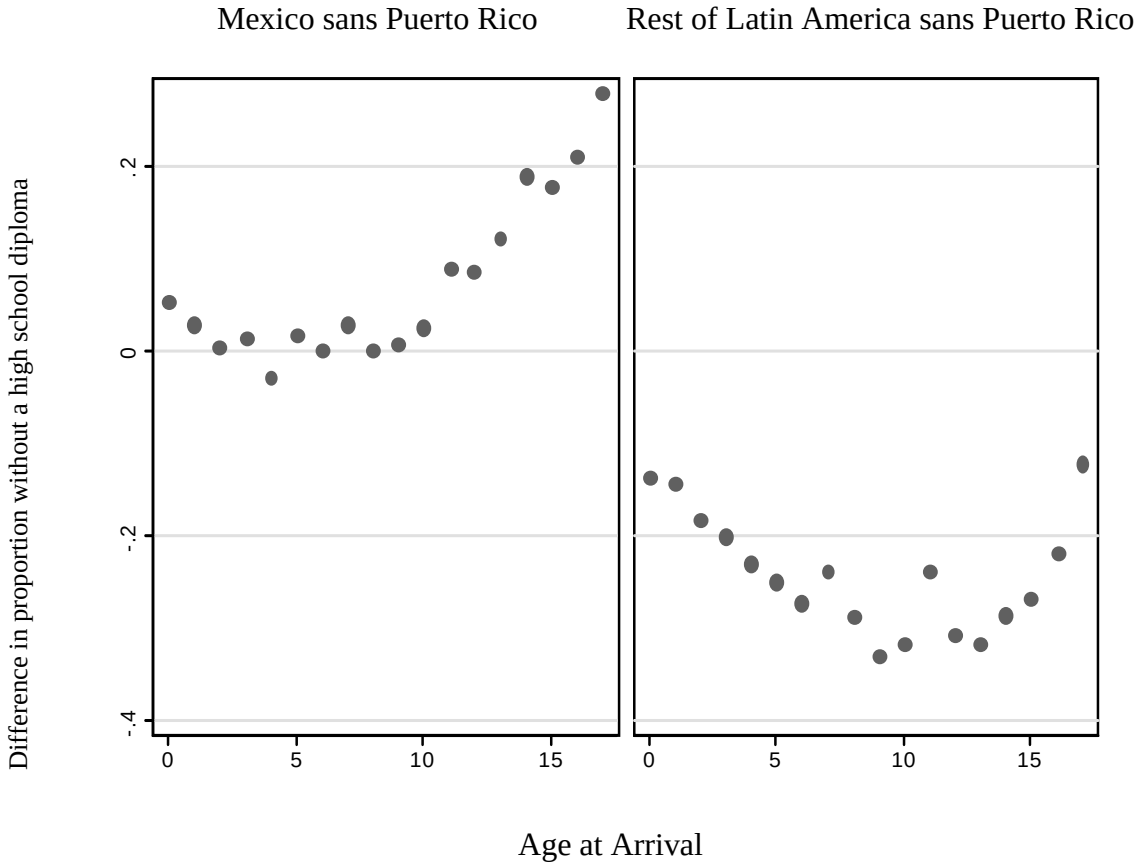
Source: Based upon calculations by the authors using U.S. Census Bureau, Census 2000 public use files. The results are for all adults 35 to 55 years old in the Census year, who were immigrants and who arrived in the country before the age of 18 years.

FIGURE 4
Difference in Proportions not Having a High School Diploma From Canada for Each of Five Regions of Origin



Source: Based upon calculations by the authors using U.S. Census Bureau, Census 2000 public use files. The results are for all adults 35 to 55 years old in the Census year, who were immigrants and who arrived in the country before the age of 18 years.

FIGURE 5
Difference in Chances of not Having a High School Diploma: From Puerto Rico, for Mexico and Rest of Latin America by Age at Arrival



Source: Based upon calculations by the authors using U.S. Census Bureau, Census 2000 public use files. The results are for all adults 35 to 55 years old in the Census year, who were immigrants and who arrived in the country before the age of 18 years.