Early Childhood Human Capital and Development: Online Appendix

Todd Schoellman*

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Abstract

This online appendix provides additional details, derivations, and robustness results for the paper "Early Childhood Human Capital and Development".

*ADepartment of Economics, W.P. Carey School of Business, Arizona State University, 501 E. Orange Street, Tempe, AZ 85287, todd.schoellman@gmail.com.

A Selection of Refugees

Refugees are typically considered to be less selected than other forms of migrants, for two reasons. First, in refugee situations there is typically a large "push" factor that leads refugees to leave, mitigating the effects of self-selection. In the Indochinese case, the main elements were political persecution, ethnic discrimination, and in some cases ongoing conflict (such as between the Vietnamese government and the Khmer Rouge). Second, once refugees are formally labeled as such, they face a different set of immigration standards from potential host countries. In essence, they are accepted on humanitarian grounds even if they lack the usual marketable skills that countries desire in their immigrants.

Anecdotal evidence generally tends to point towards modest selection for Indochinese refugees after 1975. For example, Robinson (1998) gives a common characterization of the post-1975 refugees: "Beyond that, this second wave of refugees bore scant resemblance to the relatively homogeneous, well-educated Vietnamese of the first wave. These were peasant Khmer fresh from the 'killing fields' of Cambodia; they were pre-literate Hmong from the highlands of Laos; they were ethnic Chinese and Vietnamese traumatized by perilous boat journeys, push-backs, and pirate attacks." On the other hand, two margins of selection are well-known for Indochinese refugees. First, most refugees from Vietnam fled by boat. Doing so required paying a fare and, in some cases, a bribe to Vietnamese officials (Robinson, 1998). For this reason, boat refugees were probably selected based on family income. Second, the Indochinese refugee flows were protracted. While the initial refugees fled persecution, there was widespread agreement by the mid-1980s that many migrants were making a conscious decision to seek resettlement for the sake of improved economic opportunity. This process again likely implies a degree of self-selection.

In this appendix I review evidence on the extent of selection from two different sources. First, I use a number of studies that were conducted in the 1980s by or on behalf of the Office of Refugee Resettlement. Their primary goal was to quantify the challenges faced by refugees and their rate of assimilation, particularly with respect to finding work and leaving public assistance. The Office of Refugee Resettlement conducted an annual, nationally representative survey of newly-arrived refugees. They asked a few basic questions about the refugees' backgrounds before arriving, without distinguishing between subcategories of Indochinese refugees. As a whole, refugees averaged between 4 and 6 years of schooling over this time period, with roughly half of the new arrivals speaking no English and only a few percent reporting speaking English well or fluently. These studies also asked about the refugees' occupational backgrounds in their home country; roughly one-third of refugees

from the years of interest report having been farmers or fishermen, with about one-quarter reporting sales or clerical jobs and the rest distributed among managerial, technical, and blue collar jobs (Office of Refugee Resettlement, 1980–1995).

The Office of Refugee Resettlement also sponsored several studies that were more detailed in the questions they asked, but focused on a narrow geographic region at the expense of national representativeness. They are particularly likely to over-represent areas where refugees clustered since these were areas where it was cost-effective to sample refugees. Table 1 gives some of the basic descriptive statistics of refugees taken a few years after their arrival. I focus on refugees' education, their ability to write their own language and English, their occupational background, and the characteristics of how they arrived to the US. There are two key messages from this table. First, there are dramatic differences in the pre-arrival background of refugees of different ethnic groups. Vietnamese and Chinese refugees in particular were well-educated, wrote their own language well and sometimes wrote English, and had professional occupational backgrounds. The Hmong and Khmer, on the other hand, had very little education, were unlikely to be literate even in their own language, and were almost all farmers, fishermen, or soldiers in their home country. The Lao performed somewhere in the middle. Second, the Hmong in the US in particular come from disadvantaged backgrounds that show little evidence of families with a large degree of acquired human capital. Their experiences are consistent with their background as isolated, rural farmers with no written language until the 1950s.

A.1 Comparing Immigrants to Non-Migrants

As a second source of evidence I compare the characteristics of refugee migrants before and after they immigrated to the characteristics of non-migrants from the same country. I focus on education because it is the most useful variable that is easily compared across countries. The data come from three sources. The first is the IHARP study introduced in the text in Section 2.1. That study asked a small sample of refugees about their pre-migration characteristics, including their education level as of 1975. The second is the 1990 US Census. This dataset includes the post-migration educational outcomes of a large and representative sample of refugees. The third dataset is the population censuses from Cambodia and Vietnam. Unlike Laos, these countries have conducted censuses that collect information on age and education, with the earliest census taking place in 1989 in Vietnam and 1998 in Cambodia.[1]

[1] Available online at Minnesota Population Center (2014).

Table 1: Characteristics of Refugees

	Vietnamese	Chinese	Lao	Hmong	Khmer
Schooling					
Average Years[a]	9.8	6.7	4.9	1.6	5.0
Percent with None[b]	14.0		13.8	41.0	11.8
Percent with Primary – Some High School[b]	45.8		70.1	58.0	84.5
Percent with High School Degree or More[b]	39.8		16.3	1.0	3.6
Literacy					
Native Language (Pre-Migration)[c]	98.8	81.6		26.6	65.9
Native Language (Post-Migration)[b]	93.0		91.3	54.0	77.3
English (Pre-Migration)[c]	33.8	8.8		0.9	4.2
English (Post-Migration)[b]	52.6		42.8	31.0	24.5
Occupation					
Percent Military, Farming, or Fishing[c]	36.1	20.4		90.9	59.9
Migration					
Average Months in Camps[a]	7.8	10.3	23.0	34.3	25.5
Percent Paying Bribes[c]	32.7	71.7		21.3	19.3

[a] Source: Rumbaut and Weeks (1986).

[b] Source: Strand and Jones Jr. (1985). Education responses are for household heads. Ethnic Chinese are included with Vietnamese. Literacy figures are as of the study time and presumably include some learning of English since arrival.

[c] Source: Rumbaut (1989). Refugees were asked about their literacy and occupation as of 1975. Figures for ethnic Lao not reported.

Table 2: Schooling Comparison: Refugees and Non-Migrants

	0 Years	1–11 Years	12+ Years
Panel A: Vietnam			
Non-Migrants	22%	69%	9%
Refugees, 1975	6%	63%	31%
Refugees, 1990	12%	25%	63%
Panel B: Cambodia			
Non-Migrants	48%	50%	2%
Refugees, 1975	24%	66%	10%
Refugees, 1990	32%	28%	40%

Table notes: Results represent author's calculation using data from censuses of Vietnam and Cambodia (for non-migrants); from the 1982–83 wave of the Indochinese Health and Adaptation Research Project (for refugees in 1975); and from the 1990 US population census (refugees in 1990). See text for details.

In each case the sample is restricted to adults who were born before 1957, with the idea that they would ordinarily have completed any schooling by 1975. This cutoff is imposed because the retrospective pre-migration educational outcomes are measured as of 1975 in the IHARP. The samples of immigrants are restricted to those who arrived to the US after 1975. Educational attainment is coded into three categories: no schooling; 1–11 years (e.g., less than a high school degree) and 12+ years (e.g., at least a high school degree). Table 2 gives the figures. There are two main results. First, refugees were modestly selected already as of 1975. Refugees from both countries were somewhat less likely to be entirely uneducated and more likely to have at least a high school degree. Second, refugees increased their educational attainment substantially between the end of the Vietnam War in 1975 and the 1990 Census.

I also use the 1990 US Census to provide empirical evidence on the plausibility of the hypothesis that refugees who arrived at different ages were endowed with different family backgrounds in terms of family size, parental education, family income, and so on. To do so, I test whether there is a correlation between age at arrival of the child and any of the observable family attributes.[2] Differences in outcomes could arise if there was differential selection in age at arrival (despite the historical evidence that it was unlikely); or if parents of late-arriving children make systematically different choices in how to allocate their time between investing in their children, investing in themselves, and working in the labor mar-

[2]I can connect 87 percent to their biological mother and 81 percent to their biological father.

ket. It is not necessarily clear which direction of correlation would be more worrying. A positive correlation indicates, for example, that later-arriving children grow up in families with higher income, which has a direct benefit. On the other hand, a negative correlation could indicate that parents are foregoing the labor market and investments in their own human capital in favor of investing more in their children.

To implement the test I use a host of family attributes: number of siblings; probability of having the biological mother or father in the house; birth order; family income; hourly wages and earnings of the mother and father; education of the mother and father, measured several different ways; and English language ability of the mother and father. In general, there is not much evidence of differences in family attributes by age at arrival. The correlation is not statistically significant and is as likely to be negative as positive. There are two exceptions to this rule. First, older-arriving children of all ethnic groups are statistically more likely to be eldest children and less likely to be youngest children of their family. Averaging across groups, children who arrive at age 5 are 13 percentage points more likely to be the oldest child in their family than children who arrive at age 0. Second, there is a statistically significant (95% level) and positive correlation between parental characteristics and age at arrival for ethnic Vietnamese for seven out of the fifteen outcomes explored. For the remaining four groups in total there are only three such significant correlations, an outcome that could easily be generated by chance under multiple hypothesis testing. Hence, for four of the five ethnic groups there is not much room for a story of differential selection or differences in investment patterns by age at arrival of the children. For the fifth group the evidence suggests that there may be some differences in either pre-migration characteristics or post-migration investments.

B Identification of Age at Arrival Effects

In the empirical section of the paper I estimate the effects of age at arrival by regressing outcomes such as years of schooling or wages on full sets of dummies for age, census year, and age at arrival using a pooled sample of natives and immigrants. Identification of the effect on age at arrival requires some assumptions, which are explicitly formulated and justified here.

To simplify the discussion, I specialize to the case where all time variables enter the regression equations in linear fashion; the same insights apply to the dummy variable specifications used in the paper. With linear time effects, the estimation model for the determination of

some outcome of interest y is

$$y = \boldsymbol{\beta X} + \alpha A + \omega Y + \phi AA + \varepsilon,$$

where the right hand side includes a vector of controls $\boldsymbol{X}$, the age A, the year of the Census Y, and (for immigrants) the age at arrival, AA. Greek letters denote the corresponding coefficients.

Research in the literature often proposes a more general model. Adapting from Friedberg (1992) and Borjas (1999), native outcomes y^N and immigrant outcomes y^I are given by:

$$\begin{aligned} y^N &= \boldsymbol{\beta^N X^N} + \alpha^N A^N + \omega^N Y^N + \varepsilon^N, \\ y^I &= \boldsymbol{\beta^I X^I} + \alpha^I A^I + \omega^I Y^I + \phi^I AA^I + \gamma^I C^I + \delta^I YUS^I + \varepsilon^I. \end{aligned}$$

This specification is more general in two ways. First, it allows the effect of the controls, age, and year to be different for immigrants and natives. Second, immigrant outcomes are affected by year-of-immigration cohort effects C^I, which are intended to capture changes in the composition of immigrants by year of entry, and the assimilation term YUS^I which measures the number of years an immigrant has spent in the US

It is well-known that some of the coefficients in this general model are not identified without further assumptions. The problem arises from two linear dependencies in the immigrant equation, namely $YUS^I + C^I = Y^I$ and $AA^I + YUS^I = A^I$. The latter dependency is the problem for the analysis here, since it means that the coefficient on age at arrival is not identified without further assumptions. Friedberg (1992) proposes imposing the restriction $\alpha^I = \alpha^N$ to resolve this dependency. In words, the assumption is that immigrants and natives share the same age effects, which can be identified using the natives. The effect of age at arrival on immigrant outcomes is thus identified as the differential effect of a year spent abroad for immigrants as opposed to a year spent in the US for natives. This idea of age at arrival effects exactly captures the spirit of the estimation exercise. To implement this strategy I pool natives and immigrants and impose the further restriction $\boldsymbol{\beta^N} = \boldsymbol{\beta^I}$. In this case, a general model for the outcome y is

$$y = \boldsymbol{\beta X} + \alpha A + \omega^N Y^N + \omega^I Y^I + \phi^I AA^I + \gamma^I C^I + \delta^I YUS^I + \varepsilon.$$

There is still a linear dependency in this model, but it is irrelevant for the coefficient of

interest, ϕ^I; this can be seen by plugging in for the year effects for immigrants:

$$y = \boldsymbol{\beta X} + \alpha A + \omega^N Y^N + \phi^I A A^I + (\gamma^I + \omega^I) C^I + (\delta^I + \omega^I) YUS^I + \varepsilon. \tag{1}$$

The effect of age at arrival is identified, although cohort effects and assimilation effects are not. This estimation model is more general than the one used in the text, because it also includes cohort effects as a regressor (even though the estimated coefficient does not measure "true" cohort effects). Nonetheless, implementing this equation produces essentially the same results, which are available upon request.

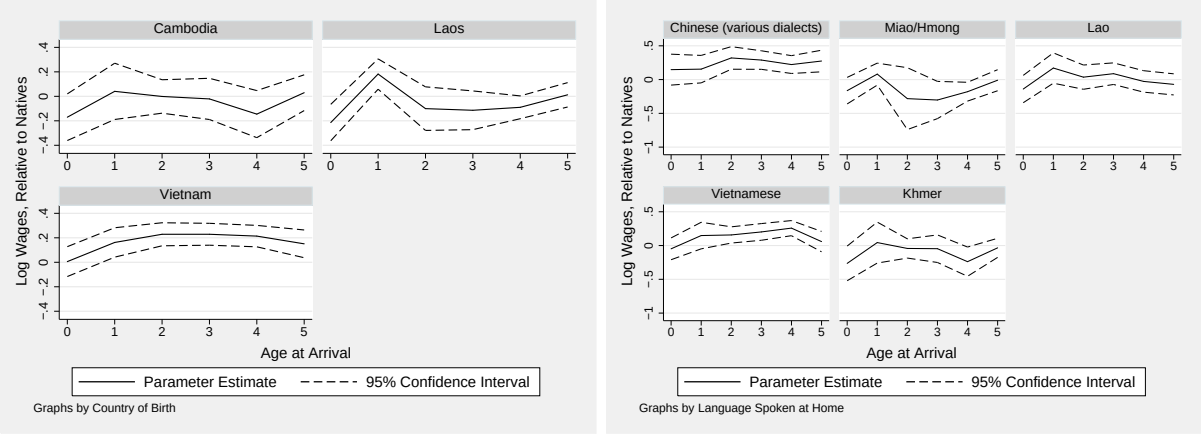
C Robustness

C.1 Alternative Decompositions

In this subsection I explore alternative decompositions of the Indochinese refugees into subgroups. The main idea is that self-reported ethnicity may not appropriately capture the different groups of refugees. Also, some Indochinese refugees report ethnicities that do not fall neatly into the five major categories, and so are excluded from earlier figures. As a check on the baseline results, I also decompose refugees by their country of birth, which captures all Indochinese refugees; and by their reported language spoken at home, in case language rather than ethnicity is a better way of grouping immigrants. Figures 1a and 1b show that the patterns for wages are similar to those for the decomposition based on ethnicity, with no trend in outcomes by age at arrival.

As mentioned in the text, US immigration policy towards Indochinese refugees shifted in 1982. A report by the General Accounting Office documented that as of 1981 the required health screenings were cursory (lasting roughly 20 seconds per person); that children under 15 were not routinely screened; and that the results of examinations did not play a part in admissions decisions. The report led to much stricter screening after it was issued. Hence, one might suspect that pre-1982 refugees are less selected on health status, and post-1982 refugees more so. Figure 2 shows that the lack of a trend is consistent for the less selected, pre-1982 refugees, although the more selected, post-1982 refugees do display a more mixed pattern.

Finally, I consider two limits on the sample of interest. First, I exclude from the sample refugees who live in "ethnic enclaves", areas with high concentrations of other residents



(a) Birth Country (b) Language Spoken at Home

Figure 1: Log-Wages by Age at Arrival for Alternative Decompositions

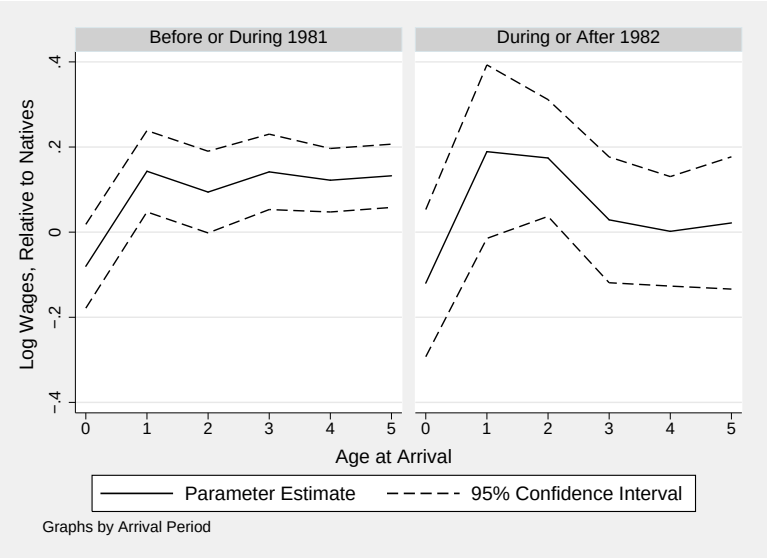


Figure 2: Log-Wage by Age at Arrival for Early and Late Arrivals

of the same ethnicity. I define a person as living in an ethnic enclave if they live in a Public Use Microdata Area (PUMA) where more than 5 percent of the population shares their ethnicity or if they live in a metropolitan statistical area (MSA) where more than 2.5 percent of the population shares their ethnicity. The PUMA is the smallest geographic region publicly available in the Census and includes between 100,000 and 200,000 people, corresponding typically to a portion of a city; MSAs are cities and the surrounding areas. This definition of ethnic enclaves excludes roughly 30 percent of refugees from the sample.

Figure 3 shows that the wage patterns are similar for those who live outside of enclaves. These findings suggest that the results are not driven by the ability of refugees to live and work in areas with others who share a similar cultural background or language.

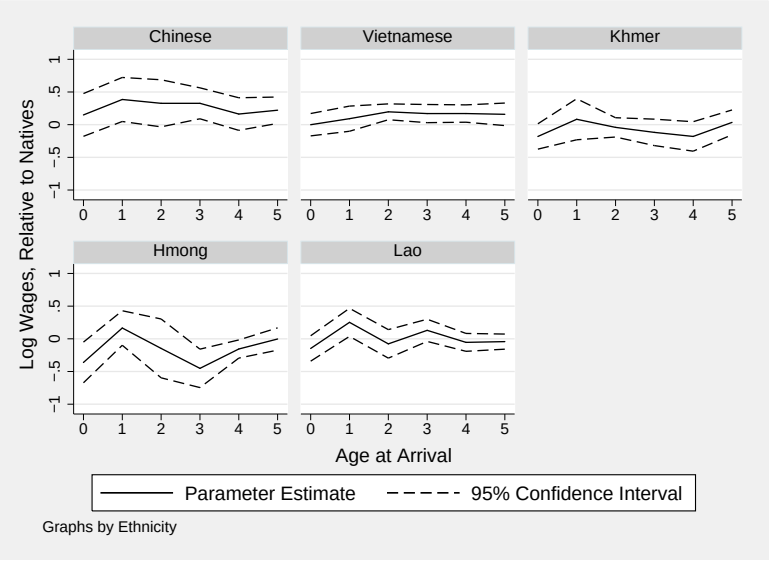


Figure 3: Log-Wage by Age at Arrival for Refugees Living Outside Enclaves

As a second sample restriction, I re-estimate my key regressions using only workers who are 23–26 years of age. The model abstracts from post-graduation human capital accumulation. Although most refugees in the sample are young some are older, and hence may have invested significantly in their human capital since graduation. Figure 4 shows that similar results obtain for very young workers who are unlikely to have made significant post-graduation investments.

C.2 Quantile Regression Estimates

A common finding in the early childhood literature is that interventions have heterogeneous effects for children with different backgrounds; typically it is the case that interventions benefit children from disadvantaged backgrounds more or only benefit children from disadvantaged backgrounds. A natural question is whether the same applies to the intervention of substituting US for Indochinese early childhood. To test for this I estimate quantile regressions for the effect of age at arrival on wages. To maximize the sample size for the regression I estimate ethnic group fixed effects but a common linear effect for age at arrival. The quantile regression estimates the effect of age at arrival at any percentile location in the

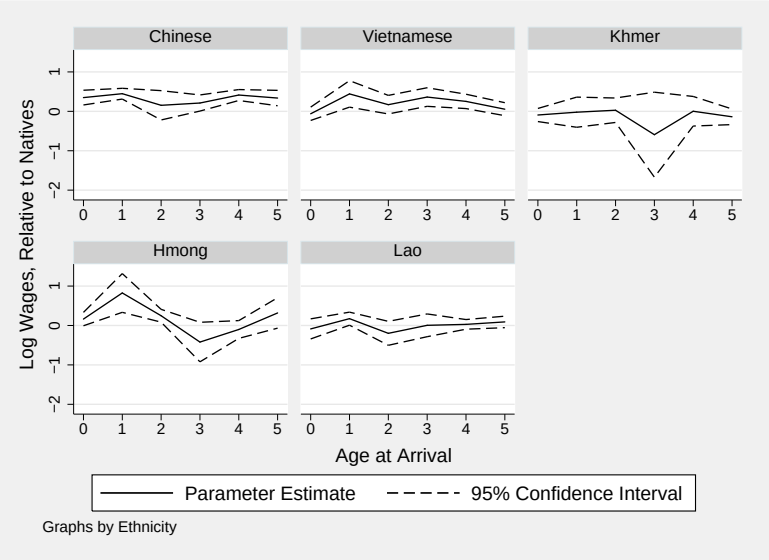


Figure 4: Log-Wage by Age at Arrival for Refugees 23–26 Years Old

Table 3: Quantile Regression Coefficients for Effect of Age at Arrival on Wages

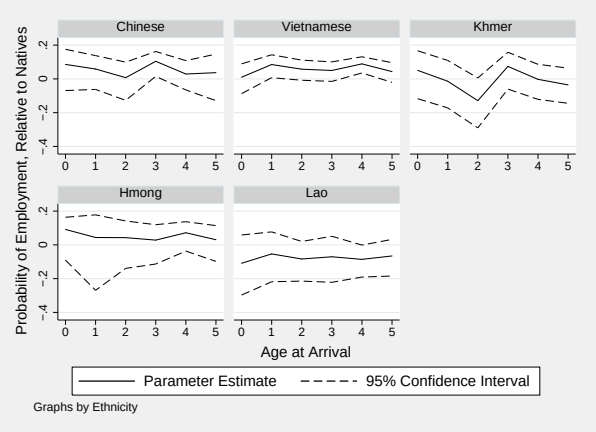
	Quantile Estimates					
	10th Pct	25th Pct	Median	75th Pct	90th Pct	OLS Estimate
Estimate	0.0050	0.0113	0.0141	0.0078	0.0019	0.0031
Standard Error	(0.0152)	(0.0102)	(0.0095)	(0.0091)	(0.0084)	(0.0099)

Note: None of the estimates are statistically significant at 10 percent levels.

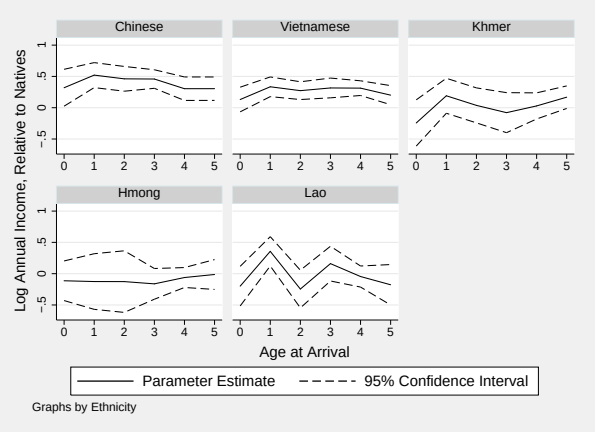
wage distribution; I focus here on the 10th, 25th, 50th, 75th, and 90th percentiles. The results are shown in Table 3 along with the corresponding estimate of age at arrival produced by OLS. There is little evidence that age at arrival has a differential impact across the wage distribution; all of the estimates are positive (arriving at older ages increases wages) and statistically insignificant. I conclude that the least-squares estimated reported throughout the paper are unlikely to mask underlying underlying heterogeneity in the effect of moving to the US.

C.3 Alternative Outcomes

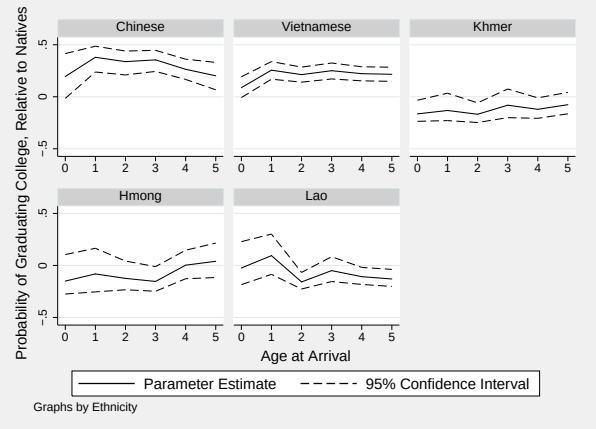
Finally, I consider alternative socioeoconomic outcomes. There is no relationship between age at arrival and probability of employment, log earnings (instead of log wages), or probability of having graduated college.[3]



(a) Probability of Employment



(b) Log-Income



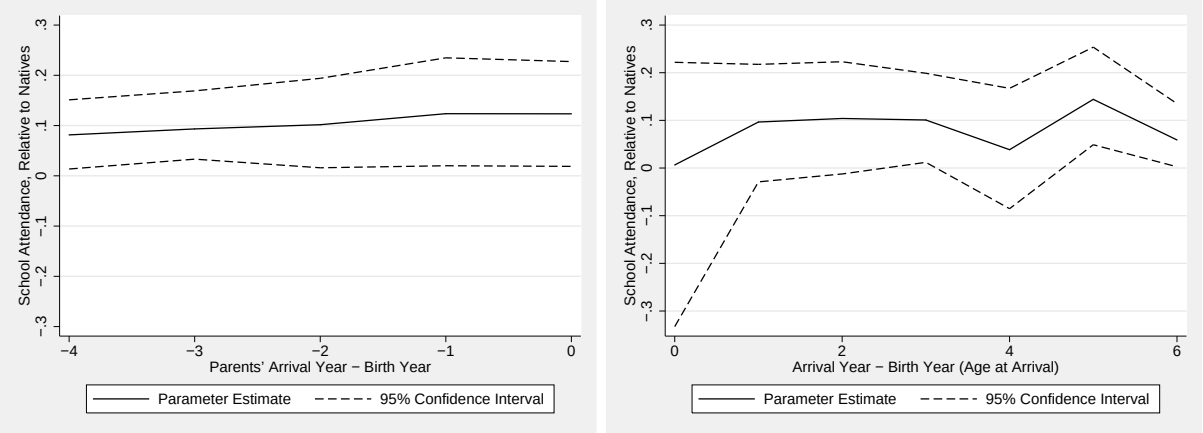
(c) Probability of Graduating College

Figure 5: Alternative Outcomes by Age at Arrival

The analysis can also be extended to look at the outcomes of children born in the US to refugee parents. This test is useful if there are important effects of exposure to adverse conditions while in utero. The test is somewhat more difficult to conduct because children can only be linked to their parents while they still live in the same household. Thus, it is

[3]For this and subsequent binary outcomes, estimation is performed via a probit model. The reported coefficient is the model-predicted change in average enrollment for each age-at-arrival group if they had instead been native-born children of non-refugee parents. Standard errors are simulated via Monte Carlo.

necessary to find an outcome more relevant to the experience of those living at home than completed schooling or wages. One such outcome is the probability of being enrolled in school for 16–18 year olds. I include natives, as a control group; child refugees; and children born in the US to Indochinese refugee parents. I identify children as having refugee parents if both parents immigrated from Vietnam, Cambodia, or Laos during the refugee period as defined above and, additionally, the parents were born in the same country and immigrated in the same year. I then regress a school attendance dummy on the same set of controls as in equation 1.



(a) Second Generation Immigrants (b) First Generation Immigrants

Figure 6: Probability of Attending School at Ages 16–18

Figure 6 shows the results. Since the sample of 16–18 year olds is smaller, all Indochinese refugees are pooled together. Panel (b) shows the results for first-generation immigrants as a function of their age at arrival, similar to previous graphs. Panel (a) shows the results for second-generation immigrants as a function of their parents' arrival year minus their birth year. Children with values less than −1 in this panel have no exposure to the Indochinese countries or refugee camps, even while in utero. Their outcomes are similar to those of first-generation child refugees, suggesting that in utero exposure is not an important part of the story.

D Derivations for the Isoelastic Model

From the text, the family's problem is:

$$\begin{aligned}
\max_{g_1,g_2,p_1,p_2,S} \quad & \int_{5+S}^{\infty} e^{-rt} A_i(t) h_2 dt - g_1 - e^{-5r} g_2 - A_i h_p p_1 - A_i e^{5(\gamma-r)} h_p p_2 \\
\text{s.t.} \quad & h_2 = \left[\lambda_2 h_1^{\frac{\sigma_2-1}{\sigma_2}} + (1-\lambda_2) \left(z_i^{\omega_1} g_2^{\omega_2} h_p^{\omega_3} p_2^{\omega_4} S^{\omega_5} \right)^{\frac{\sigma_2-1}{\sigma_2}} \right]^{\frac{\sigma_2}{\sigma_2-1}} \\
& h_1 = \left[\lambda_1 h_0^{\frac{\sigma_1-1}{\sigma_1}} + (1-\lambda_1) \left(z_i^{\eta_1} g_1^{\eta_2} h_p^{\eta_3} p_1^{\eta_4} \right)^{\frac{\sigma_1-1}{\sigma_1}} \right]^{\frac{\sigma_1}{\sigma_1-1}}.
\end{aligned}$$

Integrating out and substituting in the isoelastic case yields:

$$\max_{g_1,g_2,p_1,p_2,S} \quad \frac{A_i e^{(\gamma-r)(S+5)}}{r-\gamma} h_2 - g_1 - e^{-5r} g_2 - A_i h_p p_1 - A_i e^{5(\gamma-r)} h_p p_2 \tag{D1}$$

$$\text{s.t.} \quad h_2 = h_0^{\lambda_1\lambda_2} \left(z_i^{\omega_1} g_1^{\omega_2} h_p^{\omega_3} p_1^{\omega_4} \right)^{\lambda_2(1-\lambda_1)} \left(z_i^{\eta_1} g_2^{\eta_2} h_p^{\eta_3} p_2^{\eta_4} S^{\eta_5} \right)^{1-\lambda_2} \tag{D2}$$

with $h_1 = h_0^{\lambda_1} \left(z_i^{\omega_1} g_1^{\omega_2} h_p^{\omega_3} p_1^{\omega_4} \right)^{1-\lambda_1}$ already substituted out.

The first-order conditions for the problem are:

$$S: \quad A_i e^{(\gamma-r)(S+5)} h_2 = \frac{A_i e^{(\gamma-r)(S+5)}}{r-\gamma} \eta_5 (1-\lambda_2) \frac{h_2}{S} \tag{D3}$$

$$g_1: \quad \frac{A_i e^{(\gamma-r)(S+5)}}{r-\gamma} \omega_2 \lambda_2 (1-\lambda_1) \frac{h_2}{g_1} = 1 \tag{D4}$$

$$g_2: \quad \frac{A_i e^{(\gamma-r)(S+5)}}{r-\gamma} \eta_2 (1-\lambda_2) \frac{h_2}{g_2} = e^{-5r} \tag{D5}$$

$$p_1: \quad \frac{A_i e^{(\gamma-r)(S+5)}}{r-\gamma} \omega_4 \lambda_2 (1-\lambda_1) \frac{h_2}{p_1} = A_i h_p \tag{D6}$$

$$p_2: \quad \frac{A_i e^{(\gamma-r)(S+5)}}{r-\gamma} \eta_4 (1-\lambda_2) \frac{h_2}{p_2} = A_i e^{5(\gamma-r)} h_p. \tag{D7}$$

Inspection of (D3) reveals that it pins down $S = \frac{\eta_5(1-\lambda_2)}{r-\gamma}$, which implies that S does not vary within or across countries. Equations (D4)–(D7) link together the optimal market goods and parental investments in the two periods. Inspection shows that the model predicts $g_1 \propto g_2 \propto A_i h_p p_1 \propto A_i h_p p_2$, where the proportionality factors are functions of the share parameters (ω, η, and λ) as well as discount and growth rates (e^{-5r} and $e^{5(\gamma-r)}$), and so do not vary within or across countries.

Using proportionality, it is possible to rewrite (D6) as:

$$\kappa_1 h_0^{\lambda_1\lambda_2} z_i^{\omega_1\lambda_2(1-\lambda_1)+\eta_1(1-\lambda_2)} \left(A_i h_p p_1\right)^{\omega_2\lambda_2(1-\lambda_1)+\eta_2(1-\lambda_2)} h_p^{\omega_3\lambda_2(1-\lambda_1)+\eta_3(1-\lambda_2)} p_1^{\omega_4\lambda_2(1-\lambda_1)+\eta_4(1-\lambda_2)} = h_p p_1$$

where κ_1 captures functions of parameters and discount and growth rates that do not vary within or across countries. Solve for the time parents spend with their children p_1 in terms of exogenous parameters to find:

$$p_1 = \kappa_2 h_0^{\frac{\lambda_1\lambda_2}{1-\Psi_2-\Psi_4}} z_i^{\frac{\Psi_1}{1-\Psi_2-\Psi_4}} A_i^{\frac{\Psi_2}{1-\Psi_2-\Psi_4}} h_p^{\frac{\Psi_2+\Psi_3-1}{1-\Psi_2-\Psi_4}} \tag{D8}$$

where κ_2 is again a constant and $\Psi_i \equiv \omega_i\lambda_2(1-\lambda_1)+\eta_i(1-\lambda_2)$. Finally, use the proportionality relationship again as well as (D8) to substitute in for h_2 to find:

$$h_2 = \kappa_3 h_0^{\frac{\lambda_1\lambda_2}{1-\Psi_2-\Psi_4}} z_i^{\frac{\Psi_1}{1-\Psi_2-\Psi_4}} A_i^{\frac{\Psi_2}{1-\Psi_2-\Psi_4}} h_p^{\frac{\Psi_3-\Psi_4}{1-\Psi_2-\Psi_4}} \tag{D9}$$

Likewise, taking equation (D8) and the proportionality relationship and plugging in for h_1 yields:

$$h_1 = \kappa_4 h_0^{\lambda_1+\frac{\lambda_1\lambda_2(\Phi_2+\Phi_4)}{1-\Psi_2-\Psi_4}} z_i^{\Phi_1+\frac{\Psi_1(\Phi_2+\Phi_4)}{1-\Psi_2-\Psi_4}} A_i^{\Phi_2+\frac{\Psi_2(\Phi_2+\Phi_4)}{1-\Psi_2-\Psi_4}} h_p^{\Phi_2+\Phi_3+\frac{(\Psi_2+\Psi_3-1)(\Phi_2+\Phi_4)}{1-\Psi_2-\Psi_4}} \tag{D10}$$

with $\Phi_i \equiv \omega_i(1-\lambda_1)$. The elasticity properties in Table **??** follow directly.

Last, I characterize the problem of the refugee who moves after early childhood. They take their level of h_1 as given and choose subsequent investments g_2, p_2, and S. Their problem then is:

$$\max_{g_2,p_2,S} \quad \frac{A_i e^{(\gamma-r)S+5\gamma}}{r-\gamma} h_2 - g_2 - A_i e^{5\gamma} h_p p_2 \tag{D11}$$

$$\text{s.t.} \quad h_2 = h_1^{\lambda_2}\left(z_i^{\eta_1} g_2^{\eta_2} h_p^{\eta_3} p_2^{\eta_4} S^{\eta_5}\right)^{1-\lambda_2} \tag{D12}$$

The first-order conditions for the problem are:

$$S: \quad A_i e^{(\gamma-r)S+5\gamma} h_2 = \frac{A_i e^{(\gamma-r)S+5g}}{r-\gamma} \eta_5(1-\lambda_2)\frac{h_2}{S} \tag{D13}$$

$$g_2: \quad \frac{A_i e^{(\gamma-r)S+5\gamma}}{r-\gamma} \eta_2(1-\lambda_2)\frac{h_2}{g_2} = 1 \tag{D14}$$

$$p_2: \quad \frac{A_i e^{(\gamma-r)S+5\gamma}}{r-\gamma} \eta_4(1-\lambda_2)\frac{h_2}{p_2} = A_i e^{5\gamma} h_p. \tag{D15}$$

It is still the case that $S = \frac{\eta_5(1-\lambda_2)}{r-\gamma}$. Likewise, it is still the case that there is a proportionality relationship between the remaining two inputs, with $g_2 \propto A_i h_p p_2$. Plugging this information into (D15) yields:

$$p_2 = \kappa_5 h_1^{\frac{\lambda_2}{1-(\eta_2+\eta_4)(1-\lambda_2)}} z_i^{\frac{\eta_1(1-\lambda_2)}{1-(\eta_2+\eta_4)(1-\lambda_2)}} A_i^{\frac{\eta_2(1-\lambda_2)}{1-(\eta_2+\eta_4)(1-\lambda_2)}} h_p^{\frac{(\eta_2+\eta_3)(1-\lambda_2)-1}{1-(\eta_2+\eta_4)(1-\lambda_2)}}$$

where κ_5 is a function of share parameters and other constants. Substitution yields an expression for h_2:

$$h_2 = \kappa_6 h_1^{\frac{\lambda_2}{1-(\eta_2+\eta_4)(1-\lambda_2)}} z_i^{\frac{\eta_1(1-\lambda_2)}{1-(\eta_2+\eta_4)(1-\lambda_2)}} A_i^{\frac{\eta_2(1-\lambda_2)}{1-(\eta_2+\eta_4)(1-\lambda_2)}} h_p^{\frac{(\eta_3-\eta_4)(1-\lambda_2)}{1-(\eta_2+\eta_4)(1-\lambda_2)}}$$

where κ_6 is a final constant. It follows that human capital in the labor force is increasing in early childhood human capital for $\lambda_2 > 0$.

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