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DISSERTATION

International Labor Flows

Migration Views from the Migrant, the Receiving-Country Economy, and the Sending-Country Family

Jeffery C. Tanner

This document was submitted as a dissertation in June 2012 in partial fulfillment of the requirements of the doctoral degree in public policy analysis at the Pardee RAND Graduate School. The faculty committee that supervised and approved the dissertation consisted of Peter Glick (Chair), Paul Heaton, and Emma Aguila.

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International Labor Flows:
Migration views from the Migrant, the Receiving-Country Economy, and the Sending-Country Family

Jeffery C Tanner

Dissertation Abstract:
Just as international capital flows are the manifestation of money going to its most productive use, international labor migration is the result of human capital flowing to more productive use. Yet challenges may arise along the way. This dissertation covers three topics—three points of view—of issues in international migration. The first paper examines a new facet of the question "Who migrates?" by taking a detailed look at the cognitive and mental health profiles of migrants to investigate a potential psycho-cognitive selection (a *mentally* healthy migrant hypothesis) as an explanation of an observed positive difference between the mental health of US Hispanics and the general US population. The second describes the pull factors and resultant political economy challenges of a receiving country in an extreme case of expatriate labor: Qatar. Finally, the third paper of the dissertation explores the impact of migration on sending families by examining the effect of paternal migration on the cognitive, behavioral, and physical development of children left behind.

Submitted in partial completion for the requirements for the degree of Doctor of Philosophy, RAND Graduate School.

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Finally, I am grateful to my loving, patient, beautiful wife, Mary, without whom I would have been lost long ago: *Ana behibek*. And to my three wonderful boys: Hyrum, Joseph, and Joshua. Remember: You can do hard things!

Migration Selection in Mental Health and Acuity

Jeffery C. Tanner

Abstract: The "healthy migrant hypothesis" is often given as a potential explanation for the "Hispanic health paradox." There is evidence that a Hispanic mental health paradox also exists—that the US Latino population has better mental health than the average population at the same level of income. Using data from the Mexican Family Life Survey, this paper explores whether that paradox can be explained by selection in mental health. I also examine potential migration selection on mental acuity (intelligence).

I find four main patterns of selection for cognition or mental health among three groups. First, young urban males (age 15-18) exhibit a negative linear relationship between general intelligence and the likelihood to migrate. Second, migration is more likely among young rural women in the bottom two quintiles of mental health than those in the middle quintile. Third, I find evidence of a non-monotonic selection in mental health for rural males: those who are in the highest and lowest quintiles of mental health are much less likely to migrate than those in the middle quintile, indicating an inverted-U relation between mental health and migration for rural males. Finally rural males also demonstrate non-monotonic, selection in cognition: the most and least intelligent are more likely to migrate than those in the middle of the cognition distribution, illustrating a positive U-shaped relationship. Though patterns of selection exist, none of these selection patterns would support a mentally healthy migrant effect.

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Introduction

In comparison with the general US population, the US Hispanic population has long been characterized as having lower than average education and income levels, yet better than average physical health (Hummer et al., 2000), (Sorlie et al., 1993). Recent work by the Center for Disease Control underscores the disproportionate health enjoyed by the Latino population living in the United States: As a whole, Hispanics enjoy an advantage of 2.9 years in life expectancy at birth over the general US population, including a 2.5 year advantage over non-Hispanic Whites, despite the lower socioeconomic position of the Latino population in the US (Arias, 2010).

Though less well established, there is some evidence that this "Hispanic health paradox" of better health despite worse income and social standing is not limited to physical health. The psychology literature posits a similar advantage for the mental health of Latinos—usually evidenced by lower rates of psychological disorder.

A recent study compared incidence of psychiatric disorders among US residents and found that the risk of most psychiatric disorders was lower for Hispanics than for non-Hispanic whites (Alegria et al., 2008). Though the degree of mental health advantage varied within the Hispanic population with respect to nativity, the relationship held particularly strongly across conditions of mood, anxiety, and substance disorders for the US-resident population of Mexican descent. In a separate study, Vega et al. (1998)also concludes that Mexican Americans had lower rates of lifetime psychiatric disorder despite lower levels of education and income than other Americans, constituting a "Hispanic *mental* health paradox."

A common explanation for the paradox of Hispanics' anomalous physical health is the significant share of immigrants within the US Latino population. Migration, it is posited, might act as a screening mechanism to select those migrants with better physical health. This "healthy migrant hypothesis" posits that these migrants come from the high end of the health distribution in their home country and are also healthier than the general US population (Palloni and Arias, 2004).

Just as with the physical health paradox, a popular theory invoked to explain the paradox in Hispanic mental health is the "*mentally* healthy migrant hypothesis." This theory points to evidence that Latino immigrants have better rates of mental health than Latinos born in the US. In a US clinical study, Escobar et al. (1998) finds that immigrants had a significantly lower prevalence of emotional health and posttraumatic stress disorder than non-migrants, again despite lower socio economic status. Later, Escobar et al. (2000) review five large scale studies and conclude that in spite of significant socioeconomic disadvantages, Mexican migrants do indeed have better mental health than US-born Mexican Americans. The authors offer three plausible pathways for these differences: 1) selection, as in the healthy migrant hypothesis, 2) protection against acculturation provided by the dense traditional family networks typical of migrant populations, and 3) differences in expectations or definitions of success between first generation migrants and second generation Latinos, which expectations may be lower in absolute terms or which may be due to a difference in relative comparison groups if first generation migrants compare their welfare to peers in their home country while second generation migrants compare their welfare to others in the receiving country. A fourth pathway may be posited from

the findings of (Stillman, McKenzie and Gibson, 2009): 4) migration itself may change the migrant.

These pathways for explaining the Hispanic mental health paradox are explored in various veins of the migration literature. Pathways 2 and 3 are supported by evidence from Wu and Schimmele (2005) who report that the advantage of better mental health for minority immigrants in Canada declines with time in the host country, suggesting an erosion of cultural or social constructs.

In one of the better papers to date to look at the mentally healthy migrant hypothesis (pathway 1), Vega et al(1998)finds that Mexican migrants who have established residence in Fresno County, California, have rates of psychological disorder which are lower than the general US population, and indistinguishable from a sample of Mexico City residents. They conclude that the difference in mental health is not due to migrant selection. Yet because neither the populations of Mexicans living in the US nor the comparison group of Mexicans living in Mexico are nationally representative, nor do they cover the same age groups, nor is there evidence that they were sampled at the same time, the validity of broader claims on the hypothesized robust immigrant effect is tenuous.

The principle weakness of the healthy migrant hypothesis literature also afflicts many studies exploring mental health differences among immigrants: One cannot test for selection by analyzing only the self-selected group (the migrants) without rigorous comparison with the population from which they were known to be drawn. By construction, research designs which focus solely on individuals in a destination country cannot inform us about the selectivity of migrants because the characteristics of the population from which the migrants are drawn cannot be observed. Even the handful of studies which do compare Chicano populations living in the US and those in Mexico, as in Vega et al (1998), compare only specific communities which are not nationally representative of either the sending or receiving country. Furthermore, nearly all of these studies compare populations after migration, thus leaving open the possibility that it is the migration experience—both the relocation process and the destination—rather than migrant selection *per se* which leads to observed differences in mental health.

The potential fourth pathway generating the observed Hispanic mental health paradox—that the migration experience itself leads to improvement in mental health—is supported by a compelling experimental research design by Stillman et al (2009) to make the case that migration *causes* better *ex post* mental health among Tongans who were randomly selected to migrate to New Zealand versus those who applied for the randomization process but were rejected. Still, because most of the world's migration is non-random, it is still worth exploring whether there is migration selection in mental health, even if migrating may itself improve mental health. Moreover, the Tongan-New Zealand migration flow is an extremely small fraction of global migration flows. Thus, the question remains whether migrants come or become mentally healthy.

Though there is no evidence of a "Hispanic cognition paradox," the cognitive capacity of migrants relative to non-migrants has implications for labor market productivity in both the host and home countries. While there is a robust literature on selection on general labor market skills, these skills are most often measured indirectly as the residual from wage regressions or proxied by education levels. These vague skills are often further posited to be indicative of cognition.

Findings from these studies most often indicate negative or intermediate selection (see Chiquiar and Hanson (2005), Ibarraran and Lubotsky (2007), and McKenzie and Rapoport (2010)). Yet there is scant research on whether or not migrants are selected on mental cognition itself, likely due at least in part because of the paucity of available data on cognition for migrant populations. Fortunately, the MxFLS contains an intelligence test, which can be used investigate the degree to which these cognition scores predict migration. The question of migrant selection on mental acuity is thus instrumentally important in addition to being intrinsically interesting.

In the *American Journal of Public Health*, Rubalcava et al. (2008) give the best evidence to date on the question of the existence of the healthy migrant hypothesis. Using the Mexican Family Life Survey (MxFLS), they compare measures of physical health from a nationally representative sample of Mexicans living in Mexico in 2002 with subsequent migration behavior in the 2002-2005 period. This data structure allows a more credible investigation of the healthy migrant hypothesis. The authors examine whether height, obesity, blood pressure, hemoglobin levels, general self-reported health status, and relative general self-reported health status are statistically significantly associated with whether the individual migrated by 2005. They find only weak evidence in support of the healthy migrant hypothesis.

This paper aims to be a complement to the Rubalcava et al. (2008) piece—it uses a similar sample of 15-29 year olds from the Mexican Family Life Survey (MxFLS) to investigate the existence of patterns of migration selection. Where Rubalcava et al. (2008) explored health and education outcomes, I examine migration selection on mental welfare in two dimensions—mental health (emotional wellbeing), as measured by a 21-item set of questions about "individuals own perceptions on emotional aspects of their lives'; and mental acuity (general intelligence or cognition) as measured by an 12-item version of the Raven Standard Progressive Matrices. As far as I am aware, this is the first paper to test migration selection in cognition and emotional health using nationally representative data of migrants and non-migrants prior to migration.

Data

With a large-scale nationally representative panel of Mexicans over two waves, the Mexican Family Life Survey offers a unique opportunity to inform the debate on whether migrants self select from the healthier portions of the distributions of mental and intellectual well-being. The multi-purpose survey collected information on the socioeconomic status, health, mental health, and cognition for 15-59 year-olds by interviewing 8400 households in 150 communities in the first wave in 2002. The MxFLS went to considerable effort to follow up with wave 1 respondents for the second wave, fielded in 2005. These efforts resulted in an attrition rate of less than 9%.

The healthy migrant hypothesis and its mental health variant make claims that those who successfully migrate to the US are healthier than the general population of the home country left behind. However, few studies are able to make definitive comparative claims. The MxFLS has three advantages over previous mental health and cognition studies of the Mentally Healthy Migrant Hypothesis: 1) it collects information in the sending country prior to migration, 2) it is representative of the largest population from which recent US-bound migrants are drawn, and 3) the survey identifies US migrants regardless of their legal status.

The MxFLS is unique for a survey of its size in that it collects respondent information on physical health, mental health, and mental acuity. The physical health parameters collected by the MxFLS include height, weight, hemoglobin levels from blood spots, heart rates, systolic and diastolic blood pressure, and self-reported absolute and relative levels of overall health.

The mental health section of the survey is composed of a battery of 21 questions to measure the emotional wellbeing (*estado de animo*) of respondents and is closely related to tests of depression.[1] Exact question items can be seen in Appendix 1, together with a table giving the eigenvalues and share of variance explained from a principal components analysis of these 21 items. That analysis strongly supports the use of a single principle component to reduce the dimensionality of mental health. Once extracted, this first component is then standardized over the entire surveyed population (ages 15 and older) at a mean of zero and standard deviation of one, with higher scores indicating worse mental health. This index is the metric used to test migration selection in mental/emotional health.

Mental acuity in the MxFLS is assessed by giving each respondent a general intelligence test composed of 12 items selected from the Raven Standard Progressive Matrices. Scores on the full Raven Test are given as simply the number correct, but because the MxFLS version administers only 12 items from the Classic Raven SPM, I score each respondent's MxFLS cognition test as the percent of questions answered correctly. Thus each question counts for about 8.3 percentage points.

The Raven tests have been used for nearly 70 years. Because they simultaneously measure both eductive reasoning or fluid intelligence *g_f* (pure reasoning which generally increases up to about age 30) and reproductive ability or crystallized intelligence *g_c* (the application of logic or reasoning which generally keeps rising with age), the Raven tests are considered to be among the best direct measures of *g*, general intelligence (Raven, 2000).Thus, by mental acuity or cognition, I mean general intelligence.

As the younger population is more likely to be migrating for the first time and are therefore less likely to be affected by previous migration (Pathway 4), the sample used in this paper covers the 7,564 Mexican men and women age 15-29 at the time of the first wave of the survey in 2002 who have data on migration, education, emotional health, and cognition.[2] Overall, females

[1] According to the Users Guide for MxFLS-1, this section "draws from mental health questions tested and validated by the National Psychiatric Institute in Mexico…on [an] individual's own perceptions emotional aspects of their lives" (Rubalcava and Teruel, 2006), and the Spanish-language MxFLS website refers the reader to (Calderon Narvaez, 1997) (http://www.ennvih-mxfls.org/, see the Documentación Auxiliar section of Wave 1).

[2] Where the other covariates used in the models are missing, the missing value is replaced with the appropriate population mean and a dummy variable is added indicating whether or not the respondent had a missing value for each variable.

This sample is similar to the Rubalcava et al (2008) paper which this piece complements. Deviations from that sample are likely attributable to differences in key variables defining the population (mental health rather than physical health), differences in versions of the data (Rubalcava uses early release rather than public release data), and variation across age variables reported within the MxFLS (I use age as reported in book 3b which includes the battery on emotional health and book EA which includes the cognition test).

comprise 55.5% of the sample and 38% of those migrating between MxFLS waves,[3] while those from urban areas make up 60% of the sample and 41% of eventual migrants.

Below, Table 1 gives the resulting sample size with the share of eventual migrants and mean mental health and cognition status for rural and urban men and women in wave 1, together with standard errors. Rural males are the most likely to migrate—nearly twice as likely as urban males and rural females and five times more likely than urban females. Gender seems to be more salient than locality for emotional health, while locality seems to be more relevant for cognition.

Table 1—Rates of Migration to the United States, Levels of Mental Well-Being among Mexicans Aged 15-29 Years: Mexican Family Life Survey, 2002-2005

	Males		Females	
	Rural	Urban	Rural	Urban
Total, no.	1359	2039	1700	2466
Migration from Mexico to the United States	0.098	0.051	0.055	0.021
% moved 2002-2005, mean (SE)	(0.297)	(0.221)	(0.229)	(0.145)
Mental Well-Being				
Emotional Health, mean (SE)	-0.328	-0.348	0.096	0.061
lower values indicate better health	(0.721)	(0.716)	(0.995)	(0.968)
Cognition, mean (SE)	0.507	0.611	0.489	0.578
% Correct on 18-item Raven test	(0.238)	(0.224)	(0.240)	(0.232)

Note. Emotional Health score is the standardized first principal component of a 21-item sub survey

Overall patterns by gender and locality, then, yield interesting patterns. With an average standardized emotional health score of -0.34, males have nearly a half standard deviation advantage over females who have an average score of 0.075, indicating substantially lower emotional health for women.[4] As a whole, mental health does not appear to vary significantly by locality. Urbanites seem to have nearly identical mental health as rural residents with a difference of only three hundredths of a standard deviation at scores of -0.12 and -0.09, respectively. On average, those living in urban areas score nearly ten percentage points higher on the cognition test than those living in rural areas—59.3% versus 49.7%, or about 7 correct answers versus 6. On average males score 56.9% on the cognition test, just slightly higher than the average female score of 54.2%.

Table 2—Summary Statistics for Baseline Characteristics / Regressions Covariates by Subsequent Migration Status among Mexicans Aged 15-29 Years

	Non-migrant in w2 (N=7151)	Migrant in w2 (N=382)	Total (N=7533)

[3] As this gender imbalance among 15-29 year-olds may indicate a selected sample which excludes Mexicans who have already migrated; I also run robustness checks using a subsample of 15-18 year olds. None of the age cohorts in this younger sample has a share of previous migration greater than 0.5% and the gender ratios of this group are much closer to parity, with 49% male and 51% female. Moreover these are the cohorts most likely to migrate later.

[4] This gender imbalance in emotional health is very well established in the psychology literature in the US: adult women are about twice as likely to be depressed as men. See for example (Weissman and Klerman, 1977), (Nolen-Hoeksema, 1987), and (Nolen-Hoeksema and Girgus, 1994).

	Baseline Characteristics	SS	Mean	SD	Mean	SD	Mean	SD
Background Characteristics	Rural (<2500 inhabitants)	**	0.396	0.489	0.589	0.493	0.406	0.491
	Female	**	0.561	0.496	0.380	0.486	0.551	0.497
	Any prior migration	**	0.018	0.132	0.084	0.277	0.021	0.144
	Married / Partnered	**	0.346	0.476	0.217	0.413	0.339	0.474
Socio-Economic Status	Years of completed educ.	**	8.648	3.245	8.003	2.793	8.615	3.227
	Log hh per capita consump	**	7.235	0.816	7.025	0.834	7.225	0.818
	1st component hh asset index	**	0.086	1.383	-0.196	1.409	0.072	1.386
	2nd component hh asset indx	**	0.114	1.471	0.502	1.773	0.133	1.490
	Dwelling: Apartment	**	0.039	0.193	0.011	0.102	0.037	0.189
	Dwelling: Single Fam Home		0.228	0.420	0.247	0.432	0.229	0.420
	Dwelling: Other		0.006	0.077	0.000	0.000	0.006	0.075
Physical Health	Height	**	160.001	8.957	161.947	8.453	160.099	8.942
	Not overweight (BMI<25)	**	0.597	0.452	0.700	0.418	0.602	0.451
	Hemoglobin replete (F: hg>12, M: hg>13)	**	0.855	0.322	0.911	0.247	0.858	0.319
Indicators of Missing Values	Missing dwelling type		0.001	0.037	0.003	0.051	0.001	0.038
	Missing hh assets index		0.016	0.127	0.016	0.125	0.016	0.127
	Missing height		0.142	0.349	0.134	0.341	0.141	0.348
	Missing BMI		0.152	0.359	0.149	0.357	0.152	0.359
	Missing hemoglobin		0.166	0.372	0.165	0.372	0.166	0.372
	Missing consumption		0.017	0.127	0.013	0.114	0.016	0.127

SS designates statistical significance between the non-migrant and migrant subsamples. ** $p<0.01$

The MxFLS also contains a wealth of background information about respondents. I use measures of socio economic status and health in addition to marital status and a history of previous migration as controls in the later regression models. Descriptive statistics for these as well as indicators of the share of the data missing values for a particular variable are included above in Table 2.

We note from the trends above that those who are migrating during the 2005 wave of the MxFLS tend to be males, from rural areas, and have a previous migration history. They are also less well educated, have lower log household per capita consumption, have fewer luxury assets and more agrarian assets, are more likely to live in an apartment, and are healthier (taller, less likely to be overweight, and more likely to be hemoglobin replete).

Migrants are also less likely to be married than non-migrants. Still, not reported in the table above but interesting to note, female migrants are 10 percentage points more likely to be married than male migrants (28% versus 18%), a statistically significant finding. Migrant men in this sample are also 33% more likely than migrant women to have migrated previously. Combining these latter two results provides some evidence for the popular assertion that men tend to be "leading" migrants while women tend to be "trailing" migrants.

Estimation Strategy and Results

In this section I begin with a basic bivariate "unadjusted" model for each of the two outcome variables, then add state fixed effects as "adjusted" models for each outcome, then add age and include both cognitive and mental health together in a "simultaneous" model.[5] Following this initial set of models I run a new set of regressions adding still more controls, and then substitute the continuous cognition and emotional health variables with quintile dummies. I then conclude by running this last model separately for the very young population ages 15-18. All specifications report robust standard errors.

The aim of this paper is to explore the relationship between mental or intellectual health and the probability of migration from Mexico to the US between waves of the survey versus not migrating to the US.[6] As a basic model, I use a logistic regression with the binary dependent variable being whether or not the respondent migrated subsequent to wave 1, and a series of independent variables including our measures of emotional health and cognition as in equation (1).

$$(1) \qquad Prob\left(Mig_{i,t2} = 1 \middle| \boldsymbol{x_i}\right) = \frac{e^{x_{i,t1}'\beta}}{1+e^{x_{i,t1}'\beta}}$$

The panel nature of the data allows us to measure mental health and cognition and other covariates $\boldsymbol{x}$ for individuals i in period $t1$ prior to migration in period $t2$. This structure allows us to isolate Pathway 1 from Pathways 2-4, thus ruling out the critique in studies collecting concurrent health and migration information. Still, the research design of this paper does not allow the claim that mental health or intelligence *causes* a person to migrate. It does allow us to investigate whether those with higher mental health or intelligence are also more likely to migrate.

In the face of evidence that there are fundamentally different patterns of migration based on gender and locality,[7] the logistic regressions used here are estimated separately for males and females and for rural and urban Mexicans. These specifications control for such systemic differences in migration behavior.

For each of the four gender/locality groups, I begin with a simple "unadjusted" model. The first column of Table 3 reports the odds ratio for the unadjusted (bivariate) logistic regression between migration status and a single aspect of mental well-being: emotional health (termed "depression" to convey that higher values of the index constitute worse or negative emotional health) or cognition. Next are the odds ratios from an "adjusted" model which adds fixed effects for state of residence and a piece-wise linear control for age broken into two groups—15 to 19 and 20 to 29. These state level fixed effect regressions are included in all subsequent specifications[8] and are modeled after the conditional fixed effects logit specification of

[5] This progression mirrors the Rubalcava et al. (2008) piece to give results for cognitive and mental health selection comparable in approach to their health and education selection results.
[6] Note that 96% of the MxFLS sample which migrates internationally between waves migrates to the US.
[7] See Fussell and Massey (2004), Hondagneu-Sotelo (1994), and Rubalcava et al. (2008).
[8] Note: Because there is no variation in eventual migration status in several states, these states are dropped from the regressions, resulting in lower sample sizes in the FE regressions than reported in Table 1.

Chamberlain(1980)(1980)(1980) (1980) as in equation (2) below where the conditioning on *j* is on geography as a proxy for migration networks.[9]

$$(2) \qquad Prob\left(Mig_{j,i,t2} = 1 \middle| \boldsymbol{x_i}\right) = \frac{e^{\alpha_j + \boldsymbol{x_{j,i,t1}}'\beta}}{1+e^{\alpha_j + \boldsymbol{x_{j,i,t1}}'\beta}}$$

Log-Linear Results

The third column of Table 3 gives results of a single "simultaneous" fixed effect logistic regression with both measures of mental well-being included in addition to the controls in the adjusted model. The first three columns give results for urban males; this sequence of results is then repeated for rural males in columns 4-6 of Table 3. I then move through this same progression of columns 1-6 for rural and urban females in Table 4.

Table 3—Odds Ratios from Logistic Regression of 2002-2005 Migration and 2002 pre-Migration Emotional / Cognitive Health for Urban and Rural Males, ages 15-29

	Urban			Rural		
	Unadjusted	Adjusted	Simultaneous	Unadjusted	Adjusted	Simultaneous
Depression (- emot. health)	0.977	0.915	0.909	1.156	1.023	1.004
	(0.140)	(0.184)	(0.186)	(0.132)	(0.132)	(0.127)
Cognition	0.464+	0.624	0.617	0.461*	0.550**	0.551**
	(0.215)	(0.254)	(0.257)	(0.171)	(0.119)	(0.114)
Observations	2039	1938	1938	1359	1233	1233

*** p<0.01, * p<0.05, + p<0.1; (Robust eform standard errors in parentheses)*

Unadjusted column includes each mental welfare covariate run one at a time.

Adjusted column includes separate regressions for each mental welfare variable with piece-wise linear controls for age and state of residence in 2002.

Simultaneous column includes both mental welfare covariates as well as age and state controls.

I find no evidence of a statistically significant monotonic relationship between the probability of migration and emotional health for men (Table 3). The odds ratios for all models are centered near one—indicating that at mean levels of mental health the likelihood of migrating is the same as the likelihood of not migrating. Though not a statistically significant effect, the point estimates for the simultaneous regression for urban men implies that a 1 standard deviation increase in the emotional health score (1 standard deviation decrease in emotional health) is associated with a reduction in the odds of migration by 9 percent. For rural men, such an increase in emotional health score is associated with an increase of 0.4 percent in the migration probability for the simultaneous equation. Still, the confidence intervals around these results are fairly wide, potentially indicating that some important elements are missing from the specifications.

However, for all three introductory models for both urban and rural men, higher cognition is associated with a lower probability of migrating[10]. While this result is not statistically significant for urban men, it is significant at the 1% level for men living in rural areas where a 10 percentage

[9] Robustness checks running the models with state/municipality dummies yields similar results to the Chamberlain models.

[10] Because education is not controlled for in the specifications in Tables 3 and 4, the cognition results could suffer an omitted variable bias. Later regressions in this paper, however, do control for education.

point increase in cognition scores is associated with a decrease in the probability of migration by 5.8 percent[11] (Table 3).

As seen in Table 4, emotional health results for females are similar to males in that the odds ratios for urban and rural women are centered at one and are not statistically significant, with relatively narrow standard errors. For urban females, a one standard deviation increase in the emotional health score (decrease in emotional health) is associated with only a 1.5 percent increase in the probability of migration. A similar increase in the emotional health index is associated with a 5.1 percentage point increase for rural females—neither result is statistically significant, however.

Table 4— Ratios from Logistic Regression of 2002-2005 Migration and 2002 pre-Migration Emotional / Cognitive Health for Urban and Rural Females, ages 15-29

	Urban			Rural		
	Unadjusted	Adjusted	Simultaneous	Unadjusted	Adjusted	Simultaneous
Depression (- emot. health)	1.041	1.013	1.015	1.138	1.049	1.051
	(0.144)	(0.182)	(0.182)	(0.103)	(0.080)	(0.076)
Cognition	1.22	1.214	1.217	1.263	1.932+	1.937+
	(0.739)	(0.507)	(0.497)	(0.574)	(0.760)	(0.758)
Observations	2466	2135	2135	1700	1369	1369

*** p<0.01, * p<0.05, + p<0.1; (Robust eform standard errors in parentheses)*

Unadjusted column includes each mental welfare covariate run one at a time.

Adjusted column includes separate regressions for each mental welfare variable with piece-wise linear controls for age and state of residence in 2002.

Simultaneous column includes both mental welfare covariates as well as age and state controls.

Higher cognition is associated with a higher chance of migrating for both rural and urban women. Cognition results for rural females are marginally statistically significant, the point estimate indicating that a 10 percentage point increase in the cognition score is associated with a 6.8 percent increase in the probability of migration. Though not a statistically significant relationship, a 10 percentage point increase in the cognition score for urban females is associated with a 2 percent increase the likelihood of migration.

Finally, I arrive at my full specification, which includes those elements in the "simultaneous" regressions (both mental welfare measures, piece-wise linear age, and state fixed effects) and additional controls for physical health, including height, an indicator for obesity, and hemoglobin; education; current and previous marital status; log per capita household consumption, household wealth (as measured by the first two principal components from a series of questions on household assets), and an indicator for prior migration. In Table 5 and all subsequent tables, the first column includes dichotomous variables for male and rural indicators, while columns 2-5 estimate the model for the four gender/locality subsamples separately.

Table 5—Odds Ratios from Full Specification Conditional FE Logistic Regression of 2002-2005 Migration and 2002 Cognitive / Emotional Health, ages 15-29

[11] Conversion to a marginal effect of a 10% increase in the cognition score is assessed by the function $(\exp(\ln(OR) * .1) - 1) * 100 = \%\ change$.

	Gender & Locality as covariates	Rural Males	Urban Males	Rural Females	Urban Females
Depression (- emot. health)	1.02	1.07	0.89	1.05	1.03
	(0.06)	(0.14)	(0.18)	(0.08)	(0.18)
Cognition	0.79	0.489+	0.92	1.59	0.82
	(0.16)	(0.18)	(0.43)	(0.78)	(0.46)
Observations	7564	1233	1938	1369	2135

*** p<0.01, * p<0.05, + p<0.1; (Robust eform standard errors in parentheses)*
Covariates: wave 1 values for mental welfare, age, physical health, wealth, consumption, education, prior migration, conditioned on Mexican state of residence

While the sign and magnitude of the relationships between mental well-being and US migration in the full specifications in Table 5 are very similar to the three initial specifications, the standard errors in the male cognition regressions are somewhat larger. This may indicate that cognition is correlated with some of the controls—likely education. Consequently, the weakly statistically significant positive relationship between cognition and migration for rural women has vanished, while the strong statistical result for a negative relationship between rural men's cognition and migration becomes only weakly significant, representing a 6.9 percent decrease in the likelihood of migration.

Robustness Checks: Log-Linear Specifications

As a robustness check I use municipality rather than state fixed effects as a more specific proxy for migration networks. As seen in Appendix 2, point estimates and statistical significance is largely unaffected by this move, though the marginally significant rural male result vanishes.[12] I also use standard errors clustered at the municipal level to see if the results change throughout the paper (overall, they do not); a short discussion of the results of the municipal-clustered standard errors is also found in Appendix 2.

For an additional set of robustness checks I repeat the full specification models on the younger population of 15-18 year olds. In most of the above-cited literature on the healthy migrant hypothesis, the studies were susceptible to a selection bias. They could not reliably compare migrants to non-migrants because they only observed the migrants. As noted, the MxFLS allows us to overcome selection issues to a considerable degree as we are able to compare *ex ante* cognition and emotional health indicators with migration status observed *ex post*.

However, there remains the possibility of simultaneity, whereby previous migration and return may affect emotional well-being or cognitive functioning. Variation in health status following migration spells may be attributable to the migration experience itself, particularly if observed health varies by duration of migration and time elapsed since the migration period. If this relationship between current mental welfare and previous migration moves in a non-linear or time-dynamic way, or if there are heterogeneous effects, then our control for prior migration may not be sufficient.

As a robustness check against this possibility of reverse causality due to prior migration, I limit the sample to those between ages 15-18. No more than 0.5% of any of the four age cohorts in

[12] State fixed effects are used by the designers of the survey in (Rubalcava and Teruel, 2006).

this subpopulation has a previous migration history, but over 46% of all subsequent migrants in the 15-29 year-old sample used in this study come from these four cohorts. Each of these cohorts in the age 15-18 sample sees close to 10% or more of their populations migrate to the US in the 3 years following the initial interview. Finally, where the 15-29 year-old sample exhibits gender imbalance with females making up 55.5% of Mexicans in that age bracket, perhaps indicating a selected sample as a result of early migration, the younger subsample does not appear to be as susceptible to this problem with a gender ratio near parity at 51% female.

Re-running the models for the younger subpopulation of 15-18 year olds in Table 6 below demonstrates that most results are qualitatively similar to the previous results applying the models to the entire 15-29 year-old population, with the exception that the point estimate for urban females reverts back to a positive relationship between migration and cognition for the young population (though in none of the specifications is this relationship statistically significant).

More interestingly, where the statistical significance had evaporated for all results in the full specification models in the 15-29 population, we see that the negative relationship for cognition in urban males and the positive relationship with the emotional health index for rural females are statistically significant for this younger population. The magnitude of these effects is also larger in absolute value.

A 10 percentage point increase in cognition scores for urban males is associated with a decrease in migration probability by 13 percent. Though not statistically significant, the point estimate for cognition for females in both rural and urban areas is notable: a 10 percentage point gain in cognition would be associated with a 5.5 percent gain in the likelihood of migration.

Table 6—Odds Ratios from Full Specification Conditional FE Logistic Regression of 2002-2005 Migration and 2002 Cognitive / Emotional Health, ages 15-18

	Gender & Locality as Covariates	Rural Males	Urban Males	Rural Females	Urban Females
Depression (- emot. health)	1.084+	0.94	0.89	1.263**	1.24
	(0.05)	(0.20)	(0.19)	(0.10)	(0.21)
Cognition	0.488+	0.52	0.236*	1.73	1.71
	(0.21)	(0.28)	(0.17)	(1.53)	(2.79)
Observations	2596	418	642	432	509

*** p<0.01, * p<0.05, + p<0.1; (Robust eform standard errors in parentheses)*
Covariates: wave 1 values for mental welfare, age, physical health, SES (wealth, consumption, education), prior migration, conditioned on Mexican state of residence

We also see that as emotional health increases (emotional health decreases) among rural females, so too does the propensity to migrate. With statistical significance at the 1% level, a 1 standard deviation increase in emotional health (decrease in emotional health) is associated with a 26 percent increase in the odds of migrating—a decidedly large effect.

Heterogeneous Effects Across Mental Welfare Distributions

Finally, I examine whether there is migration selection on mental welfare from particular parts of the emotional health and cognition distributions. I give greater flexibility to the emotional health

and cognition terms by substituting the continuous measures of these variables with a set of indicators for distribution quintiles, using the third (middle) quintile as the omitted category. Where the previous specifications estimated the mean relationship, this model allows us to observe differential effects for persons of mental welfare at different parts of the emotional health and cognition distributions.

Table 7—Odds Ratios for 2002 Emotional Health Quintiles from Full Specification Conditional FE Logistic Regression of 2002-2005 Migration for 15-29 year-olds

← Poor (E. Health) Good→	Gender & Locality as covariates	Rural Males	Urban Males	Rural Females	Urban Females
Emot. Health 1st Quintile	0.94	0.509*	1.55	1.16	0.68
	(0.16)	(0.14)	(0.60)	(0.24)	(0.35)
Emot. Health 2nd Quintile	0.79	0.606+	1.26	0.79	0.82
	(0.16)	(0.17)	(0.51)	(0.34)	(0.42)
Emot. Health 4th Quintile	1.03	0.81	1.17	1.47	0.75
	(0.11)	(0.23)	(0.29)	(0.46)	(0.29)
Emot. Health 5th Quintile	0.89	0.59	1.11	1.14	0.77
	(0.14)	(0.25)	(0.47)	(0.27)	(0.35)
Observations	7,564	1,233	1,938	1,369	2,135

*** p<0.01, * p<0.05, + p<0.1; (Robust eform standard errors in parentheses)*
Covariates: wave 1 values for mental welfare, age, physical health, SES (wealth, consumption, education), prior migration, conditioned on Mexican state of residence

This set of models is applied to the sample as a whole using gender and locality as covariates, as well as in the four separate gender/locality regressions in Tables 7 and 9. These models are likewise applied to the younger subsample of Mexicans age 15-18 in the first wave of the MxFLS in Tables 8 and 10.

Table 7 decomposing the emotional health variable into quintile dummies demonstrates that where the odds ratios in the 15-29 year-old population were always near 1 and never significant across the four gender/locality types for mean emotional health levels—that is, emotional health seemed to have no relationship with the migration decision—once we allow for differential effects based on where in the emotional health distribution a person may be, we see that for the 15-29 year-old rural male population, being in the best emotional health quintile is statistically significantly associated with a nearly 50% lower probability of migrating, as compared to those in the middle quintile. It bears noting that while we reject the null of a balanced odds ratio, we cannot reject the null of this coefficient being equal to the coefficients in the 2nd and 5th quintiles, indicating an inverted U or V shape for rural males, which is made even more clear in Table 8, below.

Concerned about potential bias from reverse causality from prior migration and a selected sample from portions of the cohorts under study migrating out of the sample prior to the 2002 MxFLS, I run the regressions for the younger population in Table 8, below.

Table 8—Odds Ratios for 2002 Emotional Health Quintiles from Full Specification Conditional FE Logistic Regression of Post-2002 Migration for 15-18 year olds

		Gender & Locality as covariates	Rural Males	Urban Males	Rural Females	Urban Females
← Poor (E.Health) Good →	Emot. Health 1st Quintile	0.81	0.351**	1.16	1.87	0.51
		(0.17)	(0.10)	(0.60)	(1.41)	(0.76)
	Emot. Health 2nd Quintile	0.88	0.469*	1.25	1.32	1.74
		(0.19)	(0.18)	(0.57)	(0.74)	(1.72)
	Emot. Health 4th Quintile	1.25	0.71	1.46	2.713*	0.92
		(0.21)	(0.29)	(0.61)	(1.12)	(0.73)
	Emot. Health 5th Quintile	0.90	0.302**	0.65	2.231+	2.02
		(0.11)	(0.14)	(0.40)	(0.93)	(1.39)
	Observations	2,596	418	642	432	509

*** p<0.01, * p<0.05, + p<0.1; (Robust eform standard errors in parentheses)*
Covariates: wave 1 values for mental welfare, age, physical health, SES (wealth, consumption, education), prior migration, conditioned on Mexican state of residence

Similarly, the general specification using gender and locality as covariates indicates a negative association between subsequent migrating to the US and being in the best emotional health quintile. While the relationship between emotional health and migration continues to not be statistically significant for urbanites in any emotional health quintile for the younger population, the statistical significance becomes even more convincing for rural dwellers, especially men. Here we see not only a more pronounced result that rural males from the best emotional health quintile are less likely to migrate, we also note that the most depressed rural males (those in the 5th quintile, the worst emotional health) are only 30% as likely to migrate as a rural male in the middle of the emotional health distribution, suggesting an inverted U-shape for emotional health and migration probability among young rural males. The implication here is that those who are the most optimistic may feel they have no reason to leave, while the least optimistic may have no motivation to do so or hold deep skepticism that such a risky venture would end well. Those in the center of the distribution may be neither too pleased nor too discouraged by their current situation to want to try migrating.

The story is quite the opposite for rural females. Table 8 reveals a high propensity to migrate among those with the worst emotional health. Among those in the 4th and 5th quintiles, women are more than twice as likely to migrate as to not migrate, a result significant at the 5% and 10% levels, respectively. As illustrated by bin counts in Appendix 3, the large magnitude of these results is not driven by problems of bin size—there are in fact more observations in each of the 4th and 5th emotional health quintiles for rural females than in any of the other three quintiles. These results underscore the positive and statistically significant relationship between emotional health and migration we saw among young rural females in Table 5. Interestingly, married migrant women are nearly a standard deviation worse emotional health than single migrant women (1.1 versus 0.2), a difference significant at the 10% level. This may give support to the notion that males tend to be leading migrants while women (often their wives) tend to be trailing migrants. Still, in a regression analysis in Appendix 4, there is no evidence that mental health is related to age, education, marital status, consumption, or household assets for young 15-18 year-old rural women who eventually migrate.

Allowing for distributional flexibility also yields interesting and significant results on cognitive selection. As seen in Table 9 for the 15-29 year-old population, rural females in the second

cognition quintile are less than half as likely to migrate as women in the center of the cognition distribution. Rural males in the same cognitive quintile are 2.7 times more likely to migrate in the 3 years subsequent to the cognition test. Males in the lowest quintile of the cognition distribution (the least cognitively adept), are nearly twice as likely to migrate as their countrymen from the center of the cognition distribution.

Table 9—Odds Ratios for Cognition Quintiles from Full Specification Conditional FE Logistic Regression of Post-2002 Migration for 15-29 year olds

	Gender & Locality as covariates	Rural Males	Urban Males	Rural Females	Urban Females
← Good (Cognition) Poor →					
Cognition 1st Quintile	1.21	1.933*	1.17	0.94	0.79
	(0.19)	(0.57)	(0.46)	(0.22)	(0.42)
Cognition 2nd Quintile	1.17	2.706**	0.63	0.443**	1.82
	(0.13)	(0.75)	(0.19)	(0.12)	(0.70)
Cognition 4th Quintile	1.03	2.001+	0.65	0.96	0.95
	(0.17)	(0.81)	(0.19)	(0.27)	(0.41)
Cognition 5th Quintile	1.16	1.635+	1.12	1.09	1.04
	(0.14)	(0.43)	(0.20)	(0.32)	(0.29)
Observations	7,564	1,233	1,938	1,369	2,135

*** p<0.01, * p<0.05, + p<0.1; (Robust eform standard errors in parentheses)*

Covariates: wave 1 values for mental welfare, age, physical health, SES (wealth, consumption, education), prior migration, conditioned on Mexican state of residence

Though statistically significant only at the 10% level, rural males in the top 20-40% of the cognition distribution also exhibit a higher migration rate relative to those in the middle. Taken together with the positive relationship among the lowest cognitive quintiles, these results suggest a U-shaped relationship between migration and cognition, which may explain the negative but not statistically significant general relationship between migration and cognition exhibited by rural males in Table 5.

Interestingly, we see a bit of the reverse for rural females. Those from the second cognition quintile are only 44 percent as likely to migrate as rural females from the center of the distribution. Thos in all other quintiles, however, are very near parity of migration / non-migration in their point estimates. This result for women of intermediate cognitive ability is interesting—and statistically significant at the 1 percent level—but is something of an anomaly.

Looking at the younger population—those between ages 15 and 18 in the first wave of the MxFLS and are far less likely to have migrated previously—yields even more compelling results. The pattern of significance in Table 10 for rural males in all quintiles is more pronounced and larger in magnitude; all are 2 to 3 times more likely to migrate than those in the middle of the distribution. These rural males are likely driving the significant results for bottom two quintiles in the overall regressions in the first column, which is the general specification including gender and locality as covariates. Overall in the rural male population we see strong and statistically significant evidence for a pronounced U-shaped relationship between cognition and subsequent migration.

Table 10—Odds Ratios for Cognition Quintiles from Full Specification Conditional FE Logistic Regression of Post-2002 Migration for 15-18 year olds

← Good (Cognition) Poor →	Gender & Locality as Covars	Rural Males	Urban Males	Rural Females	Urban Females
Cognition 1st Quintile	1.560*	2.577**	1.75	0.72	0.49
	(0.32)	(0.70)	(0.67)	(0.24)	(0.53)
Cognition 2nd Quintile	1.559*	3.661**	0.55	0.86	0.59
	(0.27)	(1.30)	(0.30)	(0.47)	(0.50)
Cognition 4th Quintile	1.35	2.657+	0.84	2.584*	0.55
	(0.33)	(1.36)	(0.46)	(0.97)	(0.56)
Cognition 5th Quintile	1.15	2.846**	0.67	1.01	0.70
	(0.18)	(0.77)	(0.24)	(0.65)	(0.45)
Observations	2,596	418	642	432	509

*** p<0.01, * p<0.05, + p<0.1; (Robust eform standard errors in parentheses)*
Covariates: wave 1 values for mental welfare, age, physical health, SES (wealth, consumption, education), prior migration, conditioned on Mexican state of residence

This U-shape for the likelihood of migration over the cognition distribution is an economically interesting result. It implies that, compared to their peers, both the least and the most intelligent are more likely to see the US labor market opportunities as having a greatest wage premium over their local opportunities. This may be a function of human capital formation in schools in the production of labor market skills, though we control explicitly for education, so this concern may be at least partially ameliorated. Still, if cognition itself does not translate into higher wages except through education, then it may be that education is driving the push to migrate. Several pieces of research suggest that some students may stop attending school as they see migration as a viable career path but one which does not value a Mexican education (See (McKenzie and Rapoport, 2010) for an example). Still this U-curve in cognition and its relationship to education and labor markets appears to be a rich opportunity for further research.

Finally, for younger rural females, rather than the statistically significant negative relationship between migration and cognition in the second cognition quintile, we see a significant and very large positive propensity to migrate for those in the 4th (next-to-highest) quintile.

Conclusion

The literature suggests the existence of a Hispanic mental health paradox and a potential explanatory pathway in migrant selection in mental health alongside other potential pathways including cultural protection, referencing, and benefits stemming from the migration experience itself. Few published works employ research designs capable of accurately testing the hypothesis of increased migration among the mentally healthy. In this paper I use nationally representative data from Mexico to test whether baseline emotional health and mental acuity are associated with the likelihood of migration in the subsequent three years.

I find mixed evidence, depending on the gender and urban/rural locality of young Mexicans. Specifically, I find no evidence of migration selection on either cognition or emotional health in the urban population—male or female. However, there is an interesting pattern of migration selection on both cognition and emotional health in the rural population—for both males and females—though the patterns are inverses of each other.

The descriptive statistics indicate that migrants are most often male, rural, are less well educated, have lower consumption and fewer luxury assets. Among these, consumption consistently shows up as a statistically significant determinant of future migration. For rural males, for example, a 10 percent increase in consumption is associated with around a 40 percent decrease in migration. Migration, then seems to be driven in part by poverty.

The relationship between emotional health and migration seems to have an inverted U shape for rural males, with those in the best and worst emotional health being less likely to migrate—a relationship which seems to hold particularly strongly among the very young (those 15-18 in 2002) where there is less evidence for a selected or otherwise- biased sample due to outmigration or previous migration. That is, those in the best and worst emotional health are far less likely to migrate to the US than those in the middle of the emotional health distribution. This pattern of behavior may indicate that among rural men, the most depressed and the most optimistic are least likely to seek out a high risk / high reward life change such as migration to the US.

Among rural women, especially among the young, there is some evidence of a monotonically increasing relationship between emotional health and migration, driven by an increased likelihood to migrate among the fourth worst emotional health quintile. Here we see that more depressed young rural women are more likely to migrate. This could be a function of the higher incidence of marriage among these women, but direct analysis does not support the view that marriage, education, household assets, or consumption is related to emotional health for these women.

The cognition story is very much the reverse. Less cognitively adept rural male Mexicans—those from the lowest two cognition quintiles—are much more likely to migrate than rural males in the middle of the distribution. This result holds for both the 15-29 year-old and 15-18 year-old populations. For the younger age bracket there is evidence of a U shape for positive selection to migrate relative to the distribution of cognitive ability: in addition to these least intelligent rural males, rural males in the highest intellectual quintile nationally are also more likely to migrate. The economics of this behavioral choice are potentially quite interesting. It indicates that relative to their peers with average cognition, those at the tails of the distribution are more likely to find US migration as an attractive choice. This may be explained, for example, by a two-track US labor market segregated by documentation status. Other competing explanations, including, *inter alia*, labor market skills as produced by education, risk aversion profiles and relative skill in forecasting—certainly exist.

Those in the second cognition quintile are less likely to migrate among rural women age 15-29 in 2002, but those age 15-18 in that same gender/locality strata who are in the fourth (moderately more intelligent) quintile are more likely to migrate than rural women in the center of the distribution—a somewhat puzzling result which bears future research.

I find no statistically significant evidence of any type of migration selection on mental health for those migrating from urban areas—males or females. Though this null result could be due to power issues and the smaller share of migrants coming from urban areas, it is worth noting that the point estimates from the urban specifications are frequently considerably closer to 1 in

magnitude than those from the rural specifications, even as the standard errors are roughly comparable.

While I uncover no evidence of selectivity by quintile in cognition for those coming from urban areas, urban males do exhibit a negative overall relationship between migration and cognition (See Table 6).

In conclusion, exploring the distributional relationships between mental welfare and migration yields a far more complex relationship than simply looking at means. While any purported average mental health or acuity advantage held by the Mexican population living in the United States seems unlikely to be the result of selection in migration, this is not because there is no selection at all. Rather this null effect seems to be because the selection which does exist is washed out in full population specifications with forced monotonicity. Particularly for young rural males—who drive Mexico-US migration trends—the negative selection in the tails of the emotional health distribution offset the positive selection in the distribution's center for emotional well-being, while the positive selection at the tails of the intelligence distribution is offset by negative selection in the middle quintile. Mexican males age 15-29 migrating to the US between 2002 and 2005 are more likely to come from the center of the emotional health distribution, even as they are among the most or least intelligent of their peers.

Future research on the pathways explaining the Hispanic mental health paradox or migration selection on emotional health or intelligence should consider the migrants' gender and the locality and position in the emotional health and cognition distribution at the time of departure. Moreover, further research into the economic forces driving the U-shaped migration pattern in rural males, particularly in cognition, could be extremely interesting.

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APPENDIX 1: MxFLS-1 Mental Health Questionnaire

Below is a reproduction of the English language version of the Emotional Well-Being (Section SM) of Book 3b of the first wave of the Mexican Family Life Survey.

The MxFLS asked the following questions "related to how [the respondent has] emotionally felt during the last 4 weeks."

SM01. In the last 4 weeks, have you felt sad or anguished?
SM02. In the last 4 weeks, have you cried or felt like crying?
SM03. In the last 4 weeks, have you badly slept at night?
SM04. In the last 4 weeks, have you woken up spiritless (due to lack of energy or fear)?
SM05. In the last 4 weeks, have you had difficulties to focus on your daily activities?
SM06. In the last 4 weeks, has your appetite diminished?
SM07. In the last 4 weeks, have you felt obsessive, or constantly repetitive (for example: with straight ideas you cannot remove from your mind, or with actions that you constantly repeat)?
SM08. In the last 4 weeks, has your sexual interest decreased?
SM09. In the last 4 weeks, do you consider you had less performance in
SM10. In the last 4 weeks, have you felt pressure in the chest?
SM11. In the last 4 weeks, have you felt nervous, sorrowful, anxious, or eager more than normal?
SM12. In the last 4 weeks, have you felt more tired, or discouraged out more than normal?
SM13. In the last 4 weeks, have you felt pessimist, or have you thought things will go wrong?
SM14. In the last 4 weeks, have you frequently had a headache, or felt pain in the nape?
SM15. In the 4 weeks, have you felt more irritated, or more angry than normal?
SM16. In the last 4 weeks, have you felt insecure, or lacking confidence in yourself?
SM17. In the last 4 weeks, have you felt useless to your family?
SM18. In the last 4 weeks, have you felt fear of some things, as if you were waiting for something serious to happen?
SM19. In the last 4 weeks, have you wished to die?
SM20. In the last 4 weeks, have you lost interest on things?
SM21. In the last 4 weeks, have you felt lonely?

Response options and values for questions SM01-SM07, SM09-SM21 were as follows:

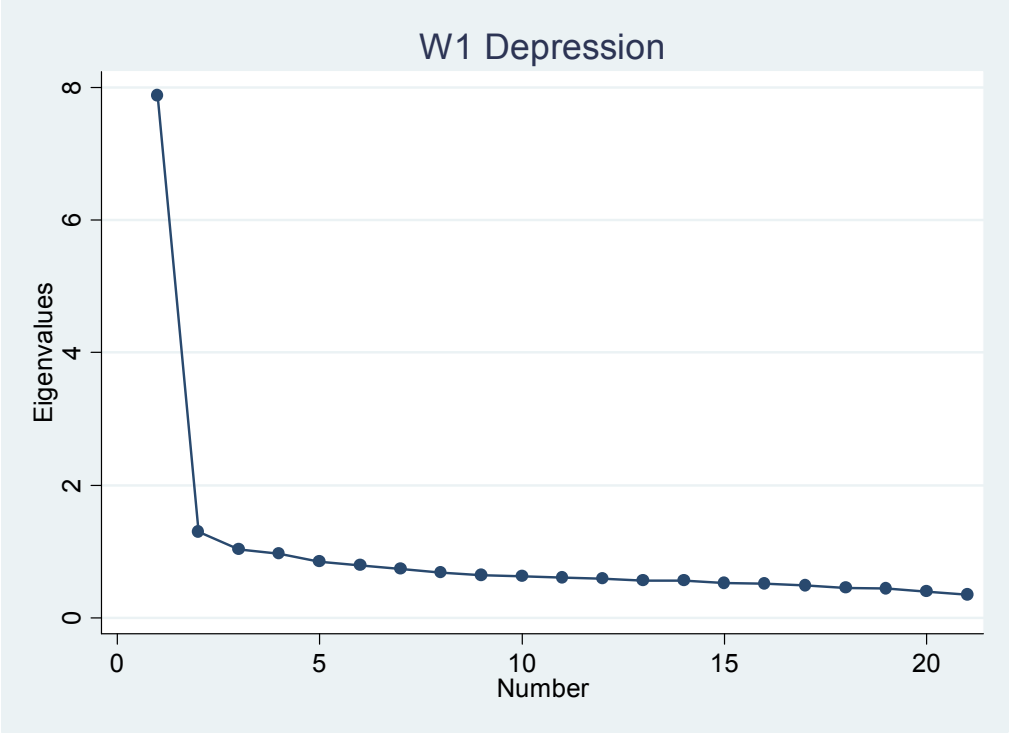
Response Option	Value
1. Yes, sometimes	1
2. Yes, a lot of times	2
3. Yes, all the time	3
4. No	4

Response options and values for item SM08 were as follows:

Response Option	Value
1. Yes, a little	1
2. Yes, some	2
3. Yes, a lot	3
4. No	4
5. Didn't want to answer	5

In coding for the principal components, questions SM01-SM07 and SM09-SM21 were recoded 4 (No) to the value of 1, and the other responses were taken as their values + 1. For item SM08, response option 5 (Didn't want to answer) was recoded to missing, and, as in the other questions, 4 was recoded to 1, 1 to 2, 2 to 3, and 3 to 4.

The Scree plot below gives strong evidence that the information in the battery of the MxFLS emotional health questions can be satisfactorily distilled to a single component. The eigenvalue for the first component is significantly higher than that of all the others, which form a fairly flat, straight line following the kink.



The table below for the entire MxFLS sample indicates that the first component accounts for 37.5% of the variation in the 21 emotional health items. The next orthogonal component only explains 6.2% more of the variation, and the marginal share explained decreases at a fairly uniform rate from there.

```
Principal components/correlation                  Number of comp.  =         1
                                                  Trace            =        21
    Rotation: (unrotated = principal)             Rho              =    0.3751

    ------------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+----------------------------------------------------------------
           Comp1 |      7.87794      6.57593             0.3751       0.3751
           Comp2 |      1.30201       .27044             0.0620       0.4371
           Comp3 |      1.03157     .0615765             0.0491       0.4863
           Comp4 |      .969993      .120312             0.0462       0.5325
           Comp5 |      .849682     .0598117             0.0405       0.5729
           Comp6 |       .78987     .0569503             0.0376       0.6105
           Comp7 |      .732919     .0480921             0.0349       0.6454
           Comp8 |      .684827     .0376946             0.0326       0.6780
           Comp9 |      .647133     .0181621             0.0308       0.7089
          Comp10 |      .628971     .0195827             0.0300       0.7388
          Comp11 |      .609388     .0236431             0.0290       0.7678
          Comp12 |      .585745     .0220382             0.0279       0.7957
          Comp13 |      .563707    .00451683             0.0268       0.8226
          Comp14 |       .55919     .0377208             0.0266       0.8492
          Comp15 |      .521469    .00535001             0.0248       0.8740
          Comp16 |      .516119     .0262395             0.0246       0.8986
          Comp17 |       .48988     .0401062             0.0233       0.9219
          Comp18 |      .449773    .00555691             0.0214       0.9433
          Comp19 |      .444216     .0525652             0.0212       0.9645
          Comp20 |      .391651      .037709             0.0187       0.9831
          Comp21 |      .353942            .             0.0169       1.0000
    ------------------------------------------------------------------------------
```

Appendix 2: Robustness Checks for Full Specification

The state fixed effects are the preferred specification of the designers of the MxFLS in Rubalcava et al. (2008), and they use corresponding clustering for standard errors. Appendix Table 2.1 shows the cognition and emotional health coefficients for the full specification, substituting municipality fixed effects for state fixed effects. The results are qualitatively similar to those in Table 5, with the exception of the cognition result for urban males which now has an odds ratio slightly greater than 1 where it was slightly below 1 previously. Also, the rural male cognition result is no longer statistically significant even at the 10% level.

Appendix Table 2.1: Municipality Conditional Fixed Effects, Full Specification

	Gender & Locality as Covariates	Rural Males	Urban Males	Rural Females	Urban Females
Depression	1.05	1.13	0.90	1.14	1.09
	(0.07)	(0.15)	(0.13)	(0.11)	(0.19)
Cognition	0.96	0.65	1.04	2.33	0.68
	(0.24)	(0.32)	(0.58)	(1.38)	(0.57)
Observations	6791	1072	1492	1115	1785

*** p<0.01, * p<0.05, + p<0.1; (Robust eform standard errors in parentheses)*

I re-ran the regressions in this paper exhibiting a statistically significant result using both municipal fixed effects and standard errors clustered at the municipal level to observe whether these changes have an effect on statistical significance and the overall results of the paper. Most of the statistically significant results reported throughout the paper do not change. Where there is a change, the pattern is often a downgrade of one notch in statistical significance level.

For example, the results in Table 8 on emotional health for 15-18 year-old rural males exhibits those in the first and fifth quintiles moving from being significant at the 1% level to being just outside that cutoff with p-values of 0.028 and 0.012, respectively. The second quintile illustrates similar results as before with a p-value of 0.015.

The cognition results for 15-18 year-old rural males in Table 10 change only slightly more. The result for the first quintile moves from significance at the 1% to the 10% level, though the second and fourth quintile results remain significant at the 1% and 10% levels, respectively. The fifth quintile result moves from significance at the 1% level to just outside that mark with a p-value of 0.016. The somewhat anomalous rural female result in the 4th quintile of the same table moves from significance at the 5% level to the 10% level.

The only statistically significant results which do change in a marked way are the depression results for rural female found in Table 8. Where the fourth and fifth quintiles were significant at the 5% and 10% levels, respectively, clustering standard errors at the municipal level drops both of those results to below the 10% threshold.

Appendix 3: Bin Sizes

Rural 15-18 year-old Females by Baseline Emotional Health Quintile and Subsequent Migration Status

W1 emotion Hlth qnt1	w2 Migrate to USA 0	1	Total
0	1,132	50	1,182
1	178	5	183
Total	1,310	55	1,365

W1 emotion Hlth qnt2	w2 Migrate to USA 0	1	Total
0	1,079	47	1,126
1	231	8	239
Total	1,310	55	1,365

W1 emotion Hlth qnt3	w2 Migrate to USA 0	1	Total
0	1,049	47	1,096
1	261	8	269
Total	1,310	55	1,365

W1 emotion Hlth qnt4	w2 Migrate to USA 0	1	Total
0	1,015	40	1,055
1	295	15	310
Total	1,310	55	1,365

W1 emotion Hlth qnt5	w2 Migrate to USA 0	1	Total
0	966	36	1,002
1	344	19	363
Total	1,310	55	1,365

While there are more women overall in the higher quintiles of the emotional health index (indicating worse emotional health), a higher proportion of these are migrants. This is not driven by small cell size.

Appendix 4: Correlates of Mental Health

Regression for potential Mental Health correlates for the Young (15-18 year-old), Rural Female sample (migrants and non-migrants):

```
Linear regression                                      Number of obs =     608
                                                       F(  5,    55) =    1.04
                                                       Prob > F      =  0.4041
                                                       R-squared     =  0.0068
                                                       Root MSE      =  2.6099

                        (Std. Err. adjusted for 56 clusters in w1 municipality)
------------------------------------------------------------------------------
             |               Robust
Mental Hlth  |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
W1 Cognition |   .6219737   .4466789     1.39   0.169    -.2731907    1.517138
       W1 Age|   .0431551   .1129176     0.38   0.704    -.1831369    .2694471
 W1 Yrs Educ |  -.0015529   .0487322    -0.03   0.975    -.0992144    .0961086
  W1 Married |   -.287714   .3165524    -0.91   0.367    -.9220992    .3466713
W1 Live House|   .3240708   .2729162     1.19   0.240    -.2228654     .871007
       _cons |  -.8941148   1.826839    -0.49   0.626    -4.555182    2.766953
------------------------------------------------------------------------------
```

Regression results for potential mental health correlates for the young (15-18 year-old) rural female sample which eventually migrates:

```
Linear regression                                      Number of obs =      37
                                                       F(  5,    19) =    0.77
                                                       Prob > F      =  0.5850
                                                       R-squared     =  0.0492
                                                       Root MSE      =  2.7914

                        (Std. Err. adjusted for 20 clusters in w1 municipality)
------------------------------------------------------------------------------
             |               Robust
Mental Hlth  |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
W1 Cognition |  -2.376813   1.647678    -1.44   0.165    -5.825443    1.071817
      W1 Age |  -.0115606   .4397491    -0.03   0.979     -.931966    .9088449
 W1 Yrs Educ |  -.0265981   .2179759    -0.12   0.904     -.482827    .4296308
  W1 Married |  -.0448191   1.822672    -0.02   0.981    -3.859716    3.770077
W1 Live House|   .5176739   .8230369     0.63   0.537    -1.204962     2.24031
       _cons |    2.61931   6.803491     0.38   0.705    -11.62056    16.85918
------------------------------------------------------------------------------
```

Qatar's Labor Markets at a Crucial Crossroad[13]

[13] A previous version of this paper was entitled "A Brief Introduction to Qatar's Labor Markets". This document has not been subject to formal review by the RAND Corporation. The opinions and conclusions are solely those of the authors and do not necessarily represent the opinions or policy of the RAND Corporation or its research clients and sponsors.

Claude Berrebi[14], Francisco Martorell[15], and Jeffery C. Tanner[16]

RAND

Abstract

With the discovery of large quantities of liquefied natural gas, the Qatari economy has experienced sustained economic growth. Similar to what has occurred in other Gulf States, a consequence of this economic boom is that the level of demand for skilled and unskilled labor far outstrips that which Qatari nationals can provide. As a result, Qatar has imported foreign laborers to the point where foreigners outnumber Qataris by more than 6.75 to 1. Moreover, the structure of the labor market – in particular, the system of generous and near-guaranteed public sector employment – diminishes incentives for young Qataris to acquire valuable skills and to work in private sector employment. The reliance on foreign laborers and the lack of skilled Qatari workers is widely seen by Qatar's leaders as a serious threat to the nation's economic autonomy and long-run economic viability. Thus a key challenge facing policymakers is to devise policies and reforms that will encourage the development of a domestic workforce with the skills and incentives to work in the economy's most important and competitive positions. Drawing on publicly available data sources, this paper provides a detailed quantitative assessment of the economic and demographic situation that underlies the current challenges, and discusses several policy options that might be used to help overcome them.

[14] RAND Corporation, Santa Monica, California. E-mail: Claude_Berrebi@rand.org; http://www.rand.org/about/people/b/berrebi_claude.html
[15] RAND Corporation, Santa Monica, California. E-mail: Francisco_Martorell@rand.org; http://www.rand.org/about/people/m/martorell_paco.html
[16] RAND Corporation, Santa Monica, California. E-mail: jtanner@rand.org;

Introduction

With the recent development of its natural resources, Qatar has seen a sharp growth in per capita income from less than USD15,000 between the mid 1980's to mid 1990's to more than USD30,000 a decade later, making Qataris currently among the world's wealthiest citizens (IMF, May 2007)[17]. Yet this newfound prosperity has not come without potential problems. As in other Gulf State Countries, the labor market is dominated by expatriate labor, and domestic labor works almost exclusively in public sector jobs. Qatari policymakers have recently expressed concern that the nation is not developing a workforce capable of competing in the global marketplace (*The Peninsula*, 2006)[18]. Support for this view can be seen in the composition of Qatar's labor market. Private and Mixed firms are dominated by expatriate workers while the vast majority of Qataris work in public sector jobs. Moreover, the economy is heavily dependant on revenue from natural resource extraction (notably natural gas and oil). The dependency on both foreign workers and natural resource sales leave the economy somewhat vulnerable (Fasano and Iqbal, 2003).

We use data from the 2004 Census as well as secondary sources to explore the key issues facing Qatar's labor market. We begin by providing some background on the political history and governance structures of Qatar, its recent economic growth, and domestic labor's capacity to participate in that growth. We then describe the problems associated with the demand for labor outstripping the domestic supply. Next we detail the market response to the lack of qualified Qataris of importing foreign labor. Here we document the rapid population growth driven by an influx of migrant workers. At the heart of the paper is a descriptive analysis of the current state of Qatar's labor market. As the civil service employs the vast majority of the Qatari labor force, we provide a detailed description of the incentives surrounding such a career choice. Finally, we report on the reactions from Qatari nationals and the national government's response policies of improving education and a quota system to ensure Qatari's are hired beyond the civil service. We conclude with our assessment that while the future is challenging, there is reason for cautious optimism.

Background: Governance, Economy, and Labor Force Preparedness

Governance

The state of Qatar sits on a small peninsula extending from Saudi Arabia into the Southern Persian Gulf. After playing a central role in the peninsula's politics since the mid 19th Century, the Al Thani family installed one of its own, His Highness Sheikh Khalifa Bin Hamad, as the head of state following Qatar's independence from Britain in 1971 and established an emirate governance structure. Following a short period of economic growth in the late 1970's as the country internalized gains from its petroleum resources, the economy retrograded and then stagnated through the mid 1990's as oil prices sagged. In 1995 the emir's son came to power, His Highness Sheikh Hamad Bin Khalifa al Thani. Since that time the economy has grown rapidly and the nation's wealth has been reinvested into social programs including universal education

[17] Based on constant dollars, using the 2000 nominal exchange rate. Authors' calculations using data from the International Monetary Fund's *International Financial Statistics, May 2007*.

[18] The analysis along this paper reflect the Qatari state of affairs at the end of 2006, at the time we completed our information and data gathering process. Naturally, due to the continuous changes advanced by Qatari policy makers, some of the practices described might no longer be actively used by the time of publication.

and health systems. Political liberalization has made similar strides as the emir has introduced the foundations for a new Constitution with plans for establishing a parliament with a majority of democratically elected representatives, and extending voting the franchise to women[19].

Economy

Qatar is one of the world's wealthiest countries. The economy grew at a very rapid average annual rate of nearly 8 percent between 2000 and 2005 (IMF, August 2007)[20]. According to the International Monetary Fund (2006), Qatar's per capita GDP is over USD30,000 – placing it squarely in the world's top five percent alongside the leading industrialized countries[21]. But since unskilled migrant labor makes up much of Qatar's population, the per capita income of Qatari nationals is surely much higher than that figure would suggest. This wealth derives from abundant oil and natural gas reserves. Known oil reserves are sufficient to continue current output levels for another 23 years, and its natural gas reserves constitute 5 percent of the global total and are the third largest in the world (CIA, 2005).

Table 1 shows the relative importance of different industries to Qatar's economy. Significantly, the dominant industry is mining and quarrying at about 55 percent of the economy's total output, demonstrating Qatar's reliance on natural gas and oil production. Government services are the second largest sector, making up 14 percent of all production. No other industry's share is larger than 10 percent.

Table 1: Industry Share of GDP (Planning Council of the State of Qatar, 2002 and 2004)

	1999	**2000**	**2001**	**2002**	**2003**
Agriculture and Fishing	0.005	0.004	0.004	0.003	0.003
Mining and Quarrying	0.570	0.591	0.570	0.569	0.546
Manufacturing	0.066	0.056	0.061	0.065	0.070
Electricity and Water	0.013	0.013	0.015	0.014	0.015
Building and Construction	0.040	0.038	0.045	0.047	0.057
Trade,Restaurants & Hotels	0.061	0.062	0.061	0.056	0.058
Transport and Communications	0.029	0.030	0.034	0.040	0.040
Finance, Insurance, Real Estate, Business Services, net of Imputed bank Service Charges	0.056	0.055	0.055	0.052	0.047
Social Services	0.012	0.010	0.009	0.009	0.009
Government Services	0.132	0.128	0.131	0.131	0.140
Household Services	0.009	0.009	0.008	0.008	0.008
Import duties	0.006	0.005	0.006	0.007	0.007

Qatari officials recognize that the dependence on hydrocarbon production leaves the economy vulnerable to fluctuations in the price of oil and natural gas (IMF, 2003). Interest in economic diversification has motivated extensive investments in domestic educational opportunities and industrial diversification. Qatar has subsidized the establishment of local

[19] While at the time of this writing the new constitution has yet to be formally instituted many of its guiding principles are already implemented.

[20] This phenomenal growth rate is more than double the global average of 2.8-2.9% over the same period. (World Bank, 2006)

[21] See table 4 below for an international comparison of GDP per capita.

branch campuses of leading Western universities[22] (Stasz et al., 2006). Additionally, the country has made efforts to develop non-petroleum industries. For example, the Qatar Steel Company was formed in 1974 as a partnership with two Japanese steel companies (Nafi, 1983). In addition, the government has encouraged and subsidized investment in non-petroleum areas such as medical services, tourism and construction (MEEPAS, 2005).

Still, the most successful initiatives have been the development of an industrial infrastructure focused on the production and export of petrochemicals and liquefied natural gas (Energy Information Administration, 2005). Qatar's private sector is vibrant and highly advanced in several sectors. The Qatar Financial Centre was established by the state in 2005 to develop an overarching commercial strategy for Qatar and to develop relations with the global financial community to attract international financial institutions and multi-national corporations with the goal of making Qatar the "financial center of choice in the Middle East" (Qatar Financial Centre, 2007). The nation is also seeking to build an "Energy City" to be the regional business center for energy commodities in the Gulf and the world's most advanced business center of its kind (Energy City, 2007).

The nation's hydrocarbon wealth is distributed to the public in the form of a generous welfare system. Education and health care are made available to all Qatari citizens (Stasz et al., 2006). Employment in government sector jobs is another important mechanism for spreading wealth (discussed below). While there is reluctance to share wealth with non-Qataris, the government does pay for many basic living expenses for all the country's residents. Taxes are low and the government heavily subsidizes water, electricity and other services enjoyed by all residents (IMF, 2003).

Education

Prior to the discovery of oil and the subsequent economic boom that transformed Qatar into one of the wealthiest countries in the world, few opportunities for formal education existed. As late as the 1970 Census, more than two-thirds of the population older than 15 years was illiterate (Winckler, 2000). During the 1970's, the country's leaders began making large investments in the educational infrastructure of the country. Government funded-education was made available to all Qataris as well as to some children of foreign-born parents (Stasz et al., 2006). In 1977 Qatar University was opened to provide a local tuition-free option for Qataris interested in pursuing higher education. Unfortunately declining oil revenues and declining budget shares decreased reinvestment of the nation's resources back into the country's economy and social programs.

After the flagging performance through the 1980's and mid 90's, the current government has made significant investments in the country's education system. These investments have led to important improvements in education levels. Currently, near-universal literacy persists among young Qataris.[23]

[22] These institutions include Carnegie Mellon University, CHN University of the Netherlands, Georgetown University, Texas A & M (offering undergraduate degrees in petroleum, chemical, and mechanical engineering), the Virginia Commonwealth University of the Arts, and the Weill Cornell Medical College, The College of the North Atlantic also has a campus offering two-year Associates degrees.

[23] According to Census figures available from the Planning Council's website, the literacy rate among 15-19 year old Qataris is 98.9 percent.

However, important disparities in levels of educational attainment exist between men and women and between the old and the young. Census data shows that 31 percent of Qatari women have post-secondary schooling while only 27 percent of Qatari men do.

Table 2: Educational Attainment by Gender and Nationality (2004 Census)

	More than a Secondary school diploma	Hold a Secondary school diploma	Does not hold a Secondary school diploma
Qatari Men	0.27	0.23	0.50
Qatari Females	0.31	0.24	0.45
All Qataris	0.29	0.24	0.48

The aggregate figures in Table 2 mask important changes over time. These can be analyzed by examining the distribution of educational attainment across different age groups reported in Table 3.[24] Compared to older cohorts who came of age when fewer educational opportunities existed, younger cohorts have completed considerably more schooling. For instance, less than 10 percent of people older than age 60 have at least a secondary degree while 66 percent of 25-29 year olds do. The relative education levels of men and women have also changed over time. Older Qatari men are better educated than older Qatari women, but this pattern reverses among those younger than 40. And while the educational attainment (measured by the fraction with at least a secondary degree) of successive cohorts of Qatari women has steadily improved, it is not clear that it has for men for cohorts younger than 50 years of age. Thus, women drive most of the recent improvement in Qatari educational levels.

Table 3: Educational Attainment by Age and Gender, Qataris Age 25+ (2004 Census)

	All			Men			Women		
	More than Secondary	Secondary degree	No Secondary degree	More than Secondary	Secondary degree	No Secondary degree	More than Secondary	Secondary degree	No Secondary degree
25 - 29	0.36	0.29	0.34	0.26	0.30	0.43	0.46	0.29	0.26
30 - 34	0.44	0.21	0.36	0.38	0.21	0.41	0.50	0.20	0.30
35 - 39	0.42	0.18	0.40	0.38	0.19	0.44	0.46	0.17	0.38
40 - 44	0.41	0.15	0.44	0.42	0.17	0.41	0.39	0.13	0.47
45 - 49	0.34	0.12	0.54	0.40	0.14	0.45	0.28	0.10	0.62
50 - 54	0.23	0.10	0.67	0.36	0.15	0.49	0.10	0.06	0.84
55 - 59	0.11	0.07	0.82	0.20	0.12	0.68	0.03	0.03	0.94
60 - 64	0.05	0.04	0.90	0.09	0.08	0.83	0.02	0.01	0.97
65 - 69	0.03	0.03	0.94	0.05	0.05	0.90	0.01	0.01	0.99
70 - 74	0.02	0.02	0.96	0.03	0.03	0.93	0.01	0.00	0.99
75 +	0.02	0.01	0.98	0.02	0.01	0.97	0.01	0.00	0.99

Clearly literacy is a necessary condition for successful participation in a global economy. Similarly, a country hoping to prepare its children to compete with the most dynamic economies in the world may be expected to need to spend an amount on per-pupil education commensurate

[24] Figures are reported for those ages 25 and older to focus on completed schooling levels.

with those dynamic economies. Table 4 reveals that although the Qatari literacy rate[25] of 89% is superior to the regional average of 85.4%, it is still significantly behind other countries outside the region with similar per capita income.

Table 4: International comparisons: literacy rates, GDP per capita and per-pupil expenditure (PPE) as % of GDP per capita

Country	Literacy rate (2003 est.)*	GDP per capita (PPP in USD, 2004)**	PPE as % of GDP per capita[26]
Intra-regional comparison			
Qatar	89.0	30,566	10
Bahrain	89.1	18,576	18
Iran	79.4	7,488	12
Israel	95.4	22,388	23
Jordan	91.3	4,609	15
Kuwait	83.5	16,038	16
Lebanon	87.4	6,601	n.a.
Oman	75.8	16,162	15
United Arab Emirates	77.9	27,799	7
Extra-regional comparison			
Australia	99.0	29,859	17
Austria	98.0	32,232	24
Finland	100.0	29,952	18
France	99.0	28,288	18
Germany	99.0	29,581	17
Japan	99.0	29,288	22
Netherlands	99.0	29,957	18
New Zealand	99.0	23,794	19
Sweden	99.0	28,524	23
Switzerland	99.0	31,583	24
United States	99.0	39,377	21

** The CIA World Factbook 2006*

*** International Monetary Fund, World Economic Outlook Database April 2006*

[25] Defined as the share of the population, age 15 and older, who can read and write (2003 estimates).

[26] Qatar data is based on PPP GDP per capita in 2004 USD from the International Monetary Fund, World Economic Outlook Database April 2006, Qatar per pupil expenditure (for school year 2004-2005) is PPP USD3180.063. The 2004 PPP conversion rate used is 4.416QAR/1USD. All other PPE as % of GDP per capita data is from 2002, from the UNESCO Global Education Digest 2005: Comparing education statistics across the world. For Japan and the US, data is from 2001, reported in the UNESCO Global Education Digest 2004.

While lower literacy rates can be partially explained through age—older cohorts did not have the benefit of current education spending and economic strength— Qatar's current per pupil expenditure as percent of GDP per capita is still relatively low. Countries with similar GDP per capita levels invest on average twice as much on their students (See Table 4). This suggests that Qataris will join the labor market with less preparation than their counterparts from other countries.

Problem: Not enough qualified Qataris to lead the nation's industries.

In such a dynamic economy with such high literacy and education rates it would be surprising to find any sizeable unemployment. Yet women provide just over a third of the Qatari labor force and unemployment, especially among women and first-time job seekers, is pronounced (2004 Census). Using data from the 2001 Labor Force Survey, Table 5 shows the unemployment rate among Qataris to be about 12 percent—50% higher than France and far higher than any country with a comparable level of per capita income (CIA, 2006). However, over 22 percent of females are unemployed, while male unemployment is only 7 percent. This three-fold difference in female unemployment over male unemployment may elucidate the reason for such a high proportion of women choosing not to participate in the labor force at all. Alternately, the high unemployment and non-participation rates could jointly be reflective of a labor market not amenable to the working preferences of Qatari women including a high reservation wage, social norms, and preferences for a gender-segregated work environment.

Unemployment is concentrated among those seeking work for the first time; the unemployment rate conditional on being previously employed is only 1 percent. These figures suggest that some Qataris, especially women, have difficulty finding work upon first entering the labor force. However, after securing a first job, unemployment is exceedingly rare.

Table 5: Unemployment Rate (UR) Among Qataris (2001 Labor Force Survey)

	UR - 1st Time Job Seekers Only	UR - Previously Employed Only	**Total UR**
Males	5.9%	1.3%	**7.2%**
Females	21.7%	0.4%	**22.0%**
Total	**10.6%**	**1.0%**	**11.6%**

Two main factors contribute to the high concentration of unemployment among those looking for jobs for the first time. First, the waiting queue for government jobs is relatively long. Second, Qataris tend to lack the educational and professional training required to obtain jobs outside the government, making public positions the only employment possibility for the vast majority of Qataris. Thus, once Qataris obtain a public service position, they rarely leave—likely because they would be unsuccessful finding a job anywhere else. Those Qataris who do hold a secondary or tertiary degree often chose fields of study of limited value in the broader labor market. While employers are interested in individuals with English proficiency, computer skills, engineering degrees, finance, accounting or marketing and public relations training (Stasz , Eide, and Martorell, 2006), most Qataris graduating from Qatar University (QU) majored in the liberal arts with a humanities or religious studies degree[27]. Even more concerning is the fact that many

[27] Data, obtained from Qatar University's Office of Institutional Research and Planning: Student Information System DataBase on 2004/05 graduates, revealed that less than 6% of Qatari students graduated with an engineering degrees

Qatari males are not pursuing tertiary degrees and enter the labor force directly upon the completion of their secondary education. Indeed, Qataris with a tertiary education are far more likely to be females (55%) than males (45%). Other research has also shown that among secondary school graduates in 2004/05 only a third chose their secondary school major in a science field while the remaining two thirds chose a literature field (Gonzalez et al, 2007).

It is apparent, then, that in spite of the improvements in education, there are still too few Qataris who are both qualified and willing to work in the country's private industries as evidenced by the high levels of unemployment and long waiting time for government posts. Qataris are either insufficiently skilled to be hired by the private sector or would prefer work for government. We argue that a combination of both factors are at play.

Economic Response to Shortfall of Skilled Qataris: Import Labor

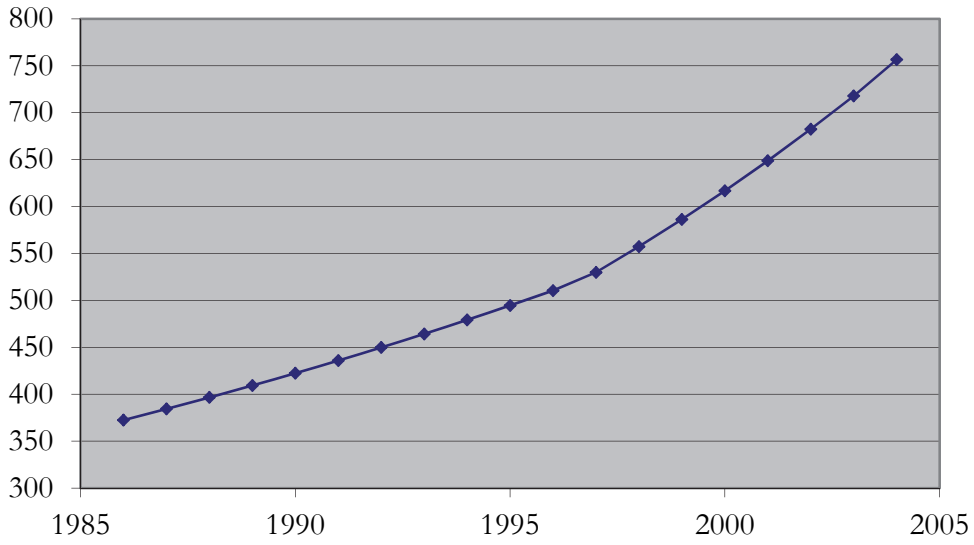
Where the domestic labor supply is insufficient to meet demand, Qatar's economy has responded by importing foreign labor. This response has drastically altered the country's demography and labor market.

Demographic Response

Examining Qatar's demographic trends can be characterized by three striking patterns: rapid population growth, population growth fueled by migrant workers, and a severe gender imbalance. First, although the population is small – just under 750,000 at the time of the 2004 Census – it has grown very quickly in the recent past. Figure 1 shows Qatar's population level from 1986 to 2004. In that relatively short period, the population has more than doubled. The implied annual population growth rate of just over 4 percent in 2005 was the highest in the world (CIA World Factbook, 2005). This rapid population growth mirrors the economic boom Qatar, and the other Gulf States, have experienced. Projections made by the U.S. Census Bureau suggest Qatar's population will continue to grow rapidly. In 2020, the population is expected to exceed 1.1 million people.

compared with 8% who graduated with a degree in Sharia or Islamic studies. Similarly while over 12% of Qataris graduates majored in geography, history or Arabic language, only 2% majored in mathematics or statistics, and none majored in computing, construction or information technology.

Figure 1: Qatar's Population from 1986 to 2004 (in Thousands)



As suggested previously, the country's astounding population growth is predominantly attributable to immigration. This fact is underscored when considering that in contrast to its overall population growth rate, Qatar's birth rate is in the bottom quarter globally. As shown in Table 6, among individuals age 15 and over, more than four-fifths of the population residing within Qatar's borders is not Qatari-born. Most non-Qataris are migrants drawn to the employment opportunities afforded in Qatar. These immigrants come from all over the world, but mainly come from much poorer Asian countries that do not offer Qatar's economic opportunities. Indians constitute the largest expatriate group, followed by Pakistanis, Filipinos and Bangladeshis (Rouag, 1998).

Table 6: Population (Age 15 and Over) by Nationality (2004 Census)

	Males	Females	**Total**
Qatari	54,482	55,923	**110,405**
	13.2%	33.9%	**19.2%**
Non-Qatari	356,734	109,272	**466,006**
	86.8%	66.1%	**80.8%**
All Nationalities	**411,216**	**165,195**	**576,411**
	71.3%	**28.7%**	**100.0%**

We examine these numbers further to observe the relation to the labor force by nationality as well as a subdivision by gender in Table 7. Here we see that labor force participation (LFP) rates are higher among non-Qataris than Qataris. 84 percent of non-Qataris age 15 and over are in the labor force compared to less than half of similarly-aged Qataris. These discrepancies are not surprising considering that most non-Qataris go to Qatar for the employment opportunities and most foreigners require sponsorship from a Qatari employer in

order to enter the country. Part of the difference in LFP rates is due to the fact that Qataris who are older than 15 year of age are much more likely to be students than are non-Qataris (22 percent compared to 5 percent).

Table 7: Relation to Labor Force by Nationality and Gender (Age 15+), 2004 Census

		In LF	Student	Neither
Qataris	Male	0.68	0.20	0.12
	Female	0.29	0.24	0.48
	Total	0.48	0.22	0.30
Non Qataris	Male	0.95	0.04	0.01
	Female	0.47	0.11	0.42
	Total	0.84	0.05	0.11
Total	**Male**	**0.92**	**0.06**	**0.02**
	Female	**0.41**	**0.15**	**0.44**
	Total	**0.77**	**0.09**	**0.14**

The third important fact regarding Qatar's population is that men substantially outnumber women: among individuals age 15 and over, men make up a little more than 70 percent of the population. The gender imbalance is not surprising as the bulk of Qatar's population is comprised of migrant workers who, as in other countries, tend to be male and come alone. Anecdotal evidence suggests that this saturation of Qatar's labor market with single men is attributable to demographic, economic, and governance features. First, most male migrants are relatively young and so are unmarried. Furthermore, the wages of a non-Qatari, though presumably better than the alternative in the guest worker's home country, are often insufficient to cover the costs of moving the spouse and family for a married expatriate. Finally, though foreign workers are allowed to bring their families with them into the country, employers have a disincentive to hire workers who may do so as the employer then also becomes sponsor and liable for the worker's family.[28] Qatari sponsorship in immigration legislation reinforces selection bias of immigrants towards migrant workers as opposed to persons migrating for other reasons. Though the resultant gender imbalance in the country is not surprising with nearly 77% of all non-Qataris being male, the overwhelming numbers of non-Qataris to Qataris makes the gender skew of the general population quite severe: Qataris comprise just 13% of the male population and Qatari females in the labor force are outnumber by non-Qatari males by more than 22:1 (2004 Census).

Among Qataris, on the other hand, no such gender imbalance exists, with approximate parity between the number of men and women. However, labor force participation rates are much lower for women, especially among Qataris. As seen in Table 7, Only 29 percent of female Qataris are in the labor force as opposed to 68 percent of men, and almost half of Qatari women are neither students nor in the labor force. Yet Qatari women – especially among the young – are better educated than men. This disconnect between education levels and labor force participation is partially attributable to Qatar's cultural norms. Indeed, despite some recent social changes, men and women have different economic and educational opportunities. For instance,

[28] For further information on Qatar visa protocols, see http://www.explore-qatar.com/living.php?s=1.

at Qatar University, some majors are only available to men or to women (Stasz et al., 2006).[29] Furthermore, many Qatari women are reluctant to work in jobs that require them to spend long hours at work and away from their families or that involve working in a mixed-gender environment (Stasz et al., 2006). As a result, the subgroup of the Qatari population most able to immediately fill positions of skilled labor and leadership in the private sector, women, is unable to do so.

Qatar's Labor Market

Economic growth, Domestic education levels, and immigration play important roles in shaping the current labor market situation in Qatar. Where the domestic labor supply has been insufficient to fuel Qatar's strong economic growth, the economy has imported astounding numbers of foreign workers. The level of labor demand combined with the lack of skills and incentives to be employed by the private sector has resulted in a distorted, even segregated labor market.

Qataris and non-Qataris essentially work in separate labor markets. Table 8 shows the distribution of the economically active population across different economic sectors by nationality and gender. Most (61 percent) members of the workforce work for private sector employers, but this is because 70 percent of non-Qataris, who represent 80 percent of Qatar's total workforce, work in the private sector. By contrast, only 4% of Qataris work in the pure private sector. Furthermore, only 0.75% of private labor is supplied by Qataris (2004 Census). Similarly, foreign women seem to be concentrated in the household sector, yet this reflects the large number of foreign women who come to Qatar and work as domestic servants. The share of Qatari women earning a wage in the household sector is near zero. Three-quarters of the Qatari labor force works in government administration in spite of the fact that this sector employs only 18 percent of the total workforce. An even larger share of Qatari women (85 percent) works in government administration, which is partly due to the fact that more than half of Qatari women work in education. The importance of government-related employment becomes even more striking when including jobs in "government establishments" (firms such as Qatar Petroleum that are owned by the government), and "mixed" sector employers (firms that are partially owned by the government, such as Qatar Airways, 50 percent of which is owned by the government and 50 percent of which is publicly owned).

Table 8: Distribution of Economically Active Population Across Economic Sectors (2004 Census)

	All			Qataris			Non-Qataris		
	All	Men	Women	All	Men	Women	All	Men	Women
Household	0.12	0.06	0.46	0.00	0.00	0.00	0.14	0.07	0.60
Private	0.61	0.69	0.15	0.04	0.05	0.02	0.69	0.76	0.18
Mixed	0.03	0.03	0.03	0.05	0.06	0.02	0.03	0.03	0.03
Government Establishment	0.06	0.05	0.08	0.13	0.15	0.10	0.05	0.04	0.07
Government Adm.	0.18	0.16	0.29	0.77	0.74	0.85	0.10	0.10	0.12

Among Qataris, skill level is an important determining factor in the labor market. Table 9 shows the distribution of the Qatari workforce across economic sectors by level of education. While all Qataris of all educational levels tend to work in government administration, this is especially true for individuals with the most and the least

[29] For example, Qatar University offers Bachelor of Science degrees in Agricultural Science, Geology, and the double major of Geography and Urban Policy exclusively to men. Conversely, only women may pursue degrees in Biomedical Science or Food Science and Nutrition.

education. The prevalence of highly educated women working for the government again reflects the fact that more than half of all economically active women work in education. Those with low levels of schooling, on the other hand, often work for the police and the military and are therefore included among government workers.

Table 9: Distribution of Qatari Workforce by Education and Economic Sector (2004 Census)

	More than Secondary	Some Secondary	No Secondary
Men			
Government Administration[30]	0.70	0.67	0.81
Government Est. Company	0.15	0.20	0.11
Mixed	0.08	0.08	0.04
Private	0.06	0.05	0.04
Household	0.00	0.00	0.00
Women			
Government Administration[10]	0.90	0.65	0.83
Government Est. Company	0.07	0.24	0.12
Mixed	0.01	0.06	0.02
Private	0.01	0.04	0.02
Household	0.00	0.00	0.01
Total			
Government Administration[10]	**0.80**	**0.66**	**0.81**
Government Est. Company	**0.11**	**0.21**	**0.11**
Mixed	**0.05**	**0.08**	**0.03**
Private & Household	**0.04**	**0.05**	**0.04**

As has been mentioned, female Qataris seem to possess a better skill set than do Qatari males. This view is supported by Table 10, which illustrates the tendency among Qatari women who are in the labor force to congregate in occupations that require more education in the government sector. Of those high-skilled government occupations held by Qataris, 58% are held by female Qataris. This high female representation is particularly poignant when considering that 73% of the Qatari labor force is male and almost all Qataris work for the government.

[30] Includes Diplomatic International and Regional

Table 10: Share of males and females engaged in the government sector by type of occupation (2004 Census)

	Qatari Male	Qatari Female
Legislators, Senior Officials & Managers	0.64	0.36
High Skilled Occupations[31]	0.42	0.58
Medium and Low Skilled Occupations[32]	0.60	0.40

The high concentration of females over males in skilled positions in the government is indicative that Qataris do respond to labor market incentives. The authors' conversations with Qataris suggest several potential labor market explanations for the pro-female gender gap in education among Qataris. Employment for Qatari women is most culturally acceptable when the woman can wear traditional dress and work in a gender segregated environment. As these jobs are most likely in higher-skilled occupations, women are not seen as ready to start working right after completing secondary school and instead go on for further education. Consequently, women may pursue more schooling because acquiring higher education is seen as more important for women's job prospects than it is for men's.

In aggregate, Qataris are better-educated on average than non-Qataris, as shown in Table 11. 52 percent of Qataris have at least a secondary school degree as compared to only 39 percent of non-Qataris. This is unsurprising given that many non-Qataris are relatively unskilled laborers from impoverished countries. Importantly the gender disparity in education seen among Qataris is even more pronounced when examining the labor market as a whole. Immigrant women are better educated than immigrant men: 31 percent of women have some post-secondary schooling as compared to only 20 percent of men. While the share of Qatari and non-Qatari women with an advanced education is the same, Qatari men are better educated that non-Qatari men. To the degree that education level is correlated with skill level, it seems that the vast majority of immigrant laborers are doing unskilled work.

Table 11: Educational Attainment by Gender and Nationality (2004 Census)

	More than a Secondary school diploma	Hold a Secondary school diploma	Does not hold a Secondary school diploma
Qatari Men	0.27	0.23	0.50
Qatari Females	0.31	0.24	0.45
All Qataris	0.29	0.24	0.48
Non-Qatari Men	0.20	0.15	0.65
Non-Qatari Females	0.31	0.22	0.47
All Non-Qatari	0.22	0.17	0.61
All Men	**0.21**	**0.16**	**0.63**
All Females	**0.31**	**0.23**	**0.47**
Total	**0.23**	**0.18**	**0.59**

Still, the area of concern here is the ability of Qataris to take positions of skilled labor and business leadership in their own economy. There is a sizable group of well-educated non-Qataris

[31] High skilled occupations include professionals, Technician & Associate professionals, and Skilled Agricultural & Fishery Workers.

[32] Medium and low skilled occupations include clerks, service workers, shop & market sales workers, craft & related trade workers, plant & machine operators, elementary occupations, and unclassified individuals.

working in the country; 22 percent of non-Qataris have some schooling beyond secondary school. This high level of skilled expatriates partially reflects the presence of well-educated Western employees of multinational corporations, many of whom work in the petroleum industry. Thus, even though Qataris are on average better educated than foreign labor, they are still not sufficiently educated to fill the positions of skilled labor. There is not enough high quality domestic labor to meet demand. The supply of high quality Qatari labor in the private sector could potentially well exceed the 4% of Qataris currently employed therein.

Where expatriate workers are severely concentrated in the private and household sectors, Qatari nationals overwhelmingly work for the government. This is largely because employment in the civil service is used as one of the key ways for the government to distribute the nation's oil wealth among Qatari citizens. In sharing that wealth the government has established considerable benefits for civil service jobs. An unfortunate and perhaps unintended consequence of this policy, however, is the almost complete absence of Qataris from the private sector.

The Public Sector and Civil Service

Why do so few Qataris work in the private sector? As we outlined in the previous section, part of the answer is that Qataris do not have the skills to compete in the private sector. The other major reason is that work in the civil service is simply a more attractive option. Government employment is more attractive because of a combination of factors which differentiate public and private sector employment opportunities. These factors can be usefully grouped into employee characteristics including skill-based competitiveness and cultural preferences, and employer characteristics including benefits, wages, retirement, job security, unemployment security, and the inability or unwillingness of the civil service to punish poor performance.

We believe that the main economic reason that so few Qataris engage in private sector labor market activities is competition around skill-based qualifications. First, for jobs requiring few skills, expatriates are willing to do the work for much lower wages than what Qataris expect. In positions that require more specialized skills, a common sentiment among private sector employers is that expatriates simply have better education and training (Gause, 1994). This sentiment is born out by the fact that although education levels have increased considerably over recent years, most Qatari university graduates have degrees in the humanities rather than the science-based technical fields the economy demands (Jolo, 2004). On the other hand the fairly rigid salary schedule used by the civil service does deter high skilled workers from joining the civil service who can command higher offers outside the civil service from employers like QP.[33]

Another part of the answer rests in cultural features of Qatari society. When Qataris do work in the private sector, they almost always do so in a managerial capacity owing to the current strong cultural preference not to work in jobs that involve substantial manual labor (Winckler, 2000). As Gause (1994) notes, the dislike of hard work should not be viewed as an immutable cultural feature. On the contrary, before the oil boom, Qataris primarily lived a hardscrabble life characterized by physically demanding work.[34] Nonetheless, the remarkable wealth enjoyed by Qataris has allowed them to pay others to do most of the difficult work– in

[33] High-skilled labor denotes those who are more valuable to the firm because of performance, training, skills, or motivation level, as opposed to low-skilled laborers which are not as valuable to the firm because they are lacking in these dimensions.

[34] Typical pre-oil boom occupations included pearl-diving, fishing, long-distance trade and nomadic pastoralism (Gause, 1994).

both the physical and intellectual sense, and this has led to a shift in attitudes about what constitutes socially acceptable work. Still, a recent media report indicates that though Qataris opinion of technical trades has deteriorated since the 1960's attitudes are slowly improving for the better (*The Peninsula*, 2006). Stasz et al (2006) note that there has been a slight increase between 1998 and 2006 of high school graduates' willingness to work in the private sector, a fact potentially corroborated by their interviews with public and private sector employers.

Still, as a result of their skill levels and preferences, most Qataris are looking for high paying jobs for low-skilled workers. As the competitive market is unable to sustain such positions in any large scale, civil service employment becomes particularly attractive. Funded by resource revenues, the public sector often requires low skill levels but offers relatively high benefits without requiring demanding physical labor.

Employee characteristics constitute institutional differences between the sectors which also contribute to decision of all but four percent of economically active Qataris choose to work in areas with at least some public sector interest, be it the civil service (government administration), government establishments, or the mixed sector.

Qatari citizens are theoretically eligible for benefits independent of whether they choose to work in the public or private sector. However, some of these benefits are *de-facto* limited to government employees. For example, every Qatari is eligible for the land and mortgage benefits[35], but one cannot get the mortgage from the bank unless one has proof of steady income—and again, this is most easily secured through public sector employment. Though most employers provide some sort of housing benefit for managerial employees, nearly all government employees have between 20 and 40 percent of their interest-free housing loan forgivable[36], in addition to a housing allowance which is collectible only for those working in government[37].

Even when ignoring additional allowances and non-pecuniary benefits provided to Qatari public sector employees in general and civil servants in particular, data from the 2001 Labor Force Survey shows large differences in the average monthly wages earned between the public and private sectors (See Table 12)[38].

Table 12: Employed persons (Age 15+) by sex, average monthly wage (QR) and sector (2001 Labor Force Survey)

	Total		Female		Male	
	Avg. Monthly Wage	No. of Employees	Avg. Monthly Wage	No. of Employees	Avg. Monthly Wage	No. of Employees
Government Administration	5721	64325	6370	11343	5582	52982
Government Establishments	5751	18127	4829	3078	5939	15049
Mixed	5677	9149	3948	951	5877	8198
Private & Households	1696	215127	1238	28308	1765	186820
Diplomatic International & Regional	5300	476	4337	119	5623	356

[35] All Qatari nationals, citizens for at least 10 years, are eligible to receive a plot of land from the state on which they can build a house.

[36] The interest free housing loan is up to 350,000 QR for Jr. staff and up to 608,000 QR for Sr. staff.

[37] For those who earn a salary of more than 3730/month the basic housing allowance is 2200 QR/month. For those who are not provided free government housing, new provision allow for an additional sum of 1000 QR/month for those with children and 500 QR for those without children. The allowances are reduced for lower salaries.

[38] The reader should cautiously interpret the figures since they represent an average of Qataris and foreign workers (the latter much more prevalent in the private sector). Similarly there is no presumption that the skills and characteristics of employees across sectors are comparable.

Total	2902	307204	2887	43799	2904	263405

Beyond salaries and benefits occurring while a Qatari is employed in the public sector, retirement income comprises yet another remunerative aspect differentiating the public and private sectors. A recent law[39] extended generous pension coverage to all public agencies employees beyond just civil servants, which might attract some additional workers to the eligible public agencies. However, Qatari employees of private companies registered as a limited liability remain uncovered under the new law.

In terms of hiring procedures, we have already alluded to the practice held by the government of practically guaranteeing a public sector job. Indeed, until recently lucrative civil service jobs were guaranteed for all college graduates. Obviously, in the private sector Qataris have to compete with foreign labor. Even if a private sector job were to be secured, retaining that job is far more difficult than in the public sector. As Table 13 indicates 71 percent of Qatari employees in the government administration have more than 5 years on the job whereas only 31 percents of the Qataris who are employed in the private sector enjoy a similar length of job tenure. The difference in tenure length reflects the perception that the public sector brings more job security[40].

Table 13: Share of Qatari employees by tenure and sector (Planning Council, 2006)

	4 years or less on the job	5 years or more on the job
Government Administration	0.29	0.71
Government Establishments	0.61	0.39
Mixed Sector	0.53	0.47
Private Sector	0.69	0.31
All Sectors combined	0.39	0.61

Related to job security are layoff policies. If a Qatari's Civil Service job is made redundant, responsibility for the former employee is transferred to the Ministry of Civil Service Affairs and Housing (MoCSA&H). The employee is then assigned to the Central Service List and continues to receive a sizeable share of his salary regardless of their work status. This arrangement potentially continues until retirement age; it is also applicable to former employees of government agencies and government corporations.[41] No comparable unemployment security exists in the private sector as a mandatory policy.

Similarly, the ministries lack power to penalize their employees. For example, if a manager is frustrated by an employee's performance he does not have the authority to punish the individual. Instead, many ministries will simply ask the employee to not show up for work, though employee's salary continues. In other cases employees who are not wanted in the public sector will be transferred to MoCSA&H and assigned to the Central Service List where they will receive their full salary including all allowances for six months, after which they will receive 60-

[39] Law 24 of 2003 creating the Public Authority for Retirement and Pensions.
[40] This large gap might also be partially explained by relatively reduced recruitment into the government administration in recent years.
[41] Note that these policies are currently being evaluated for reform.

70 percent of their previous full salary until death[42] or retirement, at which point the sanctioned employee begins receiving a state pension. This public sector job security contrasts sharply with the absence of mandatory unemployment insurance for private sector employees.

Wage data suggests that the gap between the attractiveness of the public sector in comparison to the private sector is widening over time. It is likely that on average Qatari's public employees salaries and benefits constitute a wage far higher than what they could expect to earn in the private sector and probably higher than their marginal product of labor. However, as alluded to above, it is important to distinguish between high- and low-skilled workers. Whereas the aforementioned employment conditions and benefits present low-skilled workers with a relatively lucrative option, the invariance in compensations and inability of managers to reward good performance appropriately deter high-skilled workers from joining the civil service. These conditions have resulted in an overstaffed civil service bureaucracy with limited efficiency.

Public Response to Shortfall of Skilled Qataris

The tremendous influx of foreign labor as a result of the inability of Qatar to supply its own workers to satisfy the needs of its growing economy has met mixed reviews by Qataris. Meanwhile, the Qatari government has engaged in two major policies to increase Qatari labor force participation outside of the public sector: improving education and mandating a quota for the share of foreign workers allowed to be hired by firms in the private, "mixed" and governmental sectors.

Qatar's Attitudes towards Expatriate Labor

Foreign workers are at the center of the labor market debates in Qatar as they provide nearly all of the labor in the private sector. Qataris themselves take a variety of positions regarding the importation of foreign labor, depending on the economic position of the Qatari. Qatari business owners, whose main interest is to maximize profits for their privately owned businesses, could benefit from expatriate labor as these laborers are cheap, have limited rights, and because foreign workers' visas are tied to an invitation to a specific Qatari or firm, they generally lack competing opportunities. Yet Qatari employees interested in increasing opportunities and security for themselves may wish to restrict the flow of foreign workers who compete with them for jobs. Still, Qataris as citizens seeking to maximize the overall welfare of Qataris may exhibit contrasting arguments. On the one hand Qataris will want less foreign workers because of the associated negative externalities on infrastructure (housing, sewage, security), society (discrimination, potential assimilation, loss of culture), stability (source of discontent, political pressure), and national pride (dependence on foreigners for key functions and associated vulnerability). On the other hand foreign workers, as a source of both skilled and cheap unskilled labor, contribute to Qatar's international competitiveness, its ability to attract

[42] Persons placed on the Central Service list can even continue to receive these benefits posthumously for children younger than 21 years of age.

investments and more generally its economic growth. In addition, expatriates fill demand in the household service industry (e.g., nannies, domestic cleaners, drivers, and cooks), a segregated sector in which native Qataris do not participate.

Whatever the stand an individual Qatari takes, collectively Qataris face a delicate situation of competing objectives. While there is a need to continue to increase the number of foreign workers in order to maintain the remarkable growth Qatar has been going through over the last decade,[43] Qatar also needs more Qataris to be actively involved in the economy to avoid reliance on foreign nationals and to maintain the Qatari identity. Finally, it is also in Qatar's national security interest to have its nationals distributed over the country's main economic activities.

Improved Education

As a response to these challenges, the government of Qatar has sought to improve education to increase the number and quality of Qataris able to work in high-skilled areas, even while seeking a policy of Qatarization to be able to place their new graduates in firms outside of government service.

In 1995 the emir asserted that the country's most valuable resource is its people (Qatar Foundation, 2007). Since then the emir and his government have invested heavily in the education system with the hope of increasing the supply of qualified Qataris into the private labor market. With 7,337 students enrolled during the 2000-01 academic year (Jolo, 2004, p.13), Qatar University currently accounts for more than 90% of all Qataris attending 4-year tertiary education institutions (Stasz, Eide, and Martorell, 2006). The government has also instituted a generous scholarship program that allows high school graduates to study abroad (Winckler, 2000) and has landed agreements with major Western universities to open Qatar branches of their campuses.[44]

We have previously illustrated that the major beneficiaries of the countries efforts at higher education have been women. The country's education levels have certainly improved and there is reason to hope that they will continue to improve. Indeed, the high level of Qataris currently being educated is promising for the future. As we saw in Table 7, 22% of all Qataris age 15 or over are students. Still, if past trends hold we must wonder how many of those who are currently students will chose to engage in the difficult but needed fields of mathematics, engineering, and science over continuing the current trend of majoring in the humanities and religious studies.

Qatarization

The second policy thrust of the government to increase the share of Qataris working outside of the public sector is a *de facto* quota system termed "Qatarization." This plan carries a mandate of the share of Qatari nationals a firm in a particular industry must employ. This share varies by industry.

[43] CIA World Factbook reports a yearly average GDP growth rate of over 5% (CIA 2005).

[44] These institutions include Carnegie Mellon University, CHN University of the Netherlands, Georgetown University, Texas A & M (offering undergraduate degrees in petroleum, chemical, and mechanical engineering), the Virginia Commonwealth University of the Arts, and the Weill Cornell Medical College, The College of the North Atlantic also has a campus offering two-year Associates degrees. (Stasz, Eide, and Martorell, 2006).

For instance, the Strategic Qatarization Plan set a goal that 50 percent of the workforce in the energy industry would be a Qatari national by the end of 2005.[45] This makes employment in a targeted industry very attractive to a job seeker for two reasons. First, it gives Qataris an important "leg-up" in the hiring process; employers might be compelled to hire a Qatari in place of a more qualified expatriate because of pressure from the government. Second, these quota policies drive up the wages of qualified Qataris.

While most men with post-secondary schooling also work in government administration, a sizable share also works in public sector establishments and mixed companies. Qatarization policies help draw well-educated Qataris to upper management positions by creating a sizable premium for those individuals who have skills necessary to work in that capacity.

Certainly there exists a class of policies which can improve the representation of Qataris outside of the government. For example, because they are better educated than their male compatriots, devising culture/gender sensitive policies that would make it easier for Qatari women to assume a larger role in the professional life of the country would seem to be in line with the government's interest in increasing the number of share of Qatari nationals working in the private and quasi-private sector. In fact, numerous government policies have tried to increase the relative share of Qatari nationals working in key industries.

Still, the presence of large numbers of foreigners continues despite government policies such as the Qatarization policies regulating the share of Qatari workers in firms that are intended to reduce the country's reliance on foreign workers (Winckler, 2000). And though the magnitude of the efficiency costs is not known, to move downward from 77% of all Qatari laborer working in government administration to anything approaching parity with the other sectors may have real efficiency losses for the private sector.

Looking Ahead

Qatar faces a challenging economic environment consisting of a contingent of expatriate workers which dominates the labor force, a public sector which offers Qataris employment as low skilled workers but which falls short in its ability to lure high skilled individuals, a resultant overstaffed and inefficient Civil Service bureaucracy, high unemployment among those looking for their first employment, a lack of incentives to Qataris for private sector employment, and the lack of Qataris with the relevant education and training needed to find employment outside the government.

If the economy continues along its present path, these defining features are likely to become further entrenched. Qatar's economy would effectively be run by foreign workers and management in every field, including those sectors crucial to the country's national and economic security. Alternatively, restriction on foreign labor would cripple the economy and limit the potential growth.

Fortunately, Qatar's leadership has recognized the tenuous policy position in the country's labor market. It has discussed making changes to the Civil Service which would improve efficiency and restructure benefits to be available for Qataris employed in the private sector. The government has also taken steps to improve the curriculum of its public school system in an attempt to better prepare its citizens to take a leading role in the future of their

[45] The Strategic Qatarization Plan applies to 23 companies operating in the energy industry in Qatar. As of mid-2005, 31 percent of the workforce in these companies was Qatari (http://www.qatarization.com.qa/qatarization/qat_web.nsf/newsletter/current?opendocument).

economy (See, for example, Gonzalez et al, 2007). The decision to extend an invitation and funding to prominent Western universities to establish campuses in Qatar, for example, is a promising step. Hopefully an improvement in the quality of Qatar's graduates will lessen the efficiency costs of the country's "Qatarization" policy of mandating the share of a firm's jobs to be held by Qatari nationals. Finally, in a symposium held on April 9, 2006 key organizations voiced their support for a National Action Plan dealing with labor market strategies aimed at addressing many of the issues raised here.[46] The nation has a cautious optimism that the adoption and implementation of measures discussed in and subsequent to that symposium will strike the proper balance between growth, efficiency, and autonomy.

[46] *Gulf Times Newspaper*, 14 March, 2007

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Smart Choices?
Cognitive, Behavioral and Physical Health Impacts on Children Left Behind by Paternal International Migration

Jeff Tanner
Pardee RAND Graduate School

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Abstract: Migration is regaining attention as a policy instrument to encourage economic growth in both sending and receiving countries, though it is not clear how migration affects family members who do not co-migrate. By losing a household member, migration could negatively affect these individuals, particularly children. Economic theory gives ambiguous predictions for the effect of migration on any particular child outcome: Monetary remittances are presumed to positively affect children's outcomes, but the parental absenteeism necessitated by migration is likely to incur negative impacts. Moreover migration may have complex effects on child development through the parent's migration history. Child welfare itself is multifaceted and migration may have differential effects depending on the outcome of analysis. While we cannot predict the net effect of migration on a particular outcome, we can predict the relative effect of migration on a range of outcomes.
Using panel data from the Mexico Family Life Survey (MxFLS), I employ reduced-form estimates with value-added and fixed effects models to correct for potential endogeneity to examine the effects of migration on a set of behavioral, cognitive, and health outcomes. The results suggest that child outcomes which are more time intensive are more adversely affected by migration than outcomes which are more capital intensive, which may be positively affected by migration. Finally, within a particular outcome, the effect of migration seems to come through at least two channels, a stock effect and a flow effect, which do not necessarily move in the same direction. It is not the case the all children are affected equally; decomposing the sample points to more intense effects for the poor, for example.

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1. Introduction

Because it governs the ability of human capital to flow to its most productive use, immigration policy is a critical question for improving global welfare. Revealed preferences of 200 million migrants worldwide (United Nations Development Programme, 2009) would indicate that migration has large expected returns—at least to the migrant. Nancy Birdsall proposed that "No other circumstance of birth—not race, gender, ethnicity, or parental socioeconomic status—so completely determines life chances as the nation of birth, essentially because of border restrictions on the mobility of labor" (Pritchett, 2006).

Using microdata on over 2 million individual formal-sector wage-earners in 43 countries, Clemens, Montenegro, and Pritchett (2008) estimate that observably identical workers from Mexico—though facing one of the smallest wage wedges among the 43 nationalities represented—earn 2.5 times more in the US than they do in their home country. The authors conclude that no existing policy carried out *in situ* –from microcredit to additional education to fair trade—can benefit the marginal poor household as much as one year of access to the US labor market.

While the benefits running from remittances to macroeconomic and regional development have begun to be well understood (OECD, 2005), the microeconomic effects of remittances on household structure and outcomes of individual family members, particularly non-migrating children, is considerably less well-established[47]. Yet for migration to become a viable tool for improving human development, we must better understand the long-term benefits of migration on families to whom migrants remit earnings.

The axiom that children from higher socio-economic status households have better child-outcomes is well-established (See for example (Haveman and Wolfe, 1995), (Becker and Tomes, 1986)). Similar in strength of evidence but moving in the opposite direction, studies from both US and developing country contexts indicate that children from single-parent homes tend to have worse outcomes (See for example (Seltzer, 1994), (Gertler, Levine and Martinez, 2003)).

Parental migration simultaneously elicits both of these opposing effects; which effect may dominate in child outcomes is unclear. In Ecuador, (Paxson and Schady, 2007) find that language ability for children age 36-71 months is affected by household wealth and parental education, and that these effects become more important with age. Moreover, there is no reason to believe that all inputs matter equally to all—or any particular—child outcome. For example, (Glick and Sahn, 2009) find that among older children age 14-17, years of schooling and education matter far more to math, language, and life skills than does parental wealth or education.

Because early child welfare has large impacts on later adult welfare, giving children a better start in life through policies that promote better nutrition and health, as well as development of cognitive, motor, and social skills, is an effective way to reduce later poverty and other negative outcomes[48] while improving both equity and economic growth. Poor education outcomes and poor

[47] The circumstances of co-migrating children to the US are better established in the literature. See for example (Capps and Fix, 2004) which reports children of immigrants being more likely to be in fair or poor health than children of US-born parents.

[48] See the World Bank's treatment of ECD programs in their flagship *World Development Report, 2006: Equity and Development* (World and Bank, 2007)

health of youths and adults have been linked to malnutrition, disease, and neglect in infancy and during the early years of childhood.[49] Early childhood development programs which are explicitly or implicitly intended to improve child welfare, including their cognitive and physical if not behavioral health, have proved effective in improving child growth and psychosocial development, and higher educational attainment, higher earnings, lower welfare participation levels, lower incidences of arrest, and lower out-of-wedlock births[50]. The importance of childhood welfare on later adult and national economic outcomes, together with the effectiveness of ECD interventions in improving these outcomes, underscores the importance of understanding any potential negative impacts on young children of having a parent migrate.

The body of evidence is growing in the economics literature regarding how these two effects—income and absence—interact to produce a net effect, as would be the case where migration yields an absent parent but a wealthier household (See (Antman, 2012) for example).[51]

This paper addresses whether Mexican children with a parent absent due to migration have better or worse cognitive (general intelligence), behavioral (attentiveness) and health (body mass index) outcomes relative to children who do not. Research exploring outcomes for Mexican-resident children with a US-resident parent is still quite nascent[52]. When this migration occurs, typically a parent, usually the father, will leave the family for a period of time with the expectation of earning a higher wage as an expatriate laborer. Thus, because the positive socio-economic effect of greater family income is countered by the negative effect of not having a parent, the aggregate effect of parental migration has been seen in the literature as an empirical question rather than one in which theory can provide any prediction (See Hanson and Woodruff (2003) which first posits this challenge of identification).

Section 2 of the paper gives background on parental migration and a range of child outcomes, integrated with a discussion of the relationship fathers' time inputs and financial inputs with producing child outcomes. Section 3 describes a simple model of a child welfare production function. Section 4 describes the data used in this investigation while section 5 lays out the empirical models. Section 6 gives results, and section 7 explores the existence of heterogeneous effects. Section 8 discusses the empirical findings and concludes with research and policy implications.

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[49] See for example (Behrman and Rosenzweig, 2004), (Currie and Thomas, 1995) (Currie and Thomas, 1999), (Karoly et al., 1998), and (Murnane, Willett and Levy, 1995) for the United States and (Alderman et al., 2001), (Behrman et al., 2006), (Grantham-McGregor et al., 2007), (Glewwe, Jacoby and King, 2001) and (Glewwe, 2002) for developing countries.

[50] See for example the influential work on the Perry Pre-school Program in the US (Baker, Piotrkowski and Brooks-Gunn, 1998) and the successful PIDI program in the US (Behrman, Cheng and Todd, 2004).

[51] A similar, though even less well-researched problem occurs when parents are deployed in the military. See (Chandra et al., 2009) as an example.

[52] Related work from Indonesia using the Indonesia Family Life Survey shows that adults left behind after a fellow adult leaves tend to have a better standard of living (Lu, 2007) Gertler et al (2003) while (Gertler, Levine and Ames, 2004) explore the impacts on child welfare of missing a parent due to orphanhood and suggest that the social losses of losing a parent may have a greater impact on child education attainment than the fiscal loss. This paper uses an FLS in a different context (Mexico rather than Indonesia) to investigate the more benign but more common situation in which a parent leaves the family for work but is still at least somewhat engaged and invested in the household.

2. Background

As there is little empirical work on the impact of paternal migration on their non-migrating children, this section begins by exploring child outcomes in a family with a migrating non-parent member. I also trace the existing literature on child outcomes of paternal migration to establish this research within that literature, most of which covers child education outcomes. Next, I briefly review the literature on fathers' time and finances as determinants in children's cognitive, behavioral, and physical health; I integrate evidence on paternal absence, including through migration, where it exists.

The central issue in estimating returns of migration is the potential selectivity in the migration decision—both in terms of the decision of a father to migrate and the subsequent decision of whether or not to leave his family. Parents who choose to migrate are not a random sample of the population and may be more or less engaged in their children's welfare. The literature has addressed this challenge of selection (or not) in a variety of ways. It must also be noted that all of the migration studies described here treat migration as a single binary indicator marking current migration status only. This explicitly assumes that migration has no effect on child outcomes beyond current inputs. A more realistic position, taken up in this paper, is to explicitly acknowledge that previous inputs may have a persistent effect on current outcomes (Todd and Wolpin, 2003). If there are persistent effects, then the coefficient on current migration will be biased, even if migration selection has been ameliorated (by inclusion of covariates, instrumentation, using established exogenous cutoffs (through random assignment of visas or a discontinuity), or through differencing). There is some evidence to suggest that prior inputs matter, even if they matter to a lesser degree than current inputs. For example, using longitudinal data from the Philippines, (Glewwe, 2001) establishes that timing of inputs matters to cognition, particularly for young children, and that in the case of malnutrition, earlier negative shocks may not matter as much as more recent shocks.

Most research on migration impacts on non-migrating children explores migration episodes of household members who may or may not be the child's parent. In Guatemala, (Adams, 2005) links migration of a household member to increased household expenditure on education but is unable to address selection, while (Edwards and Ureta, 2003) estimate that household remittances are associated with a lower probability of dropping out of school in El Salvador in estimates which reveal no evidence for migration selection on observables such as income, though the work does not attempt to empirically address migration selection on unobservables either. Using a randomized lottery of migration ballots from Tonga to New Zealand to control for selection, (Gibson, McKenzie and Stillman, 2009) find no effects on child education outcomes and investments of being in a migrant household. On the other hand, using exogenous variation in international exchange rates to instrument for selection in remittance flows (Yang, 2008) finds that migration, instrumented by positive exchange rate shocks, causes more child schooling and less child labor for children age 10-17 in migrant-sending households in the Philippines.

Again, in none of the preceding studies were the migrants exclusively the parent of the child under observation. Yet parental migration is a particularly compelling case—even if less frequent. Parents' migration effects on their children should *a priori* be stronger than non-parents; parents are both likely to remit larger sums as a share of their earnings back to households in which they have a child, and the absence of a parent would likely be felt more keenly by the child than the absence of any other household member, on average.

Findings for child outcomes of parental migration for Mexico are mixed, but most focus on education[53]. (Hanson and Woodruff, 2003) establish the basic framework, expanded upon in this paper, of the opposing consequences of parental migration through increased family income but reduced parental involvement. Using state-level historical migration rates interacted with mother's education to instrument for migration selection, they find a positive effect of current migration for schooling for rural girls 10-15 years old. They argue that this reduced form result is a net effect, indicating that increased household income outweighs the effects of parental loss on education attainment—a finding they argue is consistent with a relaxation of the household budget constraint. Their sample includes only rural populations, whom they argue are less likely to migrate with the entire family.

Modifying the Hanson and Woodruff (2003) approach to account for the right censuring of education years due to graduation in the Mexico ENADID data , (McKenzie and Rapoport, 2011) use an IV-censored ordered probit with Hanson and Woodruff-style instruments of historical migration networks, and instead find a negative impact of paternal migration on education attainment level for boys 12-18 and girls 16-18. Using the MxFLS data in a censored discrete time event history analysis, (Creighton, Park and Teruel, 2009) find that children of migrants in 10^{th}-12^{th} grades are more likely to drop out of school than children with two at-home parents in a series of estimations which demonstrate evidence of selection on observables (locality) but make no attempt to correct for selection on unobservables.

Similarly, (Antman, 2011) finds a negative impact of paternal migration on schooling, particularly for boys age 12-15. She uses individual child fixed effects over the five quarters of the nationally-representative ENEU Mexico data combined with an instrument for migration timing using variation in labor markets in likely US destination cities as determined by matched data from the non-nationally representative Mexican Migration Project (MMP). On the other hand, (Antman) uses household fixed effects and sibling age variation to address endogeneity with the non-nationally representative MMP data for Mexico and finds that paternal migration earlier in the life of a young girl can increase her educational attainment by one year.

Turning to the particular outcomes explored in this paper, we first establish the role of paternal influences in upbringing. The child development literature establishes a clear positive influence of fathers directly as a breadwinner, playmate, guide, role-model, and caregiver and in providing economic, social, and emotional support. Fathers also give indirect benefits for the development of their children by providing emotional and instrumental support for the child's primary care-giver, usually the mother, which fosters the quality of mother-child relationships which further encourages child development (Lamb, 2010). These roles are inadequately fulfilled in households of paternal nonresidence (Lamb, 2010). Finally, (Cyander and Frost, 1999) point to convincing evidence that the interaction between genetics and environment inscribe on the young mind "skills, abilities, dreams, and prejudices" as default characteristics for the child throughout life. They also warn that inadequate or inappropriate nurturing experiences can compromise higher neural functions, including those governing learning and socially appropriate behavior.

This pattern of paternal importance also holds up in developing countries. As another education example, a study of households in Brazil, Ecuador, Nicaragua and Panama observed that

[53] This paper does not share that education focus as school enrollment is more than 95% for the study population.

adolescents in single-mother homes are likely to have lower school attendance and attainment (Arends-Kuenning and Duryea, 2006).

COGNITION

The child development literature demonstrates a positive association between child cognition and greater paternal engagement. The (Tamis-LeMonda et al., 2004) study concludes that fathers' positive parenting has direct influences on their children's language and cognitive development while their education and income levels have indirect but no less potent impacts through enhanced mother-child engagement. Moreover, (Cabrera, Shannon and Tamis-LeMonda, 2007) find that, in contrast to mothers, fathers' influence matters for children's linguistic and cognitive development across all ages of their study—24 to 64 months. Santrock (Santrock, 1972) uses a differences-in-differences approach in examining the changes between third and sixth-grade IQ and achievement scores and finds that children of all ages and all types of father-absent homes (e.g. death, desertion, separation, or divorce) do worse than children living with their fathers.

In a much-cited paper on the effect of income on child development, (Blau, 1999) determines that cognition and emotional health, while affected by current income are more deeply impacted by changes to "permanent" income affecting a family's long-term consumption (as opposed to temporary income). Still, he concludes that family background characteristics are more important for determinants of child well-being.

In Nicaragua, (Macours and Vakis, 2010) present the only research on the relationship between parental migration and cognition. They use the presence of a household shock to instrument for regional migration and find that maternal seasonal migration has a positive effect on early childhood development for pre-school age children, which they attribute to remittances increasing nutrition and being able to mitigate any negative absence effect by the short-term nature of the migration.

BEHAVIOR

Fatherless homes are consistently associated with negative behavioral outcomes including lower education attainment through higher drop-out rates, anti-social behavior, and sexual promiscuity (See (An, Haveman and Wolfe, 1993; Antecol and Bedard, 2007; Hofferth, 2006; Sandefur, McLanahan and Wojtkiewicz, 1992)). In a touchstone article in the development psychology literature, (Olweus, 1980) finds that child misbehavior is a function of parental engagement and parenting style, but not of socio-economic status.

In the context of developing countries, Gertler, Levine, and Martinez (2003) find that controlling for changes in economic status with parental death does not reduce its negative impact on children's health or education status in Indonesia and Mexico. They conclude that while these households may be able to "insure investments in children's human capital" against the economic loss of parental death, they cannot insure against "behavioral factors related to the presence of a parent in the household" (Gertler, Levine and Martinez, 2003). Specific to the question at hand, migration of a child's caregiver is associated with more educational, behavioral and emotional problems in (Heymann et al., 2009) and (Lahaie et al., 2009), though neither of these papers address selection and the results appear to be more associative than causal. Still, it seems clear that fathers'

intra-household interaction with their children seems to contribute more than mere monetary benefits.

PHYSICAL HEALTH

In a seminal economics paper on the production of child health, (Rosenzweig and Schultz, 1982) ascribes infant health solely to material inputs. Breierova and Duflo use instrumental variables to assert that fathers' education (used as a proxy for socio-economic status) is as important as mothers' education in reducing child mortality in Indonesia (Breierova and Duflo, 2003). Work on the Young Lives data in Peru, however, indicates that children from homes where the father was absent (for any reason) were at considerably higher risk of stunting, though the paper does not attempt to control for selection on fatherlessness (Dearden et al., 2011).

Using triple-differences with the MxFLS, Nobles finds that child stature is negatively related to parent migration (Nobles, 2009b) in children age 0-11. On the other hand, (Hildebrandt and McKenzie, 2005) use a single quarter of the ENADID data with historic state-level migration rates as an instrument and report that children from a household with at least one migrant (though not necessarily the parent) have lower age-1 mortality and higher birth weights[54].

3. Economic Model

Following is a simple model of the production of child well-being. We imagine that parents choose two inputs: time and money. Regardless of how they are chosen, those inputs will produce an array of different household commodities and child outputs, including children's physical, psychological, and cognitive well-being.

This vector $\boldsymbol{Z}$ of i child outcomes for child j is produced with monetary and time resources according to a production function

$$\boldsymbol{Z}_j = Z_{i,j} = f_i(y_j(M), t_j(M); \boldsymbol{E}_j) \quad (1)$$

where y_j represents the monetary resources spent on possibly many goods for child j and t_j is the time used in possibly many different ways to aid child j in the production of child outcome i. Both monetary and time expenditures are functions of the same parameter M, the parent's decision to migrate. The parameter $\boldsymbol{E}_j$ represents the many other environmental factors affecting the child outcome, including genetic ability, child-specific history, and parental, school, and home attributes. All outcomes Z_i are assumed to be increasing in time and money such that $\partial \boldsymbol{Z}/\partial y, \partial \boldsymbol{Z}/\partial t > 0$.

In a migration event, monetary resources are usually assumed to increase because of remittance flows owing to the wage differential which is presumed to induce migration in the first place. However, particularly in the case of paternal migration discussed in this paper, it may be that a father leaving the household improves child welfare if the father is a disrupting force in the home (Craigie, 2010) or if his departure improves the bargaining position of the mother in the intra-household bargaining leading to the allocation of resources and mothers put greater weight on child

[54] Unfortunately the MxFLS data used in this paper does not collect mortality and birth-weight data in a way which could be used for a comparable analysis here.

outcomes in their own expenditure decisions (See, for example, (Duflo and Udry, 2004)). In any case, the result is the same: paternal migration results in higher monetary resources spent on child outcomes so long as migration does not reduce overall household income; that is, so long as migration relaxes the household budget constraint. Consequently, we assume $\partial y/\partial M>0$. On the other hand, time resources spent on the child by the father obviously decrease with migration as the father is physically absent. It may be that maternal time resources decrease as well if the father was contributing to childcare and all other household arrangements remain constant; the household time budget constraint is contracted. As a result, we assume $\partial t/\partial M<0$.

The total derivative of child outcome Z_i due to changes in income and time caused by migration is

$$dZ_i=(\partial Z_i/\partial y\cdot\partial y/\partial M)dy dM + (\partial Z_i/\partial t\cdot\partial t/\partial M)dt dM. \quad (2)$$

Keeping with the previous literature, we cannot tell *a priori* whether a particular child outcome will increase or decrease in absolute terms because we do not know whether the positive income effect will offset the negative absence effect. The total absolute effect of any particular outcome is ambiguous, since the first term in (2) is positive and the second term is negative.

However, we can rank order the magnitudes of the total changes of outcomes relative to each other. Because dy, dt, and dM are the same for each outcome i, the relative magnitude of the total change dZ_i across i outcomes will depend on the relative magnitude of the partials. Some outputs may improve as a result of changes in the input mix following a migration episode, and others may decline. We cannot tell which will increase and decrease in an absolute sense because we do not know the exact production function that produces a given output. However, considering whether time or money is likely to be most important for a particular output on the margin relative to other outcomes allows us to formulate hypotheses regarding the rank order of the outcomes' changes.

Relying on the previous research described above, the model would predict that child health, which seems to be a more monetary-intensive outcome, would fare better than psychological outcomes, which is relatively more time-intensive. We saw evidence that cognitive outputs depend on both types of inputs, and so is likely to fall in between the two. Thus on a number line we would expect to see behavioral health, cognitive health, and physical health from left to right[55].

4. Data

[55] Mathematically, the marginal rate of technical substitution for the child production function is $(\partial Z_i/\partial y_i)/(\partial Z_i/\partial t_i) = MP_{yi}/MP_{ti}$ which gives the additional amount of input y that must be used to keep output constant when t is decreased marginally. In a notional Cobb-Douglass production function $Z=f(y,t)=y^{\alpha}t^{\beta}$, the $MRTS_{y,t}(Z)=\alpha t/\beta y$. It follows from the literature that the production function for health outcomes is likely to have $\alpha > \beta$, such that at average levels of y and t, health is likely to increase. Similarly, the literature implies that time may be more important than money in child psychology at average levels of both, implying that $\alpha < \beta$ in the psychological production function. Finally, the literature is inconclusive regarding the relative importance of money and time, and indeed the implication is that $\alpha \approx \beta$.

Mexico is an important population to study families split by migration. The Mexico-US migration flow is one of the world's largest. Mexico has the world's third largest expatriate labor force (behind China and India); fully 12% of the Mexico-born population lives in the US. Moreover, labor, through remittances, is Mexico's second largest export behind petroleum based products. (Arenas, Conroy and Nobles, 2008) estimate that between waves of the Mexico Family Life Survey over 5% of the country's young adult men relocated to the US. Again using the MxFLS data, (Nobles, 2009a) estimates that 18% of Mexico-resident children will watch their fathers migrate away from the home over the course of childhood.

The Mexico Family Life Survey (MxFLS) is a multi-purpose longitudinal survey with a nationally representative sample of 8,440 Mexican households comprising approximately 35,000 individuals in 150 communities. The MxFLS dataset is well-suited to informing the question of child cognitive, behavioral, and health outcomes in the face of parental migration as it collects data on child and adult cognition and body mass index, child attentiveness, and complete (retrospective) migration histories for adults (age 15+) in the household in either of the two waves. The survey also contains detailed information on community, household, and individual characteristics.

The first wave (MxFLS-1) was fielded in 2002, and the second wave in 2005 (MxFLS-2) saw a 90% overall follow-up rate and was only slightly less efficient at following those family members who migrated to the US between waves. Attrition for the second wave was just over 10% with 868 households not followed up. Of the 11,315 children surveyed in the first wave, 2,416 had aged out of the children's survey three years later in the second wave and 925 children (8.1%) attritted out of the sample entirely. Comparisons of Wave One information on gender, age, relationship to household head, level of education, maximum grade passed, school completion, school attendance, and time of school attendance revealed no observable systematic pattern of attrition.

The MxFLS survey includes a battery of questions regarding children age 0-14 years. My sample of analysis focuses on non-attriting children who were 8-12 years old in the second wave (2005) for the cognition and behavioral outcomes, and 2-14 years old for the health outcome.

Cognitive Health Variable

The MxFLS administers an 18-item version of Raven's Colored Progressive Matrices to all children 5-12 years old[56]. There were roughly 2500 children aged 5-9 who took the test in the first wave and retook the test again in 2005. The variable used here is cognition-for age z-scores, normed separately in each wave, where the raw score is the percent of correct answers.[57] The test items evoke pattern matching for visual puzzles. Respondents are asked to identify the piece required to complete the design from the options given. The test requires no language (written or oral) or numeracy skills. The 18 items used by the MxFLS are taken from or made in the same style as the longer 36-item test generally used and for which international norms have been developed. Though not using the full test yields international comparisons tenuous, other shortened versions of the

[56] The MxFLS also administers an adult version of the test to individuals 13 to 64. Standardized cognition-for-age scores are calculated for respondents' mothers as a control in all regressions.

[57] Though the wave 1 surveys were all fielded in a relatively tight time period of 4-5 months in 2002, the wave 2 follow up was considerably more spread out, with some re-interviews coming as late as 2006 and 2007. Accordingly, cognition-for-age z-scores seems to be the most straightforward way to deal with the variation in maturation between tests. Importantly, this means that an individual child is not compared to the same pool across waves. Analysis with raw scores controlling for age explicitly does not change the results in this paper.

Raven Standard Progressive Matrices have been shown to retain the consistency and reliability of the full tests (Hamel and Schmittmann, 2006)

The Raven tests have been used for nearly 70 years and are still widely considered the best direct measure of *g*, general intelligence, because they simultaneously measures fluid intelligence *g_f* or pure reasoning, which generally increases up to about age 30 (also called *eductive* ability), and crystallized intelligence *g_c*, or the application of logic or reasoning, which generally keeps rising with age (also termed *reproductive* ability). The secular trend often noted with the Ravens of improvements in a population over time is usually thought to be a function of general increases in the inputs to cognition: health, environment, and education. Still, the test has shown remarkably stability and effectiveness in measuring cognition across cultures and time (Raven, 2000). Still, as with most intelligence tests, abilities exhibited in the Raven may be a function of schooling. We test this by dropping it as a potentially endogenous variable, but do include it in robustness checks. Still, as 96% of children in the sample attend school, the effect of schooling on migration is largely netted out.

Behavioral Health Variable

The child behavioral variable is a subjective measure of the child's attentiveness as scored on a 4-point Likert scale by the enumerator evaluating the child's "attentiveness or seriousness" in performing a particular task. As with the cognition test, the attentiveness measure is applied to children age 5-12. Other child development work has included attentiveness in indices profiling children's behavioral health, including the motivation to learn (See, for example, (Carvalhaes, 2010)).

Physical Health Variable

The physical health variable used is body mass index. The MxFLS data has information on height and weight for each respondent age 2-14, from which can be calculated BMI scores which are then age standardized. With the 3 year average lag between administering the two waves of the survey, most of children included in the age catchment in both waves are between age 5 and 14 in the second wave. I use this slightly wider age band for physical health than cognition and behavioral health to obtain the largest sample possible for each outcome[58]. A child's BMI z-scores is often thought to be a short- to medium-term outcome of nutritive, caloric, and physical environmental inputs. BMI, however, is not monotonically desirable. Individuals with BMI greater than 25kg/m^2 are considered overweight. In the MxFLS sample, less than 1% of children are overweight in wave 1 and less than 7% are overweight in wave 2. There is no statistically significant difference in the prevalence of being overweight by fathers' wave 2 migration status (See Appendix 5 for details).[59] Other health variables are also included in the MxFLS but are less well-suited for this analysis, often because the data are missing critical covariates for inputs from the mother.[60]

Migration Variables

[58] Results using the same age band as in cognition and attentiveness have similar results to the wider sample in the bmi empirical estimations.

[59] Table 2below illustrates that children of 2005 migrants have much worse 2002 BMI-for-age scores than children whose fathers do not migrate in 2005. There is no statistically significant difference in 2005 BMI z-scores, however.

[60] Hemoglobin levels, for example, are collected for nearly all children. Unfortunately, mothers' hemoglobin, a seemingly critical covariate, is missing for some 40% of the sample. Child height/length is highly determined by inputs *in utero*; construction of such inputs for the mother was unfeasible.

The key variables of interest are a dichotomous indicator of whether or not the father is currently in the US and a continuous variable of the share of the child's life that the father has been in the US. The current migration status variable is constructed differently depending on when the father's migration occurred in relation to the two MxFLS waves. Estimating the effect of maternal migration is not possible as so few mothers in the sample leave their children. When mothers do migrate from Mexico, it appears they almost always take their children with them. The MxFLS does not ask the migration status of children's parents directly. However, the survey does take a complete retrospective migration history of every household member age 15 and older. The MxFLS also identifies the father (and mother) of children in the household; if the parent is not present, he is denoted as dead or living outside the home. The MxFLS also identifies whether household members older than 15 years are married (or cohabiting), and if so, who their spouse or partner is; if the spouse is absent, the MxFLS identifies if he is currently in the United States. Finally, the MxFLS identifies everyone who was in the household in the first wave but is currently migrating in the US in the second wave.

With this series of relationships we identify as having a migrant father in Wave 1 all children for whom the father is noted as absent in wave 1 and the mother's spouse is noted as in the US in wave 1, or for whom the father is absent in wave 1 but present in wave 2 and their wave 2 migration history reveals that the father was in the US during the wave 1 period. Children are identified as having a migrant father in Wave 2 if the child's father, as identified by living with child in wave 1, is identified as migrating in the US in Wave 2, OR the Child's father is absent in Wave 2 and child's mother's spouse is identified as in the US in Wave 2.

As migration may have cumulative (or persistent) effects on child cognition, I also use the migration histories to include a variable on the share of the child's life to date that the father has been away in the US.[61] The variable indicating the share of the child's life the father has been migrating in the US is constructed using the father's migration history applied over the period of the child's life. These two variables—current and lifeshare migration—are used together in the empirical models which follow.

Alternately, we may also specify migration using a set of variables indicating direction of migration: fathers who leave (were in the household in wave 1 but are in the US in wave 2), fathers who return (were in the US in wave 1 but are in the household in wave 2), fathers who never migrate (are not in the US in either wave), and fathers who 'always' migrate (are imputed to be in the US in both waves). This specification of the migration dynamic is applied in the value-added models as an alternate to the VAM+ specification with the set of migration variables described in the previous paragraph. [62]

Note that these specifications do not differentiate between domestic migration and domestic cohabitation. There are also a handful of respondents (<10) in these samples whose fathers migrated

[61] For children whose father was imputed to be in the US in both waves, as a conservative imputation I assign the time spent away to be 3 years and use that to calculate the share of life the father has been in the US. Three years is the minimum time for a father to be away if away during the period spanning both waves.

[62] This dynamic specification of migration is used only in the VAM+ regressions as these indicator variables as described are time invariant and so collinear with the individual fixed effect in the difference in differences specificaltion. The difference in differences specification is identified off of changes in the father's migration status, and treats leaving and returning symmetrically and treats those whose fathers are home in both waves in the same way as those whose fathers are in the US both waves.

to other countries besides the US. The appropriate interpretation on the migration variables, therefore, is the effect of a father's US migration relative to all other family arrangements of father and child.

Control Variables

The empirical models which follow use individual, maternal, household, and school characteristics as covariates. Mother's cognition is the average of cognition scores over the two MxFLS waves of a twelve-item Raven test for those age 13+ in the sample[63]. Household size is defined as the number of people who share meals and who have lived or who are planning to live in the home for at least one year or whose absence does not exceed or expect to exceed one year. Education level is the highest grade level of schooling completed. Age is given in whole years. Household size is the number of individuals currently residing in the same household. Total older (younger) siblings are the number of older (younger) individuals living in the same household with the same mother as the respondent. The household assets variables are the first and second (unrotated) principal components over 14 items in which the household head indicated household possession; in general, the factor loadings indicate that the first component is associated with household consumables and the second with agrarian assets[64]. Rural localities are those with a population of less than 2500 inhabitants. The health models also include a set of controls for the respondent's mother's health including her body mass index, hemoglobin counts in g/dL, and height in cm.

A set of community-level school variables is also included in the regression models, though only the first wave of the MxFLS recorded this information. The school controls include school and class size, principal and teacher age and experience, whether the teachers have had in-service training, and the first principal component of a school facilities infrastructure index[65]. The school sampling structure of the MxFLS-1 is such that school variables are reported by two teachers each, in at least two schools in the child's community. These schools are not necessarily the particular school attended by the particular child in the survey. The school variables used in the regressions are the average over these 4 teachers. Though the MxFLS does not provide with the exact information

[63] Adult cognition is taken to be static over the age of mothers in this sample (average mother's age is 37 years in wave 2). Out of concern that including both cognitive scores in the regressions would only add noise, I average the two scores together. Where only one wave's maternal cognition score exists, I use that score.

[64] Eigen value and scree plot analysis give a clear indication that 2 is the most parsimonious number of components for the data. The items of ownership of "*this residence*" and "*other assets*" loaded onto component 2 in the first wave but onto both components equally in the second. Owning "*bicycles*" and "*motorized vehicles*" loaded equally onto both components in the first wave but more heavily onto the first component in the second wave. *Electronics, large appliances*, *small appliances*, and *liquid financial assets* all load onto component 1 in both waves, while owning *other land or real estate*, a *tractor*, *cows or bulls*, *horses or mules or donkeys*, *small livestock*, *and domesticated fowl* all load onto component 2 in both waves.

[65] The eigen value and scree plot analyses for the school infrastructure elements were inconclusive as to whether one or two components were more appropriate. I chose to include only the estimates using the first component because it is a more parsimonious approach. However, using two components makes not substantive changes to any regression results. For the sake of interest, when two components are used, items loading onto the first component of school infrastructure were school *bathroom quality* (as the first component of a principle component analysis of 5 bathroom items), *furnishings* being in good repair, *floor materials* being in good repair, and *class materials* being of very good quality. Indicators of the school having *video equipment* for classroom use, *computers* for student use, and *library books* for students to check out all loaded strongly onto the second component. The items of having *no rain problems*, having *teaching materials*, having *grass*, having *good ceiling quality*, and having *clean floors* load approximately equally onto both components.

on the school, principal, and teachers experienced by the individual child, this construction does help avoid some of the endogeneity between school selection and migration which may affect cognition and behavioral outcomes.

Summary Statistics

The attrition rate for children age 8-12 in the second wave (the cognition and attentiveness sample) was about 10% between waves and similar for the age 5-14 (BMI) sample. About 3% of children have a father who was at home in wave 1 but left for the US by wave 2.

Table 1 gives summary statistics for all dependent outcomes and independent variables in wave 2, by parental migration status and for the sample as a whole for the age 5-12 sample used for cognition and attentiveness. The table also gives summary statistics for children's school attendance and years of education, as well as mothers' mental health and the log of per capita income, which are excluded from the main regression results as they are potentially endogenous (i.e., they are correlated with the error term). The table first relates wave one and wave two lifeshare migration rates, wave one paternal migration, and averages for the outcome variables in both waves.

Roughly 4.5% of the children in the sample have a father migrating in wave 2, and the sample is evenly split by gender among children of migrants and non-migrants as well as in the sample as a whole. Children with migrant fathers in wave 2 have lower cognition-for-age z-scores and lower attentiveness scores at both baseline and endline, but they are equally likely to be in school (more than 96% of both children of migrants and non-migrants age 5-12 are reported to attend).

While the children of non-migrants tend to have more educated mothers, their mother's cognition-for-wave z-scores are indistinguishable from mothers of migrant children; mothers in migrant households also tend to be slightly younger. While the mental health scores of mothers in migrant households is notably higher (meaning they are less depressed), the difference is only marginally statistically significant. Though there is no difference among children's age or household size between the migrant and non-migrant samples, children of migrants do have higher counts of younger siblings. Children of migrants also score much higher on the second principal component of the household assets index and are much more likely to be rural, but there is no difference in the log of per capita household consumption of children of migrant and non-migrant fathers. The rural profile of migrants is likely related to the smaller school size (total attendance) and class size. Schools in migrants' districts also have less experienced teachers and are less likely to have all of the materials they need.

Table 1 Summary Statistics of Sample

		Father not in US in Wave 2 (N=2765)		Father Mig. in US in Wave 2 (N=131)		All (N=2896)	
Variable	SS	Mean	SD	Mean	SD	Mean	SD
W1 Dad in USA	***	0.026	0.159	0.397	0.491	0.043	0.202
W1 Share life Dad in USA	***	0.002	0.024	0.062	0.078	0.004	0.031
W2 Share life Dad in USA	***	0.002	0.024	0.082	0.100	0.006	0.036
w1 Child Cognition	*	-0.034	1.003	-0.195	0.991	-0.041	1.003
w2 Child Cognition	**	0.003	1.007	-0.183	0.954	-0.005	1.006
w1 Attentiveness	**	3.277	0.578	3.160	0.605	3.272	0.580
w2 Attentiveness	***	3.370	0.513	3.206	0.537	3.362	0.515
w2 Child Age		10.213	1.373	10.145	1.458	10.210	1.377
w2 Mom Age	*	37.160	6.647	36.070	5.396	37.111	6.599
Mom Cognition		-0.010	0.957	-0.097	0.877	-0.014	0.953
Mom Yrs Educ	***	7.037	3.394	6.163	2.911	6.997	3.378
w2 Household size		6.280	2.400	6.221	1.947	6.277	2.382
w2 # older siblings		1.409	1.437	1.555	1.247	1.416	1.429
w2 # younger siblings	***	1.141	1.093	1.500	1.157	1.157	1.098
w2 hh asset index 1		0.016	1.609	0.151	1.174	0.022	1.592
w2 hh asset index 2	***	0.215	1.625	0.606	2.036	0.233	1.648
w2 log hh per capita consumption		7.204	0.840	7.183	0.794	7.203	0.838
w2 Rural	***	0.454	0.498	0.748	0.436	0.468	0.499
w1 Age<7		0.392	0.488	0.427	0.497	0.394	0.489
Female		0.499	0.500	0.550	0.499	0.502	0.500
w2 Mom mental hlth	*	9.080	7.991	10.477	8.564	9.143	8.021
w2 Child yrs educ		3.918	1.608	3.710	1.624	3.908	1.610
w2 Child is in school		0.967	0.178	0.969	0.173	0.967	0.177
Avg size of elem school	**	335.228	150.044	305.991	134.275	333.905	149.469
Avg elem principal age		47.398	6.212	47.106	6.733	47.385	6.235
Avg elem principal experience		13.355	6.717	14.237	6.864	13.394	6.725
Avg elem teacher age		40.984	4.871	41.297	5.866	40.998	4.920
Avg elem teacher experience	**	9.100	3.344	8.426	3.340	9.070	3.347
Teachers w/ inservice training (%)		0.651	0.258	0.618	0.306	0.649	0.260
Percent schools lack materials	***	0.327	0.314	0.413	0.401	0.331	0.319
Avg Elem class size	**	33.966	11.529	31.376	6.995	33.848	11.375
Sch infrastructure index		-0.560	1.218	-0.718	1.264	-0.567	1.221
Missing school covariates		0.117	0.322	0.130	0.337	0.118	0.322

SS designates statistical significance between the non-migrant and migrant subsamples. *** p<0.01, ** p<0.05, * p<0.1

Table 2 below gives summary statistics for variables included only in the physical health regressions for the age 2-14 sample. The patterns seen in the age 5-12 sample of the covariates listed above are mirrored in the rest of the covariates in the age 2-14 sample. The two exceptions, also included in Table 2, are school covariates: The principal's experience (Avg elem principal

experience) and teacher in-service (anycarramagelemm) variables have differences between the non-migrant/migrant samples which are statistically significant—schools from migrants' districts have principles with more experience but fewer teachers who have had in-service training.

Table 2

		Father Not in US in Wave 2 (N=3886)		Father Migrating in US in Wave 2 (N=198)		All (N=4084)	
Variable	SS	Mean	SD	Mean	SD	Mean	SD
w1 BMI	***	-0.025	0.976	-0.258	0.961	-0.336	0.937
w2 BMI		-0.034	0.943	-0.097	0.822	-0.037	0.937
w2 Child age		9.437	2.522	9.510	2.733	9.441	2.533
w2 Mom height		153.733	7.246	153.423	6.231	153.718	7.199
w2 Mom BMI		28.222	5.229	28.177	5.087	28.220	5.221
w2 Mom hemoglobin		13.394	1.348	13.394	1.602	13.394	1.361
Missing Mom BMI		0.021	0.144	0.035	0.185	0.022	0.146
Missing Mom height		0.020	0.138	0.025	0.157	0.020	0.139
Missing Mom hemoglobin		0.415	0.493	0.369	0.484	0.413	0.492
Avg elem principal experience	*	13.51094	6.80506	14.34695	6.640049	13.55147	6.798729
Teachers w/ inservice training (%)	**	0.656656	0.257807	0.609574	0.304197	0.654373	0.2604

SS designates statistical significance between the non-migrant and migrant subsamples. *** p<0.01, ** p<0.05, * p<0.1

Children of migrants do not have a discernibly different BMI-for-age score in the second wave (though they do in the first), nor are their age or mothers' anthropometrics different than children who do not have a father migrating in the US.

Missing Data

For variables which are missing data in more than 4% of respondents, respondents are assigned the mean value in the sample population for that variable.[66] I also add a dummy variable for to empirical models accompanying each variable for which this imputation is made, which indicator takes on the value of 1 if the corresponding covariate value was missing (and so assigned the mean) and zero otherwise. Variables receiving this treatment include mother's years of education (and its square), mother's height, mother's BMI, mother's hemoglobin, and the school variables[67].

5. Empirical Strategies

[66] If a respondent is missing data for a variable in which less than 4% of respondents are missing, that observation is dropped from the analyses.

[67] Observations which were missing a value for one of the school variables were also missing values for all other school variables. Consequently only one "missing" indicator is added to the empirical models, accounting for all school variables.

In estimating the net impact of paternal migration on children left behind, we must confront the endogeneity issues of heterogeneity and simultaneity/reverse causality. To the extent that unobservable inputs affect the migration decision and also affect child outcomes, the estimates of the relationship between migration and child outcomes may be biased.

Unfortunately, as explained previously, we cannot sign the parental migration selection bias *a priori*. Concerned parents may altruistically decide that the best thing to help their child progress would be for the father to migrate to increase household income, thereby allowing desired financial investments in the child to be made. More capable, ambitious, or healthy parents may be more likely to migrate and may also have more capable and healthy children. On the other hand a bad parent may self select to leave (either because they are disinterested in the child or because they realize they are a bad parent), and the very removal of a disrupting influence in the child's life may have positive effects on the child independent of any potential positive remittance effect. Alternately the loss of a job might precipitate a father's decision to migrate in search of work, while corresponding wage loss might result in less investment in unmeasured inputs (books, study materials, parent time, food) which could improve the child's welfare; or the same job loss could increase parental home time, potentially partially offsetting the child impacts of wage loss.

Some of these factors may be controlled for directly or by proxy in the value-added plus model. While we cannot definitively rule out all confounding alternative factors, the value-added plus model includes prior measures of the outcome variable which, together with lagged inputs, is assumed to be a sufficient statistic of prior inputs not included in the model, including elements of child endowment and paternal attributes such as those which may be positively or negatively associated with migration (Todd and Wolpin 2003). The value-added plus model also allows the effect of previous inputs on the current output to persist at a declining and variable rate, thus affording the model greater flexibility of the coefficient of inputs in the production function relative to the fixed effect model. On the other hand, the difference in differences (child fixed effect) specifications will sweep out endogeneity problems caused by time-invariant unobservables which might affect migration and cognition. In their 2007 paper, Todd and Wolpin use a dataset with near-complete child histories on inputs to test a set of estimation equations using various restrictions on empirical equation (4), below, to determine which specification give the best fit. Their results indicate that a value-added plus model (using current inputs and lagged inputs and outcomes to estimate current outcomes) and the child fixed effect model fit the data best, but that the value-added plus model has an edge in cross-validation checks.[68]

I use both the value-added plus and the child fixed effect models to estimate the effect of paternal migration on child outcomes, as both perform well while using alternate assumptions to address issues of endogeneity. The value-added model is more efficient than the fixed effect model (though they are not nested, and so a Hausman test cannot be established), as the fixed effect differences out potentially useful variation in addition to potential fixed biases.

Following (Todd and Wolpin, 2003), (Todd and Wolpin, 2007) and (Andrabi et al., 2009), we employ a value-added plus model and a child fixed effects model as we make alternate assumptions

[68] Other models tested in(Todd and Wolpin, 2007) include the contemporaneous, cumulative, "straight" value-added, and sibling (mother) fixed effect. (Andrabi et al., 2009) also test the "gains score" value-added model and find it inefficient and implausible.

about the relationships of endowments (genetically imbued at birth) and inputs to child outcomes.[69] Both perform well in terms of minimizing bias while using alternate assumptions to address issues of endogeneity.

We can specify the production function model generally as

$$\boldsymbol{Z}=Z_{ija}=h_{ia}(\boldsymbol{G}_j(a), \mu_{ij0}) \quad (3)$$

in which a particular child outcome Z_i from the vector of child outcomes $\boldsymbol{Z}$ for child j at age a is a function of the vector $\boldsymbol{G}$ of all inputs and exogeneous environmental factors applied at any time up until age a. Here $\boldsymbol{G}$ includes the child outcome production function $f(y,t)$ in (1). The child's initial endowment of factors contributing to Z_i is denoted as μ_{ij0}.

The empirical implementation of (3) commonly assumes that the production function is approximately linear in inputs and endowments, and that input effects do not depend on the child's age but may depend on the size of lag between when they were applied and current age (Todd and Wolpin, 2007). If so, the "true" estimation equation becomes

$$\begin{aligned} Z_{ija} = \quad & \boldsymbol{X}_{ija}\boldsymbol{\alpha}_1 + \boldsymbol{X}_{ija\text{-}1}\boldsymbol{\alpha}_2 + \ldots + \mathbf{X}_{ij1}\boldsymbol{\alpha}_a \\ & + \boldsymbol{\beta}_a\boldsymbol{\mu}_{ij0} + \boldsymbol{v}_{ija}\boldsymbol{\varrho}_1 + \boldsymbol{v}_{ija\text{-}1}\boldsymbol{\varrho}_2 + \ldots + \boldsymbol{v}_{ij1}\boldsymbol{\varrho}_a + \varepsilon_{ija} \end{aligned} \quad (4)$$

where $\boldsymbol{X}_{ija}$ and $\boldsymbol{v}_{ija}$ are the vectors of observed and unobserved inputs at age a.

In the face of incomplete data, researchers have been required to make assumptions which place restrictions on (4) to make it estimable with the available data. Elements of paternal migration enter into both $\boldsymbol{X}$ for observable migration correlates such as the father's physical whereabouts, and $\boldsymbol{v}$ for unobservable migration characteristics such as father's health, entrepreneurial spirit, and level of care for the child (relative weighting of the child's welfare in the father's utility function), and importantly, fathers' time investments and financial investments (through remittances). Because we are not able to construct fathers' time and financial investments / remittances from the MxFLS data for absent fathers, I use a set of migration status variables $\boldsymbol{M}$ as a reduced form estimate of time and money net impacts.

As indicated, for the case of paternal migration impacts on child outcomes using the MxFLS data, other unobserved factors (e.g. father's health and entrepreneurial spirit) may endogenously influence parent inputs including those which simultaneously induce a father to migrate and which also affect child outcomes.

When data on lagged inputs are missing or incomplete, the educational production function literature commonly uses a value-added specification. All value-added models use lagged outcome scores in the regression. As previously indicated, when the only lagged variable used is the lag of the outcome, the model assumes that the lagged outcome is a sufficient statistic for the cumulative effects of all previous inputs germane to the child's production of the outcome. The value-added plus specification relaxes that assumption by including available lagged inputs as regressors as well, with the subsequent assumption that the lagged outcome variable is a sufficient statistic for all

[69] (Todd and Wolpin, 2003) and (Todd and Wolpin, 2007) apply a similar function to cognitive achievement. A slightly more general model used here can be used for a range of child outcomes without loss of applicability.

previous *unobserved* inputs into the child's production of the outcome, including endowment μ. This weaker assumption of the value-added plus model is less likely to be violated, making it a better choice than the standard value-added model. The panel nature of the MxFLS data allows the application of such a value-added plus model with a one period lag of inputs. The model employed in this paper also includes alternate specifications of the set of included reduced form migration variables, $\boldsymbol{M}$ for child j at various ages (a) but consistent across outcomes i, and contemporaneous values of fixed or mechanical inputs $\boldsymbol{F}_{ij}$.[70]

$$Z_{ija} = \quad \boldsymbol{X}_{ija}\boldsymbol{\alpha}_1 + \boldsymbol{X}_{ija\text{-}1}\boldsymbol{\alpha}_2 + \gamma Z_{ija\text{-}1} + \boldsymbol{M}_{j(a)}\boldsymbol{\varphi} + \boldsymbol{F}_{ij}\boldsymbol{\theta} + e_{ija} \tag{5}$$

Moving from (4) to (5) requires the assumptions that influence of current unobserved inputs on current outputs declines geometrically and are uncorrelated with included inputs and the baseline score, or that both current and lagged omitted inputs are uncorrelated with included regressors. It also assumes that the impact of the endowment declines at the same rate as unobserved inputs and that the error terms is serially correlated to match the rate of decay of input effects such that the difference between current and lagged error terms is an independently and identically distributed (iid) shock.

The child fixed-effect specifications allows us to overcome endogeneity concerns with respect to unobserved endowments and other static unobserved variables such as parents' attitudes toward child welfare which may affect both the migration decision and child outcomes.[71] Within-child fixed effects require full sets of inputs and outcomes for at least two periods in the same child's life. With exactly two periods, this becomes a difference-in-differences estimator with the assumptions that the impact of the endowment on achievement is independent of age, and either that omitted inputs are age invariant and so are differenced out, or that the differenced included inputs are orthogonal to the differenced omitted inputs. The estimation equation for the child difference in differences model can be written as

$$Z_{ija} - Z_{ija\text{-}1} = (\boldsymbol{X}_{ija} - \boldsymbol{X}_{ija\text{-}1})\,\boldsymbol{\alpha} + (\boldsymbol{M}_{ija} - \boldsymbol{M}_{ija\text{-}1})\boldsymbol{\varphi} + (\beta_a - \beta_{a'})\,\boldsymbol{\mu}_{ij0} + e_{ija} - e_{ija\text{-}1}.$$

[70] These include controls such as school infrastructure characteristics for which data only appears in MxFLS-1, mother's cognition which is a proxy for heritable endowments, and child's age which increases mechanically over the period and which is already taken into account as the current and lagged outcomes are given as z-scores constructed by age cohort.

[71] A Note on the sibling fixed effect specification: Though Todd and Wolpin (2003) indicate that a fixed-effect model based on siblings of different ages but at the same calendar time are a special case of the within-child estimator using the same child tested at different ages, they later opine in Todd and Wolpin (2007) that to use a sibling fixed effects model, siblings need to be the same age at the time of the outcome measure (though taken at different calendar periods). Other researchers have taken a more liberal view and allow siblings to be of different ages at the time of evaluation, so long as those siblings are deemed to have reached their ceiling level in the outcome (see (Antman, 2008)). None of these three approaches is a good fit for the MxFLS data because it only contains two waves, three years apart, and only reports child cognition and behavioral data for respondents between age 5 and 12 for each wave. Thus the sample would be limited either to those families who happen to have two children within 4 years such that they are age 5-9 in the first wave and 8-12 in the second for the case of testing siblings at the same calendar time but at different ages (these children would also have the same value for father's current migration status and so we could not directly estimate our parameter of interest), or the sample would be limited to those families who happened to have two children, preferably of the same gender, exactly three years apart. Both scenarios would severely limit the sample along parameters which are not intrinsically compelling. Finally, children do not reach their "ceilings" for any outcome evaluated here by age 12, so the Antman approach is not applicable either.

In this specification the set of migration variables $\boldsymbol{M}$ is limited to two variables: an indicator taking the value 1 if the father is migrating in the US at age a or a - 1 (equivalent to wave 2 and wave 1), and a continuous variable bounded between 0 and 1 for the share of the share of the child's life which the father has spent migrating in the US at age a or a - 1. For the child fixed effects model to be consistent, the impact of the endowment and other unobserved factors (including factors contributing to migration and child outcomes) must be independent of age ($\beta_a = \beta_{a'}$) such that the endowment term μ (which includes both a child's endowment ability and all other time invariant observables and unobservables) drops out, and that prior outcomes do not affect later unobserved input decisions ($e_{ija\text{-}1} \perp \boldsymbol{X}_{ija}$). Finally if unobserved factors are age dependent, the differenced observed inputs must be orthogonal to differenced unobserved inputs. Importantly in the discussion on migration selection, the DD specification nets out any characteristics which may have increased the likelihood of migration and which affect child outcomes which existed at the time of the first MxFLS wave, as well as inputs and characteristics which are fixed over time, in μ.

For the value-added specifications, the endogneity concerns with respect to unobserved inputs on observed inputs may be ameliorated for observed input variables of interest if a valid instrument can be found which can exogenously shift the endogenous input.[72] (McKenzie, Gibson and Stillman, 2010) compare empirical approaches to overcoming selection using the randomization of the Tonga-New Zealand migration lottery and find that with the exception of instrumental variables, all non-experimental approaches overestimate the wage gains from migration—though fixed effect estimation fares best among alternatives to instrumental variables. Commonly used instruments for Mexican migration are historical migration rates (either at the state or community level through censuses, or for historical migration programs like the *bracero* program in the early 1900s), or distance to the US border, or some interaction of these with a measure of household socio-economic status (usually the mother's education level).

I have applied all of these to the reduced form equations for all child outcomes in this paper, as well several others of my own invention, and find that none is a valid instrument for this context. All fail the Stock and Watson "rule of thumb" that the first stage F-statistic should be greater than 10 and so are weak as instruments (Wooldridge, 2002). As a result, the second stage regression coefficients are often implausibly large. Results are available in Appendix 2.

Importantly, all of the literature which instruments for migration only instruments for current migration status. If the results in this paper are accurate, then migration has at least two important components: current migration (a "flow" of sorts) and migration history (the "stock" or cumulative effect of migration). Omitting one of these components creates a real bias in the estimate of the relationship between migration and outcomes, no matter how precisely instrumented the included component may be. Triangulating between the results of the value-added plus models and the fixed effect models may give sound evidence as to the true relationship between migration and child outcomes.

6. Results

[72] The fixed-effect estimators might also benefit from instrumenting to take out the effect of time-variant unobservables correlated with included regressors. I have not seen proposed a dynamic instrument which can predict both outgoing and return migration but does not plausibly violate the exclusion restriction. Still, in the future, it may be possible to overcome even this hurdle with an Arrelano-Bond type estimator (Arellano and Bond, 1991). This estimate requires at least three periods of data to use the difference in the first two as instruments for the third. With the third wave of the MxFLS fielded in the summer of 2009, this may be possible.

To understand the relationship between fathers' migration and child cognitive, behavioral, and physical health, the value-added plus and child fixed effect models described above are applied to three child outcome indicators: objective cognition scores, attentiveness scores, and body mass index. Table 3 below shows results for cognition in alternate specifications.

Cognition Results

Value-Added plus estimates for the migration variables ("abbreviated results") are shown in Table 3. Full results are in Table 1 of Appendix 3. Column 1 is a simple value-added model, controlling only for the previous cognition test score and current migration status. Column 2 adds the full host of controls but continues to treat migration with a single variable indicating current migration status. Column 3 introduces the life share variable indicating the share of the child's life her father has spent immigrating in the US, based on the father's reported migration history. A control for migration in wave 1 is added in column 4, where column 5 repeats that model but adds dummies for birthyear cohort. This model in column 5, which has the full set of controls including birth years, and indicators for current and previous wave migration and the variable for the life share of migration, is the preferred VA+ model and is the one most comparable to the fixed effects specification. Consequently, this is also the VA+ model used for robustness checks and testing heterogeneous effects. Column 6 gives a different treatment to migration, incorporating an element of migration direction with indicators for whether the father returned in wave 2 (was gone in wave 1 only), left in wave 2 (was home in wave 1) or has always been away (in the US in both MxFLS waves); the omitted category is fathers who have always been home (not in the US in either wave). Column 7 reproduces column 5, but controls for year of birth with cohort dummies (not shown). Robust standard errors, clustered at the municipal level are given in parentheses[73]. This succession of models in columns 1-7 for the VA+ models is used for each of the child welfare outcomes in their respective sections below.

We see that current migration has a negative coefficient in each of the specifications, decreasing the child's cognition score by a little less than a fifth of a standard deviation, though the result is only marginally statistically significant in the model which includes neither previous migration nor birthyear dummies. In the "directional" variations (columns 6 and 7), children whose fathers recently left to migrate to the US do worse on cognitive measures by about 0.3 standard deviations, a statistically significant result. There is also some evidence in these directional regressions that paternal migration may have persistent negative effects as those whose fathers returned do worse by a fifth of a standard deviation on the cognition measure relative to those whose fathers were not in the US in either wave, though this is only marginally statistically significant.

[73] Clustering at the household level changes little, though standard errors are, somewhat larger. In the stratified clustered random sampling methodology of the MxFLS, municipality is the clustered selection level, and so clustering by municipality as done in this paper is arguably the better approach.

Table 3: Cognition VAM+

Cognition VAM+ Abbreviated Results

VARIABLES	(1) Bivariate w2 Child Cognition	(2) Full 1 w2 Child Cognition	(3) Full 2 w2 Child Cognition	(4) Full 3 w2 Child Cognition	(5) Full 3 birthyears w2 Child Cognition	(6) Full 4 w2 Child Cognition	(7) Full 4 birthyears w2 Child Cognition
W2 Dad in USA	-0.149	-0.108	-0.199*	-0.187	-0.194		
	(0.107)	(0.111)	(0.114)	(0.115)	(0.117)		
W1 Dad in USA				-0.163	-0.170		
				(0.140)	(0.142)		
W2 Share life Dad in USA			1.107*	1.693***	1.746***		
			(0.589)	(0.640)	(0.654)		
Dad returned from USA						-0.215*	-0.219*
						(0.117)	(0.123)
Dad left for USA						-0.298**	-0.304**
						(0.121)	(0.124)
Dad in USA W1 & W2						0.143	0.139
						(0.197)	(0.192)
Constant	0.0113	-0.346	-0.358	-0.352	0.772**	-0.332	0.780**
	(0.0334)	(0.344)	(0.344)	(0.346)	(0.384)	(0.348)	(0.385)
Observations	2,896	2,778	2,778	2,778	2,778	2,778	2,778
R-squared	0.056	0.164	0.165	0.165	0.174	0.167	0.175

Robust, clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The life share variable in columns 3-5 indicates that conditional on a father's current migration status (and all other factors), cognition scores improve the longer the father has been away. A one percentage point increase in the share of the child's life (roughly 1.2 months of additional absence at the sample mean age of 10.2 years old) that the father has been in the US is associated with an increase of 0.017 standard deviations on the Raven cognition test. As the average lifeshare of paternal migration in the sample for children whose father was in the US in wave 2 is 8.2%, the average cognitive benefit due to the lifeshare effect is 0.14 standard deviations. On potential explanation of this seemingly contradictory result is that because money can be saved but time cannot, this lifeshare result may be associated with higher (smoothed) consumption as migrants are able to increase the stock of household savings the longer they are away.

Other covariates, where significant, have the expected signs. The child's previous cognition score, mother's cognition score, and mother's education, and the first principal component of the household asset index in the second wave all have a positive effect on child cognition and are strongly statistically significant. The second component of the household asset index in the second wave is negatively associated with child cognition. Interestingly, wave 1 household size is negatively associated with cognition, but the association is positive for wave 2 household size. Once we condition on birth cohort, child age is negatively associated with cognitive test scores, another puzzling result.

The fixed effect model makes assumptions less likely to be violated and which are not nested in the assumptions of the value-added plus model. We are able to sweep aside family-level time

invariant factors including genetic endowment and fixed paternal proclivity towards migration, which may be endogenous in the child cognition / paternal migration relationship. Table 4 gives child fixed effect results which net out the child's endowment, child's parental cognitive endowment and fixed migration selection characteristics and fixed inputs.

Table 4: Cognition Fixed Effects, abbreviated results

VARIABLES	(1) Bivariate FE Child Cognition	(2) Simple FE Child Cognition	(3) Full FE Child Cognition
Dad in USA	-0.00212	-0.000563	0.0142
	(0.101)	(0.101)	(0.105)
Share of life Dad in USA		0.401	0.947
		(1.420)	(1.730)
Constant	-0.0230***	-0.0251***	-0.445***
	(0.00443)	(0.00866)	(0.137)
Observations	5,792	5,792	5,704
R-squared	0.000	0.000	0.007
Number of id	2,896	2,896	2,885

Robust, clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Column 1 only includes changes in migration status as a control (where positive movement in the migration variable indicates outmigration); column 2 adds only the migration lifeshare variable. Column 3 includes both of these migration variables but adds the time-variant covariates as well[74]. Cognition is not related with paternal migration in a statistically significant way, and the point estimate is essentially zero with a relatively small standard error. However, it is interesting to note that outmigration has a positive coefficient in the full fixed effect model, where the point estimate was negative in the VA+ models, and significantly so with the "directional" set of migration variables. As with the VA+ models, lifetime migration share is positive (though it is not significant in the DD models). Complete results for the fixed effect models are given in Appendix Table A3.2

Overall, current paternal migration effects on cognition are negative or not distinguishable from zero across the VAM+ and DD specifications. The share of a child's life the father has spent in the US is more robust and positively related to cognition outcomes. The empirical results imply an ambiguous net effect for cognition: Migration status, where significant, is negative, but migration

[74] Excluded are time-variant characteristics which increase mechanically, such as age. Variation in such variables is artificial due to variation in the order in which households were surveyed across the two waves. As such variation adds only noise and attenuates results, I drop the variable in the FE regressions. In the end, it makes little difference to the results.

lifeshare, where significant, is positive. For most empirical models, however, neither effect is distinguishable from zero.

These results are robust to the inclusion of potentially endogeneous variables of consumption (log of household per capita consumption), child's years of education, and mother's depression—though mother's depression is negatively and significantly related to child cognition in both the VA+ and FE models. Abbreviated results of robustness checks are reported in Tables A3.3 and A3.4.

Attentiveness Results

The progression of models for the attentiveness outcome is identical to that used for cognition. Abbreviated results for the VA+ model of attentiveness are reported in Table 5 below.

Table 5: Attentiveness VAM+, abbreviated results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Bivariate	Full 1	Full 2	Full 3	Full 3 birthyears	Full 4	Full 4 birthyears
VARIABLES	w2 Attentiveness	w2 Attentiveness	w2 Attentiveness	w2 Attentiveness	w2 Attentiveness	w2 Attentiveness	w2 Attentiveness
W2 Dad in USA	-0.162**	-0.136*	-0.198**	-0.196**	-0.195**		
	(0.0671)	(0.0756)	(0.0824)	(0.0832)	(0.0832)		
W1 Dad in USA				-0.0224	-0.0221		
				(0.0615)	(0.0627)		
W2 Share life Dad in USA			0.752**	0.832**	0.845**		
			(0.335)	(0.389)	(0.395)		
Dad returned from USA						-0.0329	-0.0300
						(0.0556)	(0.0565)
Dad left for USA						-0.236**	-0.233**
						(0.0931)	(0.0932)
Dad in USA W1 & W2						0.00448	0.00600
						(0.0880)	(0.0885)
Constant	3.313***	3.269***	3.259***	3.259***	3.411***	3.269***	3.416***
	(0.0708)	(0.206)	(0.206)	(0.206)	(0.246)	(0.206)	(0.245)
Observations	2,894	2,776	2,776	2,776	2,776	2,776	2,776
R-squared	0.005	0.046	0.048	0.048	0.050	0.048	0.051

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Wave 2 migration (or outmigration in the set of dynamic migration variables) is negative and statistically significant for the attentiveness outcome across all VA+ models. Here a father currently migrating is associated with a reduction of a fifth of a point on the 4-point attentiveness scale on a base of 3.3 points. The lifeshare variable, however, is consistently positive and statistically significant. A one percentage point increase in the share of the child's life the father has been migrating is associated with an increase of 0.008 points in the attentiveness scale. As the average share of a child's life is 8% for those whose parents are migrating in wave 2, the gains from the lifeshare variable amount to about 0.064 points on the attentiveness scale, which is still an order of magnitude less than the loss due to the father being gone. The positive lifeshare benefit does not appear large enough to offset the negative current migration effect on child attentiveness. Paternal migration as estimated by the VA+ model seems to be a net negative for children's attentiveness.

Table 6: Attentiveness FE

	(1)	(2)	(3)

VARIABLES	Bivariate FE Attentiveness	Simple FE Attentiveness	Full FE Attentiveness
Dad in USA	-0.0199	-0.0114	-0.0223
	(0.0603)	(0.0601)	(0.0615)
Share of life Dad in USA		2.175**	1.824*
		(0.956)	(0.957)
Constant	3.318***	3.307***	3.229***
	(0.00266)	(0.00575)	(0.0819)
Observations	5,788	5,788	5,700
R-squared	0.000	0.002	0.003
Number of id	2,894	2,894	2,883

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

As seen in the Table 6 above, this result seems to hold, though current migration status is no longer statistically significant. Lifeshare is marginally significant in the full fixed effect model, though the magnitude of the positive effect is larger than what was observed in the VA+ model. Complete results of the Attentiveness fixed effect model are found in Appendix Table A3.6.

Robustness checks were run on the VA+ and DD models with the potentially endogenous variables mentioned previously: consumption, child's years of education, and mother's depression. The results described above were robust to these tests, and abbreviated results can be found in Appendix Tables A3.7 and A3.8. In addition, as the attentiveness score is a Likert score and so may be ordinal in nature, I also tested for robustness of functional form by employing an ordered probit with the VA+ model. While the interpretation is slightly different, of course, the result is the same: a negative, large, and statistically significant result for current migration and a positive, statistically significant, though much smaller coefficient for the lifeshare variable. It seems reasonable to conclude that time inputs are the critical input for child attentiveness and that paternal migration has a net negative impact on child behavioral health.

Physical Health Results

Again, the progression of models for the physical health outcomes using z-scores of the body mass index (BMI) follows the same sequencing as that in the cognition and attentiveness sections. The sample is larger for the BMI estimates because the data available for the outcome variable covers a wider age range (2-14 here versus 5-12 for cognition and attentiveness).

Table 7: BMI: VAM+, abbreviated results

VARIABLES	(1) Bivariate w2 BMI	(2) Full 1 w2 BMI	(3) Full 2 w2 BMI	(4) Full 3 w2 BMI	(5) Full 3 birthyears w2 BMI	(6) Full 4 w2 BMI	(7) Full 4 birthyears w2 BMI
W2 Dad in USA	0.0447	0.0485	0.0498	0.0527	0.0482		
	(0.0602)	(0.0631)	(0.0596)	(0.0606)	(0.0598)		
W1 Dad in USA				-0.0408	-0.0468		
				(0.0629)	(0.0635)		
W2 Share life Dad in			-0.0147	0.112	0.139		

USA							
			(0.364)	(0.457)	(0.464)		
Dad returned from USA						0.0198	0.0120
						(0.0551)	(0.0547)
Dad left for USA						0.104	0.0969
						(0.0662)	(0.0663)
Dad in USA W1 & W2						-0.0348	-0.0354
						(0.0955)	(0.0927)
Constant	-0.0224	-0.782*	-0.782*	-0.772*	-0.518	-0.805*	-0.550
	(0.0200)	(0.399)	(0.401)	(0.405)	(0.419)	(0.409)	(0.424)
Observations	4,084	3,938	3,938	3,938	3,938	3,938	3,938
R-squared	0.232	0.268	0.268	0.268	0.271	0.268	0.271

Robust, clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

As illustrated in Table 7 above, the value-added plus models indicate a positive relationship with current and lifeshare migration, though none of the results is statistically significant. Complete Results are found in Appendix Table A3.9. The Difference in Differences (Fixed Effect) results in Table 8 below, illustrate the same positive relationship between BMI and current migration but with statistically significant results. Here a father who migrates to the US can expect to see their child's body mass increase by 0.l standard deviations. Similarly, the share of the child's life the father has been gone is also positive and statistically significant. A one percentage point increase in the share of the child's life the father is migrating in the US is associated with an increase of 0.01 standard deviations in age-standardized BMI.

Table 8: BMI z-score Difference in Differences, abbreviated results

VARIABLES	(1) Bivariate FE BMI	(2) Simple FE BMI	(3) BMI Full BMI
Dad in USA	0.112**	0.118**	0.108**
	(0.0540)	(0.0539)	(0.0522)
Share of life Dad in USA		1.196**	1.111*
		(0.607)	(0.615)
Constant	-0.0423***	-0.0491***	1.174*
	(0.00245)	(0.00429)	(0.698)
Observations	8,122	8,122	8,016
R-squared	0.001	0.001	0.009
Number of id	4,061	4,061	4,047

Robust, clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Complete results in Appendix Table A3.10

Robustness checks similar to those run for the attentiveness and cognition outcomes were conducted for BMI results, with no changes in the patterns described above. Abbreviated results for these tests are found in Appendix Tables A3.11 and A3.12.

It seems reasonable to conclude that as an outcome, children's body mass index benefits from the migration of their fathers. This is evidence that monetary inputs are more important than paternal time inputs for a child's physical health.

Overall, we have seen that attentiveness outcomes are negative, and physical health outcomes are positive, and cognition outcomes are ambiguous but likely somewhere in between the other two outcomes. I interpret this result as evidence of the empirical prediction of the economic model—that paternal migration should have relatively better (or less negative) effects on outcomes in which there is less parenting involved, like health. This rank ordering of results from worst to best in child welfare—behavior then cognition then physical health—fits with the predictions of the economic model.

7. Effects Over Gender, Wealth, Locality, and Age Groups

In this section I use the value-added plus and difference in differences models to explore effects in the outcomes of children over gender, wealth (consumption), locality, and age. Accordingly, I split the sample into boys/girls, by wealth as higher/lower than median log per capita household consumption, by urban/rural, and by age <7 / age 7+ and run the preferred regressions from the tables above (column 5 for the VAM+ and column 3 for the FE/DD). Table 9.1 below reports the coefficients of the current status and lifeshare migration variables for each of these regressions for the VAM+ specification. Table 9.2 does the same for the FE model. Additional details of these regression runs are given as abbreviated results regression tables in Appendix Tables A4.1-A4.21, which also include results from regression runs interacting the group variables of interest with the current and lifeshare migration variables (interaction results not reported in tables below)

Table 9.1: Summary Table of Coefficients from VAM+ specifications testing Effects by Gender, Wealth, Locality, and Age. (Details in Appendix Tables A4.1-A4.21)

	Cognition		Attentiveness		BMI	
	Current Mig [Past Mig]^	Lifeshare	Current Mig	Lifeshare	Current Mig [Past Mig]^	Lifeshare
Overall	-0.193	1.737***	-0.195**	0.846**	0.0483	0.136
Boys	-0.214	2.278**	-0.162	0.296	0.0236 [-0.239***]	0.763**
Girls	-0.152	1.453	-0.222**	1.259**	0.0523	-0.442
Poor	-0.180	2.040*	-0.253**	1.614**	0.0530	-0.334
Wealthy	-0.266*	1.168	-0.130	0.279	0.0418	0.651
Urban	-0.151 [-.0392**]	1.913*	-0.106	0.372	-0.203	-0.340
Rural	-0.230	1.839**	-0.234**	1.040**	0.0876	0.187
Older	-0.011	-0.445***	-0.177**	0.968**	0.0711	1.111**

Younger	1.666**	2.088**	-0.203*	0.386	-0.00283	-0.138

^Past Migration (migrating in wave 1) coefficient reported if statistically significant

Table 9.2: Summary Table of Coefficients from FE specifications testing Effects by Gender, Wealth, Locality, and Age.

	Cognition		Attentiveness		BMI	
	Current Mig	Lifeshare	Current Mig	Lifeshare	Current Mig	Lifeshare
Overall	0.014	0.947	-0.022	1.824*	0.108**	1.111*
Boys	0.048	1.091	0.034	-2.070	0.147*	0.954
Girls	-0.014	0.913	-0.078	3.835***	0.082	1.563
Poor	-0.036	0.0723	-0.079	1.755	0.164**	0.321
Wealthy	0.104	1.853	0.075	1.949*	0.012	1.498
Urban	0.383**	3.803***	0.003	3.915**	0.019	-0.340
Rural	-0.094	-0.133	-0.026	0.808	0.136**	1.609***
Older	0.211	-0.270	0.056	2.568**	0.090	1.463
Younger	4.375***	-2.791	-0.150	1.060	0.126	0.864

Both the VAM+ and FE models indicate statistically significant and positive relationships of current migration on the cognition scores of younger children (age 5-6), and both specifications indicate a positive relationship between the share of life of paternal migration and cognition for the urban subsample. Share of life is also positively correlated with attentiveness in both specifications for the poor and older samples, as well as the overall sample.

While results which are statistically significant in one class of models are not always significant in the other, in the vast majority, the signs of coefficients agree across models whenever a coefficient is significant in at least one model.[75] Examining these more closely yields interesting patterns. Boys, for example, show a positive relationship between lifeshare and cognition and current migration and BMI. Girls show a negative relationship between current migration and attentiveness but a positive correlation between attentiveness and lifeshare. Wealth also reveals interesting results: Those whose household's per capita consumption is below the median exhibit a positive relationship between lifeshare and cognition and attentiveness, while current migration is negatively related to attentiveness but positively related to BMI. There are no particular patterns among the better-off children, except for a weakly statistically significant relationship between lifeshare and attentiveness.

[75] Of the 29 statistically significant results in Tables 9.1 and 9.2 above, the coefficient bears the opposite (though not statistically significant) sign in only 5, yielding an agreement rate of over 80%.

Continuing onto patterns in locality, lifeshare is positive and significantly linked with cognition and attentiveness for both the urban and rural populations on the cognition and attentiveness outcome (as well as BMI for rural folks as well). Current migration is negatively related to attentiveness but positively related to BMI for those living in rural areas of Mexico. Finally, splitting the sample by age gives perhaps the most puzzling results, at least for cognition where the younger subsample (age 5-6) do far better on their cognition scores when their father is migrating—a result borne out by both the VA+ and FE models at high levels of statistical significance. On the other hand, the older subsample (age 7-9) on the cognition outcome experiences the only statistically significant negative relationship of any outcome with lifeshare of paternal migration. This may be indicative that the optimal relative mix of time versus financial inputs changes with age for cognitive outcomes, and certainly supports the economic theory and discussion earlier that cognition requires a more even mix of time and money than do behavioral or physical health outcomes, resulting in more uneven results. Rounding out the findings, we observe that lifeshare is positive and significant for older children in both attentiveness and BMI.

8. Discussion and Conclusion

While the immediate net impact of paternal migration on any particular outcome is cannot be signed by economic theory, it does allow us to predict the rank order of outcomes according the relative importance of paternal time versus money in the outcome production function. The empirical results support this prediction: current migration is negatively associated with behavioral outcomes, is negative to middling with cognitive outcomes, and is positively associated with physical health.

Alternately, the effect of the share of a child's lifetime in which the father migrates to the US is positive in each specification explored in this paper, and is nearly always statistically significant. Conditional on his current whereabouts, the longer the father has spent migrating (presumably earning higher wages), the better off the child's cognitive, behavioral, and physical health may be. One potential explanation which merits further development may be that lifeshare is partially exhibiting effects of families' increased (smoothed) consumption, as financial assets can be saved while time cannot be; fathers who are away longer earn more which, *ceteris paribus*, benefits families. Alternately, it may be that a selection mechanism is at work: perhaps fathers who choose to stay away longer do so because they know their children are resilient, or because they know they have poor parenting skills and so their time spent in child-rearing contributes little relative to the superior wages they earn as a migrant worker.

I take this as evidence of migrant earnings relaxing the household budget constraint through accumulated wealth. It may also be that as a father spends more time abroad his children may be better to cope with his absence or the experience in some way may make him a better provider for his children—through experiences gained including a broader world view, increased earnings potential, etc. Overall these results are suggestive that though there may be short term costs of migration born by children of migrants, medium run impacts may be positive.

Prior research has been somewhat mixed regarding the effect of parental migration on children's outcomes, education being the most studied. This is perhaps not surprising if the sole metric of parental migration is the father's current migration status. Indeed, the research presented

here on cognition, a gives results straddling positive and negative effects not statistically discernible from zero for current migration in nearly all models. However, if we allow for more dynamic effects, controlling for current migration status we see that paternal migration is more likely associated with positive results for child cognition in the medium term—as evidenced by the positive and statistically significant coefficient on the share of the child's life the father is away.

As may be expected with a system in which a single decision effects two critical inputs in opposing ways, the net welfare effect may be a function of which outcome variable is examined. In the case of paternal migration impacts on children's physical health, the net effect is dominated by the positive channel of the income effect, while behavioral outcomes are more heavily influenced by the negative path of the parental absenteeism effect. General intelligence as measured by the Raven cognition test occupies a sort of middle ground, being influenced in similar measure by both paths. All of these results are robust to the inclusion of potentially endogenous variables: household per capita consumption, child's years of education, and mother's depression.

These general results expose telling patterns when decomposed by gender, household wealth, locality, and age. For example, children from poorer households seem to feel migration effects more acutely—their BMI scores and to a degree their cognition scores are much better than those from wealthier households, but their attentiveness scores are much worse. On the other hand, boys see more pronounced effects of fathers' migration on cognition and BMI while migration has a larger (negative) impact on attentiveness for girls. The effect on cognition is larger for urban children tend to do better than their rural counterparts. Where cognition scores are helped for the young, the older children are more affected in their attentiveness and BMI outcomes.

The policy implications of this research point to the need for a nuanced approach to understanding the impact of paternal migration on child welfare, depending on both outcome and time horizon. Outcomes which rely more on parental time inputs fare worse than those which rely more on financial inputs, at least in the short term. Child welfare is complex, and parental migration is likely to have mixed near-term results. On the other hand, the medium term results of migration seem to be uniformly positive, as the share of the child's life a father has spent migrating has a statistically significant positive relationship with all outcomes tested, in nearly all specifications. This may imply that the potential negative relationship between current migration status and a particular outcome may be somewhat mitigated through a well-functioning guest worker program wherein migrants are allowed frequent re-entry. Such a regime, as in the *bracero* program which ended in the 1960's, would allow for more frequent visits to the home-country family, which could break up long periods of fatherlessness.

This paper highlights two areas meriting further research. First, it is clear that migration has a complex relationship with outcomes of children left behind. The VA+ and Difference in Differences models both indicate that current and lifetime absence matters to child welfare. The VA+ model also gave an alternate plausible formulation of migration capturing the direction of migration flows. Further theoretical and empirical work would be useful to better understand the nature of these relationships. Second, child welfare is not monolithic and attempts to describe it using a single variable (say, education) in relation to parental migration will give an inaccurate understanding of child well-being. Rather, welfare is contingent on the specific child outcome under observation. This paper has traced out the relationship of paternal migration on three outcomes: cognition, attentiveness, and BMI. Further research into other child outcomes is warranted.

Finally, the internal validity of the results of this paper are somewhat undermined by the possibility of the existence of migration selection on time-variant unobservables which also affect child welfare. If the MxFLS fields and publishes its third wave as initially planned, there is hope that we may be able to further disentangle the countervailing income and parenting effects of paternal migration, perhaps using an Arrelano-Bond estimator (Arellano and Bond, 1991). Doing so should be valuable in shaping the global debate on international migration policy.

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Appendix 1: Extension of the economic model

Previous version of this paper included an economic model of parental selection. This model is preserved here as instructive of future directions of work.

What follows traces out the beginnings of a notional model of the motivations of parents to migrate with respect to their child's welfare. Parents who are completely unmotivated by their child's welfare are an uninteresting case for the economic question at hand—they will migrate regardless of impact on the child, positive or negative. Here we model parents optimizing over their child's welfare and a bundle of all other goods and competing interests. The interesting question here is under what conditions a "fully" altruistic parent, or a parent who acts as a perfect agent for his child, might still chose to migrate. Thus, it may be useful to model the altruistic parent's migration decision to estimate the worth of a present parent.

The level of parental altruism or parenting ability may be positively or negatively correlated with the migration choice. It could be that caring parents may want to be better providers for their children, or it could be that poor parents may not care about potential negative effects of being gone, and selfishly want to get away from their responsibilities. Either way, the parent may be more likely to migrate, but their parenting preferences would have opposite effects on their children.

While there may be some selection issues here, it is not clear which way selection might go: would good parents be more willing to migrate because of a desire to help the family, or would a bad parent be more willing to migrate making a rational decision that his children may be just as well off with him as without him?

For the present purpose we will ignore the problem of uncertainty. Even if a parent's migration decision is fully altruistic, they may not actually obtain work. Still, leaving the home for access to better labor markets does not guarantee better outcomes, even if the migrant successfully finds employment. It is not clear that their migration decision will actually benefit their children and developing the economics of the conditions under which children would benefit is a useful exercise. We can couch the relationship between parental altruism and migration choice in a Becker-type model of parental investment in child well-being [76] and similar in spirit to (Leibowitz, 1974) which was the first to model home investments of time and money in their children.
Parents' utility function is defined over their own consumption (c_p)and the future wealth of their children (w_c) weighted by the parent's altruism (a), bounded between 0 and 1:

$$U_p = U(c_p) + a \cdot V_c(w_c)$$

where $U'>0$ and $U''<0$. Parents can work either in the domestic market or the foreign market at wages w_D and w_F. Parents have some level of wealth w_p which is a function of their wage and time spent working at that wage, t_D or t_F:

$$w_p \equiv w_D t_D + w_F t_F$$

Parents allocate their wage between own consumption c_p and investment in the child y_c such that the fiscal budget constraint becomes

$$w_p = c_p + y_c$$

Parents allocate their time endowment T between working in the domestic or foreign market such that the temporal budget constraint is

[76] See (Becker and Tomes, 1979), (Becker and Tomes, 1986), and (Becker, 1993). These models owe their roots

$$T = t_D + t_F$$

We continue with the child human capital production function used in this paper styled after Hanson and Woodruff (2003) where Children's wealth w_c is generated through a production function for human capital (in this case cognition) H_c as a function of resources spent on the child y_c, parenting of the child represented by whether the parent is present in the home or not as the labor market decision t_F, and family characteristics as a technology parameter, all weighted by the market rate of return to human capital r:

$$w_c = r \cdot H_c = r \cdot h(y_c, t_F; \phi)$$

where $\frac{\partial h}{\partial y_c}, \frac{\partial h}{\partial \phi} > 0$ and $\frac{\partial h}{\partial t_F} < 0$. That is, human capital depends positively on parental financial and temporal investment, with foreign work representing a negative temporal investment. The parent's allocation decision then becomes:

$$\max_{y_c, t_F} U(w_p - y_c) + aV(rh(y_c, t_F; \phi))$$

Or substituting in for the budget constraints:

$$\max_{y_c, t_F} U(w_D T + (w_F - w_D)t_F - y_c) + aV(rh(y_c, t_F; \phi))$$

Solving this give us the following First Order Conditions:

FOC [y_c]:

$$-\frac{dU}{dc_p} + a\frac{dV}{dw_c} r \frac{\partial h(\phi)}{\partial y_c} = 0$$

$$rh'_{y_c} aV' = U'$$

or

$$r\frac{\partial h(\phi)}{\partial y_c} = \frac{U'}{aV'}$$

[t_F]:

$$\frac{dU}{dc_p}(w_F - w_D) + a\frac{dV}{dw_c} r \frac{\partial h}{\partial t_F} = 0$$

$$rh'_{t_F} aV' = -U'(w_F - w_D)$$

or

$$r\frac{\partial h(\phi)}{\partial t_F} = -\frac{U'}{aV'}(w_F - w_D)$$

Thus the parent should optimally choose their consumption and fiscal investment such that marginal utility of investing in children is equal to the marginal benefit of consuming that investment directly; or such that the benefit of investing the marginal return to additional investment in human

capital is equal to the relative utility they get from their children. Similarly, they should optimally choose their time allocation such that the marginal cost to children of traveling for work equals the negative of the marginal benefit; or that the marginal 'return' of not investing time in their children equals the negative marginal rate of substitution of their direct utility to utility derived from children weighted by the wage differential between the foreign and domestic markets.

It is useful for the implications which follow to note that comparative statics for the model reveal that overall parental investment in human capital is increasing in altruism:

$$\frac{dHC}{da} = -\frac{U'}{2arV'} + \frac{U'}{2arV'}\left(w_F - w_D\right)$$

will always be positive so long as the wage differential is positive—which we assume must be true to entice any migration. More specifically, fiscal investment is increasing in altruism so long as the marginal benefit in child's human capital by investment weighted by the wage differential is greater than the marginal cost of spending less time with the child, and indeterminate if not as the result hinges on the bracketed term in

$$\frac{dy}{da} = rV'U''(w_F - w_D)\left[{}^{-}h'_t - h'_y(w_F - w_D)\right] +^{-} ar^2 h'_y h''_t V'^2$$

Similarly comparative statics of paternal time investment (or time away as in t_F) reveals that

$$\frac{dt_F}{da} = rV'U''\left[{}^{-}h'_t - h'_y(w_F - w_D)\right] +^{-} ar^2 h'_y h''_t V'^2$$

Again, signing the result depends on the bracketed term. If the marginal benefit of investment weighted by the wage differential is less than the marginal cost of migration in the human capital function, then migration increases with altruism, and has an indeterminate sign otherwise. Thus it bears repeating that even if parents migrate for purely altruistic reasons, it is not clear that their migration decision will actually benefit their children.

Moving forward, we can combine the first order conditions to obtain the simple relationship

$$-h'_{t_F}(\phi) = h'_{y_c}(\phi)\cdot\left(w_F - w_D\right)$$

implying that optimally parents will invest time and money into the child up to the point where the marginal benefit of an additional peso times the relative household wealth gains of migration (remittances less their domestic opportunity cost of wage), augmented by ϕ, offsets the marginal harm, mitigated by ϕ, of being away from the home to earn that marginal peso.[77]

Further research could test parent's migration decision through a propensity to migrate, using the marginal change in child's cognition at the average due to migration and marginal change in household wealth at the average due to migration. A Heckman selection model might be appropriate.

[77] This model can easily be extended to offer an alternate explanation for return migration: At every period *t* migrants assess the tradeoff they are making according to the First Order Conditions above. Where the left-hand side dominates the right (they've been gone for "too long" / coming home would be very helpful, and wage gains cannot compensate for the loss), they return. An iterative process of this nature could also describe cyclical migration. This is a complimentary view to models in which households maximize utility over a finite horizon and prefer home country consumption over consumption overseas such that migration periods are used to accumulate wealth to be consumed at home. For discussion and examples of such models, see (Yang, 2009), (Djajic and Milbourne, 1988), (Hill, 1987), and (Yang, 2006).

Appendix 2: Instrumental Variables

The first stage fails in all outcomes for all 12 instruments attempted here; all have a first stage F statistic in the 3-4 range, far below the Stock and Watson rule of thumb of 10. Additionally, the magnitude of effects of second stage results are often much too large to be credible. Still, the signs on the migration variable are consistent across instruments and largely consistent with the uninstrumented value-added plus models. An explanation of the instruments used follows.

First, I exploit the panel structure and sampling method of the Mexico Family Life Survey using the between-wave exogenous expansion of migration networks. In the second wave the MxFLS interviews all wave 1 individuals and everyone with whom they are living. Individuals who move into an MxFLS sample family between waves 1 and 2 are interviewed in wave 2. In like manner, every member of a new household into which an original MxFLS respondent might move is also interviewed. Part of those interviews includes questions on whether the respondent has family in the US. I use migration status of wave one respondents' new household members' relatives as an instrument for the migration decision of parents from the original household. As an example, if an older child from a wave-1 MxFLS household marries into a new household, all individuals in that new household are interviewed. The US-migration status of the relatives of the new household represent an expansion of the migration social network of those in the original household. So long as the marriage decision is not based on the prospective spouse's household's relatives' migration status, the exclusion principle should hold.

Second, I will use the pre-wave 1 migration history of non-parent adults living in the household to instrument for parent migration in the second wave. The exclusion restriction here requires that a co-resident non-parent adult's migration history not affect the child's current cognition. This is perhaps more likely to hold for the intercept rather than the slope of the child's outcome trajectory, but *a priori* it will likely be less susceptible to a weak instrument problem than the first option.

Third, I follow the spirit of the (Hanson and Woodruff, 2003) and (McKenzie and Rapoport, 2007) work and use historical regional Mexican immigration rates interacted with household economic status to instrument for parental propensity to migrate. The MxFLS data are taken from a stratified sample of 136 of the 2438 Mexican municipios (roughly comparable to US counties). Specifically I use historical Mexico census data on the share of the population which has migrated in the previous five years as of 1960 (using state-level migration rates) and 1990 (using municipality-level migration rates). Though this instrument captures connections, it also picks up effects of the local economic situation which may correlate with child outcomes. Still the 50-year lag means that child outcomes are unlikely to be affected by any proximate community shock acting through the instrument. The central criticism of this instrument for the Hanson and Woodruff paper, that migration networks may directly affect older children's schooling enrollment decisions, is not applicable here for two reasons: 1) my population is considerably younger (maximum age is 12) and so less likely to have agency about schooling choices, and 2) my outcome is cognition, rather child's education enrollment—which I control for directly.

Cognition

Cognition VAM+ IV set 1

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Full 1	w2_ipums90muni mxUS5yr	w2_ipums90statemx US5yr	w2_ipums60prevst mxUS	w2_ipums60statemx US5yr

W2 Dad in USA	-0.119	-1.139	-2.284	0.380	0.868
	(0.114)	(4.398)	(1.846)	(1.732)	(1.990)
Constant	-0.339	-0.177	-0.00328	-0.407	-0.481
	(0.346)	(0.806)	(0.512)	(0.458)	(0.458)
Observations	2,778	2,762	2,762	2,762	2,762
R-squared	0.165	0.122		0.155	0.125
1st Stage F-stat		3.402	3.504	3.437	3.373

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Cognition VAM+ IV set 2

	(1)	(2)	(3)	(4)
VARIABLES	w2_ipums90munimxUS5yrmommed	w2_ipums90statemxUS5yrmommed	w2_ipums60prevstmxUSmommed	w2_ipums60statemxUS5yrmommed
W2 Dad in USA	-3.916	-2.942	0.735	1.109
	(10.35)	(2.340)	(1.949)	(2.530)
Constant	0.244	0.0965	-0.461	-0.518
	(1.651)	(0.589)	(0.507)	(0.538)
Observations	2,762	2,762	2,762	2,762
R-squared			0.135	0.103
1st Stage F-stat	3.401	3.481	3.413	3.353

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Cognition VAM+ IV set 3

	(1)	(2)	(3)	(4)
VARIABLES	newmigrelw1hh	w2_kmusmommed	w2_mighh95mommed	w2_braceromigratemommed
W2 Dad in USA	-68.04	2.720	-1.713*	-5.159*
	(1,809)	(3.721)	(0.990)	(3.004)
Constant	9.761	-0.762	-0.102	0.410
	(269.1)	(0.708)	(0.398)	(0.765)
Observations	2,776	2,778	2,778	2,778
R-squared			0.062	
1st Stage F-stat	3.384	3.430	3.623	3.475

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Attentiveness

Attentiveness VAM+ IV set 1

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Full 1	w2_ipums90munimxUS5yr	w2_ipums90statemxUS5yr	w2_ipums60prevstmxUS	w2_ipums60statemxUS5yr
W2 Dad in USA	-0.139*	-6.307	-0.860	0.0476	-2.467

	(0.0756)	(8.765)	(1.557)	(1.496)	(1.873)
Constant	3.259***	4.401***	3.403***	3.237***	3.698***
	(0.208)	(1.627)	(0.332)	(0.324)	(0.390)
Observations	2,776	2,760	2,760	2,760	2,760
R-squared	0.049			0.043	
1st Stage F-stat	7.116	3.426	3.513	3.472	3.409

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Attentiveness VAM+ IV set 2

	(1)	(2)	(3)	(4)
VARIABLES	w2_ipums90muni mxUS5yrmommed	w2_ipums90statemxUS5 yrmommed	w2_ipums60prevstmxU Smommed	w2_ipums60statemxUS5 yrmommed
W2 Dad in USA	-8.377	-0.336	1.587	-1.991
	(18.69)	(2.074)	(1.899)	(2.524)
Constant	4.780	3.307***	2.955***	3.610***
	(3.377)	(0.411)	(0.415)	(0.469)
Observations	2,760	2,760	2,760	2,760
R-squared		0.042		
1st Stage F-stat	3.422	3.487	3.447	3.389

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Attentiveness VAM+ IV set 3

	(1)	(2)	(3)	(4)
VARIABLES	newmigrelw1hh	w2_kmusmommed	w2_mighh95mommed	w2_braceromigratemommed
W2 Dad in USA	-51.58	5.207	-1.395*	-6.009
	(1,100)	(4.827)	(0.837)	(3.863)
Constant	12.57	2.292**	3.487***	4.322***
	(198.9)	(0.965)	(0.251)	(0.848)
Observations	2,774	2,776	2,776	2,776
R-squared				
1st Stage F-stat	3.412	3.463	3.619	3.477

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

BMI

BMI VAM+ IV set 1

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Full 1	w2_ipums90mun imxUS5yr	w2_ipums90statemx US5yr	w2_ipums60prevst mxUS	w2_ipums60statemx US5yr

W2 Dad in USA	0.0510	-2.666	2.035	-3.630*	-4.419
	(0.0598)	(10.98)	(2.331)	(2.192)	(3.553)
Constant	-0.758*	-0.479	-1.012	-0.369	-0.280
	(0.400)	(1.488)	(0.617)	(0.693)	(0.788)
Observations	3,938	3,913	3,913	3,913	3,913
R-squared	0.268		0.066		
1st Stage F-stat	79.53	4.128	4.159	4.115	4.113

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

BMI VAM+ IV set 2

	(1)	(2)	(3)	(4)
VARIABLES	w2_ipums90munimxUS5yrmommed	w2_ipums90statemxUS5yrmommed	w2_ipums60prevstmxUSmommed	w2_ipums60statemxUS5yrmommed
W2 Dad in USA	7.506	2.116	-8.133	-14.06
	(54.04)	(3.382)	(6.376)	(19.79)
Constant	-1.515	-1.110*	-0.341	0.103
	(4.305)	(0.599)	(1.269)	(2.201)
Observations	3,407	3,407	3,407	3,407
R-squared		0.035		
1st Stage F-stat	3.282	3.288	3.274	3.297

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

BMI VAM+ IV set 3

	(1)	(2)	(3)	(4)
VARIABLES	newmigrelw1hh	w2_kmusmommed	w2_mighh95mommed	w2_braceromigratemommed
W2 Dad in USA	17.10	-2.403	-1.393	0.186
	(162.8)	(4.679)	(1.600)	(2.060)
Constant	-2.750	-0.724	-0.800*	-0.919**
	(18.91)	(0.606)	(0.434)	(0.417)
Observations	3,936	3,427	3,427	3,427
R-squared			0.146	0.242
1st Stage F-stat	4.102	3.307	3.371	3.327

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix 3: Complete Regression Results for Main Regressions

Table A3.1 Cognition VAM+ Complete Results

Cognition VAM+ Complete Results

VARIABLES	(1) Bivariate w2 Child Cognition	(2) Full 1 w2 Child Cognition	(3) Full 2 w2 Child Cognition	(4) Full 3 w2 Child Cognition	(5) Full 3 birthyears w2 Child Cognition	(6) Full 4 w2 Child Cognition	(7) Full 4 birthyears w2 Child Cognition
W2 Dad in USA	-0.149	-0.108	-0.199*	-0.187	-0.194		
	(0.107)	(0.111)	(0.114)	(0.115)	(0.117)		
W1 Dad in USA				-0.163	-0.170		
				(0.140)	(0.142)		
W2 Share life Dad in USA			1.107*	1.693***	1.746***		
			(0.589)	(0.640)	(0.654)		
Dad returned from USA						-0.215*	-0.219*
						(0.117)	(0.123)
Dad left for USA						-0.298**	-0.304**
						(0.121)	(0.124)
Dad in USA W1 & W2						0.143	0.139
						(0.197)	(0.192)
w1 Child Cognition	0.234***	0.118***	0.119***	0.119***	0.117***	0.118***	0.116***
	(0.0259)	(0.0255)	(0.0256)	(0.0255)	(0.0252)	(0.0254)	(0.0251)
w2 Mom Age		0.00217	0.00227	0.00215	0.00109	0.00193	0.000882
		(0.00430)	(0.00426)	(0.00426)	(0.00423)	(0.00429)	(0.00426)
Mom Cognition		0.162***	0.161***	0.160***	0.162***	0.160***	0.162***
		(0.0239)	(0.0240)	(0.0240)	(0.0240)	(0.0240)	(0.0240)
Mom Yrs Educ		0.0212***	0.0214***	0.0214***	0.0231***	0.0213***	0.0230***
		(0.00796)	(0.00796)	(0.00794)	(0.00804)	(0.00794)	(0.00806)
Mom Yrs Educ squared		-3.13e-06	-1.96e-06	-2.39e-06	-8.24e-06	-3.93e-06	-1.02e-05
		(1.45e-05)	(1.45e-05)	(1.45e-05)	(1.57e-05)	(1.44e-05)	(1.56e-05)
female		-0.0193	-0.0202	-0.0203	-0.0272	-0.0202	-0.0271
		(0.0351)	(0.0350)	(0.0349)	(0.0330)	(0.0347)	(0.0329)
w1 # older siblings		-0.0174	-0.0167	-0.0155	-0.00736	-0.0149	-0.00661
		(0.0472)	(0.0472)	(0.0476)	(0.0481)	(0.0474)	(0.0479)
w2 # older siblings		0.0137	0.0125	0.0131	0.0121	0.00990	0.00875
		(0.0518)	(0.0518)	(0.0523)	(0.0530)	(0.0521)	(0.0529)
w1_# of younger siblings		-0.0660	-0.0687	-0.0694	-0.0769*	-0.0719	-0.0791*
		(0.0448)	(0.0451)	(0.0450)	(0.0454)	(0.0448)	(0.0451)
w2 # younger siblings		0.0128	0.0147	0.0166	0.0181	0.0152	0.0165
		(0.0398)	(0.0398)	(0.0397)	(0.0405)	(0.0394)	(0.0401)
w1 Rural		0.0937	0.0964	0.0932	0.0945	0.0929	0.0945
		(0.120)	(0.121)	(0.120)	(0.116)	(0.121)	(0.117)
w2 Rural		-0.140	-0.144	-0.140	-0.151	-0.133	-0.144
		(0.129)	(0.128)	(0.128)	(0.125)	(0.129)	(0.125)
w1 hh asset index 1		0.0226	0.0222	0.0224	0.0212	0.0223	0.0211
		(0.0191)	(0.0190)	(0.0190)	(0.0186)	(0.0192)	(0.0188)
w1 hh asset index 2		0.00854	0.00676	0.00663	0.00590	0.00785	0.00715

		(0.0173)	(0.0171)	(0.0172)	(0.0175)	(0.0172)	(0.0176)
w2 hh asset index 1		0.0724***	0.0735***	0.0730***	0.0720***	0.0724***	0.0713***
		(0.0149)	(0.0149)	(0.0152)	(0.0157)	(0.0154)	(0.0159)
w2 hh asset index 2		-0.0388**	-0.0390**	-0.0384**	-0.0387**	-0.0388**	-0.0391**
		(0.0177)	(0.0177)	(0.0180)	(0.0184)	(0.0179)	(0.0184)
w1 Household size		-0.0393**	-0.0382**	-0.0392**	-0.0422**	-0.0386**	-0.0415**
		(0.0167)	(0.0168)	(0.0169)	(0.0166)	(0.0168)	(0.0165)
w2 Household size		0.0459**	0.0459**	0.0459**	0.0462**	0.0469**	0.0473**
		(0.0205)	(0.0205)	(0.0205)	(0.0207)	(0.0201)	(0.0204)
Mom Yrs Educ_miss		-0.161	-0.157	-0.158	-0.170	-0.157	-0.168
		(0.111)	(0.111)	(0.111)	(0.115)	(0.112)	(0.116)
w2 Child Age		0.00407	0.00454	0.00538	-0.101***	0.00497	-0.101***
		(0.0151)	(0.0149)	(0.0148)	(0.0263)	(0.0149)	(0.0264)
Avg size of elem school		9.55e-05	9.41e-05	9.83e-05	0.000104	0.000111	0.000117
		(0.000174)	(0.000174)	(0.000174)	(0.000177)	(0.000173)	(0.000176)
Avg elem principal age		0.00599	0.00596	0.00608	0.00580	0.00586	0.00557
		(0.00595)	(0.00597)	(0.00590)	(0.00587)	(0.00587)	(0.00584)
Avg elem principal experience		-0.00410	-0.00450	-0.00449	-0.00471	-0.00446	-0.00467
		(0.00474)	(0.00475)	(0.00469)	(0.00484)	(0.00468)	(0.00483)
Avg elem teacher age		0.00293	0.00300	0.00295	0.00210	0.00308	0.00226
		(0.00381)	(0.00375)	(0.00374)	(0.00372)	(0.00379)	(0.00376)
Avg elem teacher experience		-0.0128*	-0.0124	-0.0128*	-0.0130*	-0.0128*	-0.0130*
		(0.00758)	(0.00760)	(0.00763)	(0.00756)	(0.00767)	(0.00759)
Teachers w/ inservice training (%)		-0.144	-0.146	-0.151	-0.142	-0.152	-0.143
		(0.0994)	(0.0992)	(0.101)	(0.100)	(0.102)	(0.101)
Percent schools lack materials		-0.0441	-0.0439	-0.0430	-0.0391	-0.0448	-0.0407
		(0.0605)	(0.0608)	(0.0604)	(0.0598)	(0.0610)	(0.0602)
Avg Elem class size		-0.000565	-0.000590	-0.000704	-0.000433	-0.000879	-0.000614
		(0.00187)	(0.00188)	(0.00192)	(0.00190)	(0.00190)	(0.00188)
Sch infrastructure index		-0.000975	-0.000113	-0.000660	0.00407	0.000182	0.00492
		(0.0193)	(0.0196)	(0.0195)	(0.0195)	(0.0197)	(0.0197)
Missing school covariates		-0.0940*	-0.0941*	-0.0929*	-0.0699	-0.101*	-0.0780
		(0.0524)	(0.0528)	(0.0519)	(0.0494)	(0.0512)	(0.0487)
Constant	0.0113	-0.346	-0.358	-0.352	0.772**	-0.332	0.780**
	(0.0334)	(0.344)	(0.344)	(0.346)	(0.384)	(0.348)	(0.385)
Observations	2,896	2,778	2,778	2,778	2,778	2,778	2,778
R-squared	0.056	0.164	0.165	0.165	0.174	0.167	0.175

Robust, clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A3.2 Cognition Fixed Effect; Complete Results

VARIABLES	(1) Bivariate FE Child Cognition	(2) Simple FE Child Cognition	(3) Full FE Child Cognition
Dad in USA	-0.00212	-0.000563	0.0142
	(0.101)	(0.101)	(0.105)
Share of life Dad in USA		0.401	0.947
		(1.420)	(1.730)
rural			-0.138
			(0.127)
# of older siblings			0.0662
			(0.0459)
# of younger siblings			0.0507
			(0.0424)
Household asset index 1			0.0102
			(0.0152)
Household asset index 2			-0.0163
			(0.0150)
Household Size			0.0550***
			(0.0200)
Constant	-0.0230***	-0.0251***	-0.445***
	(0.00443)	(0.00866)	(0.137)
Observations	5,792	5,792	5,704
R-squared	0.000	0.000	0.007
Number of id	2,896	2,896	2,885

Robust, clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A3.3 Cognition Robustness Check VAM+

Cognition Robustness Checks using Full3by model; Abbreviated Results

VARIABLES	(1) Original VAM+ Full3by	(2) Consumption	(3) Yrs Educ	(4) Mom Mental Hlth
W2 Dad in USA	-0.194	-0.189	-0.179	-0.183
	(0.117)	(0.120)	(0.114)	(0.118)
W1 Dad in USA	-0.170	-0.172	-0.177	-0.162
	(0.142)	(0.142)	(0.142)	(0.144)
W2 Share life Dad in USA	1.746***	1.717***	1.788***	1.716**
	(0.654)	(0.647)	(0.645)	(0.663)
w1 log hh per capita consumption		0.0294		
		(0.0335)		
w2 log hh per capita consumption		0.0428		
		(0.0452)		
w1 Child yrs educ			-0.00587	
			(0.0203)	
w2 Child yrs educ			0.0772***	
			(0.0185)	
w1 Mom mental hlth				0.134***

				(0.0465)
w2 Mom mental hlth				-0.141***
				(0.0465)
Constant	0.772**	0.301	0.799**	0.760*
	(0.384)	(0.455)	(0.382)	(0.390)
Observations	2,778	2,761	2,778	2,745
R-squared	0.174	0.177	0.179	0.177

Robust, clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A3.4 Cognition Robustness Check FE

Cognition Robustness Check FE; Abbrev Results

VARIABLES	(1) Original FE	(2) Consumption	(3) Yrs Educ	(4) Mom Mental Hlth
Dad in USA	0.0142	0.0116	0.0149	0.0150
	(0.105)	(0.106)	(0.105)	(0.105)
Share of life Dad in USA	0.947	0.924	0.878	0.918
	(1.730)	(1.727)	(1.732)	(1.729)
log hh per capita consumption		0.00138		
		(0.0326)		
Years of Education			0.00529	
			(0.00773)	
Mom mental health				-0.0470**
				(0.0192)
Constant	-0.445***	-0.428	-0.448***	-0.416***
	(0.137)	(0.286)	(0.137)	(0.139)
Observations	5,704	5,684	5,704	5,704
R-squared	0.007	0.008	0.008	0.008
Number of id	2,885	2,884	2,885	2,885

Robust, clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A3.5 Attentiveness: VAM+ complete results

VARIABLES	(1) Bivariate w2 Attentiveness	(2) Full 1 w2 Attentiveness	(3) Full 2 w2 Attentiveness	(4) Full 3 w2 Attentiveness	(5) Full 3 birthyears w2 Attentiveness	(6) Full 4 w2 Attentiveness	(7) Full 4 birthyears w2 Attentiveness
W2 Dad in USA	-0.162**	-0.136*	-0.198**	-0.196**	-0.195**		
	(0.0671)	(0.0756)	(0.0824)	(0.0832)	(0.0832)		
W1 Dad in USA				-0.0224	-0.0221		
				(0.0615)	(0.0627)		
W2 Share life Dad in USA			0.752**	0.832**	0.845**		
			(0.335)	(0.389)	(0.395)		
Dad returned from USA						-0.0329	-0.0300
						(0.0556)	(0.0565)
Dad left for USA						-0.236**	-0.233**
						(0.0931)	(0.0932)
Dad in USA W1						0.00448	0.00600

& W2							
						(0.0880)	(0.0885)
w1 Attentiveness	0.0175	-0.0203	-0.0197	-0.0195	-0.0193	-0.0199	-0.0199
	(0.0190)	(0.0202)	(0.0200)	(0.0200)	(0.0204)	(0.0202)	(0.0206)
w2 Mom Age		-0.000142	-7.47e-05	-9.07e-05	-0.000238	-0.000183	-0.000322
		(0.00209)	(0.00208)	(0.00208)	(0.00211)	(0.00208)	(0.00211)
Mom Cognition		-0.00377	-0.00461	-0.00468	-0.00467	-0.00466	-0.00461
		(0.0145)	(0.0144)	(0.0144)	(0.0143)	(0.0145)	(0.0144)
Mom Yrs Educ		0.00876*	0.00888*	0.00888*	0.00901*	0.00883*	0.00895*
		(0.00491)	(0.00487)	(0.00487)	(0.00490)	(0.00488)	(0.00491)
Mom Yrs Educ squared		-3.44e-05***	-3.36e-05***	-3.36e-05***	-3.05e-05**	-3.43e-05***	-3.14e-05**
		(1.17e-05)	(1.19e-05)	(1.19e-05)	(1.25e-05)	(1.18e-05)	(1.24e-05)
female		0.0190	0.0183	0.0183	0.0177	0.0185	0.0179
		(0.0188)	(0.0187)	(0.0187)	(0.0186)	(0.0185)	(0.0185)
w1 # older siblings		-0.0176	-0.0171	-0.0169	-0.0174	-0.0168	-0.0173
		(0.0195)	(0.0193)	(0.0192)	(0.0191)	(0.0196)	(0.0195)
w2 # older siblings		-0.000571	-0.00141	-0.00134	0.000286	-0.00257	-0.000949
		(0.0246)	(0.0244)	(0.0244)	(0.0243)	(0.0246)	(0.0245)
w1_# of younger siblings		0.00776	0.00593	0.00584	0.00348	0.00503	0.00284
		(0.0283)	(0.0279)	(0.0279)	(0.0279)	(0.0280)	(0.0280)
w2 # younger siblings		-0.0336	-0.0323	-0.0321	-0.0311	-0.0329	-0.0320
		(0.0214)	(0.0212)	(0.0213)	(0.0212)	(0.0213)	(0.0213)
w1 Rural		0.0280	0.0296	0.0291	0.0260	0.0292	0.0262
		(0.0770)	(0.0775)	(0.0775)	(0.0781)	(0.0767)	(0.0772)
w2 Rural		-0.0840	-0.0870	-0.0863	-0.0832	-0.0837	-0.0808
		(0.0828)	(0.0831)	(0.0830)	(0.0841)	(0.0821)	(0.0832)
w1 hh asset index 1		3.00e-05	-0.000214	-0.000186	-0.000618	-0.000242	-0.000659
		(0.0100)	(0.00993)	(0.00992)	(0.00982)	(0.00984)	(0.00974)
w1 hh asset index 2		-0.00892	-0.0101	-0.0101	-0.0101	-0.00949	-0.00942
		(0.00689)	(0.00693)	(0.00693)	(0.00694)	(0.00677)	(0.00676)
w2 hh asset index 1		0.0197**	0.0204**	0.0203**	0.0213**	0.0200**	0.0209**
		(0.00965)	(0.00958)	(0.00961)	(0.00958)	(0.00969)	(0.00968)
w2 hh asset index 2		-0.0108	-0.0109	-0.0109	-0.0110	-0.0110	-0.0112
		(0.00795)	(0.00791)	(0.00793)	(0.00800)	(0.00788)	(0.00794)
w1 Household size		0.0124	0.0132	0.0131	0.0130	0.0133	0.0132
		(0.0103)	(0.0101)	(0.0101)	(0.0101)	(0.0104)	(0.0104)
w2 Household size		-0.000868	-0.000863	-0.000877	-0.00135	-0.000433	-0.000925
		(0.0129)	(0.0127)	(0.0127)	(0.0126)	(0.0130)	(0.0129)
Mom Yrs Educ_miss		-0.0841	-0.0818	-0.0819	-0.0829	-0.0815	-0.0824
		(0.0534)	(0.0535)	(0.0535)	(0.0534)	(0.0531)	(0.0529)
w2 Child Age		0.0125*	0.0128**	0.0129**	0.00619	0.0127**	0.00616
		(0.00631)	(0.00637)	(0.00641)	(0.0125)	(0.00636)	(0.0125)
Avg size of elem school		-0.000346***	-0.000347***	-0.000346***	-0.000348***	-0.000341**	-0.000343**
		(0.000129)	(0.000129)	(0.000129)	(0.000130)	(0.000130)	(0.000131)
Avg elem principal age		0.00342	0.00340	0.00342	0.00351	0.00332	0.00341
		(0.00387)	(0.00388)	(0.00387)	(0.00390)	(0.00389)	(0.00392)
Avg elem principal experience		0.00263	0.00236	0.00236	0.00214	0.00240	0.00219
		(0.00370)	(0.00370)	(0.00370)	(0.00374)	(0.00368)	(0.00372)
Avg elem teacher age		-0.00416	-0.00410	-0.00411	-0.00433	-0.00406	-0.00427
		(0.00325)	(0.00326)	(0.00325)	(0.00322)	(0.00328)	(0.00324)
Avg elem teacher experience		0.0124*	0.0126**	0.0125**	0.0124*	0.0125**	0.0124*
		(0.00630)	(0.00626)	(0.00626)	(0.00634)	(0.00626)	(0.00634)

Teachers w/ inservice training (%)		-0.0507	-0.0520	-0.0527	-0.0514	-0.0525	-0.0511
		(0.0673)	(0.0670)	(0.0666)	(0.0668)	(0.0668)	(0.0670)
Percent schools lack materials		0.00386	0.00405	0.00417	0.00307	0.00334	0.00227
		(0.0639)	(0.0644)	(0.0645)	(0.0652)	(0.0650)	(0.0657)
Avg Elem class size		3.34e-05	1.79e-05	2.49e-06	8.13e-05	-6.18e-05	1.76e-05
		(0.00165)	(0.00166)	(0.00167)	(0.00167)	(0.00165)	(0.00166)
Sch infrastructure index		-0.0141	-0.0135	-0.0136	-0.0137	-0.0133	-0.0134
		(0.0136)	(0.0136)	(0.0136)	(0.0135)	(0.0136)	(0.0135)
Missing school covariates		-0.0130	-0.0130	-0.0129	-0.00924	-0.0162	-0.0127
		(0.0503)	(0.0507)	(0.0506)	(0.0512)	(0.0511)	(0.0516)
Constant	3.313***	3.269***	3.259***	3.259***	3.411***	3.269***	3.416***
	(0.0708)	(0.206)	(0.206)	(0.206)	(0.246)	(0.206)	(0.245)
Observations	2,894	2,776	2,776	2,776	2,776	2,776	2,776
R-squared	0.005	0.046	0.048	0.048	0.050	0.048	0.051

Table A3.6 Attentiveness FE, Complete Results

	Attentiveness FE		
	(1)	(2)	(3)
VARIABLES	Bivariate FE attentiveness	Simple FE attentiveness	Full FE attentiveness
Dad in USA	-0.0199	-0.0114	-0.0223
	(0.0603)	(0.0601)	(0.0615)
Share of life Dad in USA		2.175**	1.824*
		(0.956)	(0.957)
rural			0.124*
			(0.0704)
# of older siblings			-0.0108
			(0.0286)
# of younger siblings			0.0264
			(0.0259)
Household asset index 1			0.00154
			(0.0100)
Household asset index 2			0.00498
			(0.00894)
Household Size			0.00136
			(0.0121)
Constant	3.318***	3.307***	3.229***
	(0.00266)	(0.00575)	(0.0819)
Observations	5,788	5,788	5,700
R-squared	0.000	0.002	0.003
Number of id	2,894	2,894	2,883

Robust, clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A3.7 Attentiveness Robustness Checks using VAM+ model; Abbreviated Results

Attentiveness Robustness Checks using Full3by model; Abbreviated Results

VARIABLES	(1) Original VAM+ Full3by	(2) Consumption	(3) Yrs Educ	(4) Mom Mental Hlth	(5) Ordered Probit VAM+ Full3by
SINGLE					
W2 Dad in USA	-0.195**	-0.193**	-0.193**	-0.192**	-0.497**
	(0.0832)	(0.0845)	(0.0828)	(0.0820)	(0.213)
W1 Dad in USA	-0.0221	-0.0229	-0.0218	-0.0165	-0.0473
	(0.0627)	(0.0620)	(0.0628)	(0.0623)	(0.156)
W2 Share life Dad in USA	0.845**	0.841**	0.828**	0.820**	2.146**
	(0.395)	(0.396)	(0.390)	(0.388)	(0.961)
w1 log hh per capita consumption		0.0201			
		(0.0173)			
w2 log hh per capita consumption		0.0270			
		(0.0209)			
w1 Child yrs educ			0.0195		
			(0.0138)		
w2 Child yrs educ			0.00206		
			(0.0136)		
w1 Mom mental hlth				-0.0253	
				(0.0373)	
w2 Mom mental hlth				0.0180	
				(0.0368)	
Constant (VAM)	3.411***	3.049***	3.451***	3.400***	
	(0.246)	(0.288)	(0.246)	(0.248)	
Constant - cut 1					-3.443***
					(0.618)
Constant - cut2					-2.385***
					(0.586)
Constant - cut 3					0.193
					(0.586)
Observations	2,776	2,759	2,776	2,743	2,776
R-squared	0.050	0.052	0.051	0.053	

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A3.8 Attentiveness Robustness Check using FE

Attentiveness Robustness Check using FE; Abbrev Results

VARIABLES	(1) Original FE	(2) Consumption	(3) Yrs Educ	(4) Mom Mental Hlth
Dad in USA	-0.0223	-0.0188	-0.0196	-0.0228
	(0.0615)	(0.0621)	(0.0617)	(0.0616)
Share of life Dad in USA	1.824*	1.840*	1.552*	1.840*
	(0.957)	(0.959)	(0.932)	(0.956)

log hh per capita consumption		0.0243		
		(0.0195)		
Years of Education			0.0207***	
			(0.00488)	
Mom mental health				0.0256
				(0.0227)
Constant	3.229***	3.041***	3.218***	3.213***
	(0.0819)	(0.164)	(0.0818)	(0.0832)
Observations	5,700	5,680	5,700	5,700
R-squared	0.003	0.004	0.009	0.003
Number of id	2,883	2,882	2,883	2,883

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A3.9 BMI: VAM+ complete results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Bivariate	Full 1	Full 2	Full 3	Full 3 birthyears	Full 4	Full 4 birthyears
VARIABLES	w2 BMI	w2 BMI	w2 BMI	w2 BMI	w2 BMI	w2 BMI	w2 BMI
W2 Dad in USA	0.0447	0.0485	0.0498	0.0527	0.0482		
	(0.0602)	(0.0631)	(0.0596)	(0.0606)	(0.0598)		
W1 Dad in USA				-0.0408	-0.0468		
				(0.0629)	(0.0635)		
W2 Share life Dad in USA			-0.0147	0.112	0.139		
			(0.364)	(0.457)	(0.464)		
Dad returned from USA						0.0198	0.0120
						(0.0551)	(0.0547)
Dad left for USA						0.104	0.0969
						(0.0662)	(0.0663)
Dad in USA W1 & W2						-0.0348	-0.0354
						(0.0955)	(0.0927)
w1 BMI	0.462***	0.432***	0.432***	0.432***	0.430***	0.433***	0.431***
	(0.0204)	(0.0214)	(0.0214)	(0.0213)	(0.0214)	(0.0213)	(0.0214)
w2 Mom height		0.00171	0.00171	0.00166	0.00187	0.00180	0.00201
		(0.00216)	(0.00216)	(0.00218)	(0.00218)	(0.00219)	(0.00219)
w2 Mom BMI		0.0241***	0.0241***	0.0241***	0.0238***	0.0241***	0.0238***
		(0.00335)	(0.00335)	(0.00336)	(0.00337)	(0.00336)	(0.00337)
w2 Mom hemoglobin		-0.000492	-0.000479	-0.000364	-0.000787	-0.000285	-0.000714
		(0.00997)	(0.0100)	(0.0100)	(0.00995)	(0.0100)	(0.00996)
Missing Mom		-0.199**	-0.199**	-0.201**	-0.220**	-0.215**	-0.233**

BMI						
	(0.0990)	(0.0950)	(0.0950)	(0.102)	(0.0843)	(0.0920)
Missing Mom height	0.395*	0.396*	0.399*	0.415*	0.410**	0.425**
	(0.205)	(0.205)	(0.205)	(0.209)	(0.204)	(0.207)
Missing Mom hemoglobin	0.0346	0.0346	0.0348	0.0328	0.0346	0.0327
	(0.0305)	(0.0305)	(0.0304)	(0.0301)	(0.0306)	(0.0302)
w2 Mom Age	0.00321	0.00321	0.00317	0.00259	0.00323	0.00265
	(0.00242)	(0.00243)	(0.00243)	(0.00240)	(0.00243)	(0.00240)
Mom Cognition	0.0164	0.0164	0.0163	0.0186	0.0168	0.0192
	(0.0158)	(0.0158)	(0.0158)	(0.0157)	(0.0159)	(0.0158)
Mom Yrs Educ	0.00311	0.00311	0.00317	0.00324	0.00320	0.00324
	(0.00594)	(0.00594)	(0.00595)	(0.00594)	(0.00595)	(0.00594)
Mom Yrs Educ squared	6.86e-06	6.86e-06	6.75e-06	9.82e-06	6.92e-06	1.00e-05
	(1.12e-05)	(1.12e-05)	(1.13e-05)	(1.20e-05)	(1.12e-05)	(1.19e-05)
female	0.0433	0.0433	0.0435	0.0429	0.0434	0.0428
	(0.0262)	(0.0262)	(0.0263)	(0.0260)	(0.0263)	(0.0260)
w1 # older siblings	-0.000252	-0.000265	0.000320	0.00313	-0.000776	0.00197
	(0.0308)	(0.0308)	(0.0308)	(0.0305)	(0.0308)	(0.0304)
w2 # older siblings	-0.0357	-0.0357	-0.0358	-0.0367	-0.0348	-0.0357
	(0.0327)	(0.0327)	(0.0328)	(0.0325)	(0.0326)	(0.0323)
w1 # of younger siblings	0.00577	0.00582	0.00634	0.00327	0.00760	0.00445
	(0.0291)	(0.0290)	(0.0290)	(0.0281)	(0.0290)	(0.0281)
w2 # younger siblings	-0.0297	-0.0297	-0.0296	-0.0275	-0.0305	-0.0284
	(0.0241)	(0.0240)	(0.0241)	(0.0234)	(0.0241)	(0.0235)
w1 Rural	0.0314	0.0313	0.0304	0.0323	0.0308	0.0324
	(0.0743)	(0.0745)	(0.0743)	(0.0730)	(0.0741)	(0.0730)
w2 Rural	-0.108	-0.108	-0.106	-0.113	-0.108	-0.115
	(0.0911)	(0.0914)	(0.0908)	(0.0895)	(0.0901)	(0.0891)
w1 hh asset index 1	0.00371	0.00371	0.00388	0.00396	0.00362	0.00370
	(0.0118)	(0.0118)	(0.0119)	(0.0118)	(0.0119)	(0.0118)
w1 hh asset index 2	0.0119	0.0119	0.0119	0.0117	0.0124	0.0121
	(0.0111)	(0.0112)	(0.0112)	(0.0113)	(0.0113)	(0.0113)
w2 hh asset index 1	0.0228**	0.0228**	0.0228**	0.0225**	0.0225**	0.0223**
	(0.00924)	(0.00915)	(0.00911)	(0.00896)	(0.00923)	(0.00908)
w2 hh asset index 2	0.00241	0.00241	0.00256	0.00329	0.00255	0.00328
	(0.0124)	(0.0125)	(0.0126)	(0.0127)	(0.0126)	(0.0128)
w1 Household size	0.00953	0.00952	0.00924	0.0101	0.00928	0.0101
	(0.0113)	(0.0112)	(0.0113)	(0.0114)	(0.0113)	(0.0114)
w2 Household size	-0.0130	-0.0130	-0.0130	-0.0134	-0.0132	-0.0136
	(0.0104)	(0.0104)	(0.0104)	(0.0107)	(0.0105)	(0.0108)
Mom Yrs Educ_miss	-0.0882	-0.0882	-0.0890	-0.0772	-0.0902	-0.0786
	(0.0613)	(0.0610)	(0.0611)	(0.0617)	(0.0612)	(0.0618)

w2 Child age		-0.0100	-0.0100	-0.00992	-0.0481***	-0.00996	-0.0477***
		(0.00692)	(0.00691)	(0.00691)	(0.0159)	(0.00692)	(0.0159)
Avg size of elem school		-0.000105	-0.000105	-0.000104	-0.000110	-0.000109	-0.000115
		(0.000139)	(0.000138)	(0.000138)	(0.000138)	(0.000137)	(0.000137)
Avg elem principal age		0.00308	0.00308	0.00313	0.00291	0.00312	0.00291
		(0.00391)	(0.00391)	(0.00390)	(0.00388)	(0.00391)	(0.00389)
Avg elem principal experience		0.00122	0.00122	0.00122	0.00125	0.00134	0.00137
		(0.00304)	(0.00300)	(0.00300)	(0.00295)	(0.00299)	(0.00295)
Avg elem teacher age		-0.00716*	-0.00716*	-0.00719*	-0.00801**	-0.00715*	-0.00796**
		(0.00395)	(0.00395)	(0.00394)	(0.00395)	(0.00392)	(0.00393)
Avg elem teacher experience		-0.00280	-0.00280	-0.00289	-0.00251	-0.00284	-0.00246
		(0.00553)	(0.00553)	(0.00555)	(0.00562)	(0.00556)	(0.00562)
Teachers w/ inservice training (%)		0.0789	0.0789	0.0772	0.0849	0.0799	0.0874
		(0.0778)	(0.0779)	(0.0775)	(0.0777)	(0.0771)	(0.0774)
Percent schools lack materials		0.0816	0.0815	0.0820	0.0842*	0.0806	0.0827
		(0.0501)	(0.0503)	(0.0502)	(0.0499)	(0.0501)	(0.0497)
Avg Elem class size		-0.000329	-0.000328	-0.000351	-0.000506	-0.000255	-0.000415
		(0.00150)	(0.00149)	(0.00149)	(0.00148)	(0.00148)	(0.00146)
Sch infrastructure index		-0.0264	-0.0264	-0.0267	-0.0246	-0.0268	-0.0248
		(0.0168)	(0.0168)	(0.0168)	(0.0165)	(0.0167)	(0.0165)
Missing school covariates		-0.0568	-0.0568	-0.0566	-0.0491	-0.0538	-0.0467
		(0.0429)	(0.0430)	(0.0430)	(0.0426)	(0.0436)	(0.0431)
Constant	-0.0224	-0.782*	-0.782*	-0.772*	-0.518	-0.805*	-0.550
	(0.0200)	(0.399)	(0.401)	(0.405)	(0.419)	(0.409)	(0.424)
Observations	4,084	3,938	3,938	3,938	3,938	3,938	3,938
R-squared	0.232	0.268	0.268	0.268	0.271	0.268	0.271

Robust, clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix A3.10 BMI z-scores FE

VARIABLES	(1) Bivariate FE BMI	(2) Simple FE BMI	(3) BMI Full BMI
Dad in USA	0.112**	0.118**	0.108**
	(0.0540)	(0.0539)	(0.0522)
Share of life Dad in USA		1.196**	1.111*
		(0.607)	(0.615)
Mother height			-0.00815**
			(0.00395)
Mother BMI			0.0118**
			(0.00545)
Mother hemoglobin			-0.0157*
			(0.00868)
Missing Mom height			0.293
			(0.198)
Missing Mom BMI			-0.151
			(0.174)
Missing Mom hemoglobin			0.0154
			(0.0246)
Rural			-0.0414
			(0.0882)
# of older siblings			-0.00735
			(0.0284)
# of younger siblings			-0.00975
			(0.0269)
Household asset index 1			0.0149
			(0.00928)
Household asset index 2			-0.0137
			(0.00998)
Household Size			-0.00918
			(0.0114)
Constant	-0.0423***	-0.0491***	1.174*
	(0.00245)	(0.00429)	(0.698)
Observations	8,122	8,122	8,016
R-squared	0.001	0.001	0.009
Number of id	4,061	4,061	4,047

Robust, clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix A3.11 BMI Robustness Checks using VAM+ model; Abbreviated Results

BMI Robustness Checks using Full3by model; Abbreviated Results

VARIABLES	(1) Original VAM+ Full3by	(2) Consumption	(3) Yrs Educ	(4) Mom Mental Hlth
W2 Dad in USA	0.0482	0.0541	0.0500	0.0452
	(0.0598)	(0.0593)	(0.0600)	(0.0594)
W1 Dad in USA	-0.0468	-0.0460	-0.0504	-0.0505
	(0.0635)	(0.0625)	(0.0634)	(0.0646)
W2 Share life Dad in USA	0.139	0.117	0.160	0.156
	(0.464)	(0.456)	(0.465)	(0.467)
w1 log hh per capita consumption		0.0228		
		(0.0203)		
w2 log hh per capita consumption		-0.0319		
		(0.0219)		
w1 Child yrs educ			-0.0148	
			(0.0141)	
w2 Child yrs educ			0.0154	
			(0.0157)	
w1 Mom mental hlth				0.0244
				(0.0263)
w2 Mom mental hlth				-0.0204
				(0.0266)
Constant	-0.518	-0.455	-0.516	-0.536
	(0.419)	(0.482)	(0.418)	(0.427)
Observations	3,938	3,912	3,938	3,899
R-squared	0.271	0.271	0.271	0.271

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix A3.12 BMI Robustness Check using FE

VARIABLES	(1) Original FE	(2) Consumption	(3) Yrs Educ	(4) Mom Mental Hlth
Dad in USA	0.108**	0.109**	0.108**	0.108**

	(0.0522)	(0.0527)	(0.0523)	(0.0522)
Share of life Dad in USA	1.111*	1.092*	1.124*	1.108*
	(0.615)	(0.618)	(0.613)	(0.615)
log hh per capita consumption		-0.0180		
		(0.0202)		
Years of Education			-0.00215	
			(0.00627)	
Mom mental health				-0.0104
				(0.0193)
Constant	1.174*	1.195*	1.145	1.183*
	(0.698)	(0.719)	(0.711)	(0.698)
Observations	8,016	7,987	8,016	8,016
R-squared	0.009	0.009	0.009	0.009
Number of id	4,047	4,046	4,047	4,047

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix 4: Effects by Gender, Wealth (Consumption), Locality, and Age

Appendix Table A4.1 Cognition – Gender – VAM+

Gender

Cognition Effects by Gender using VAM+ Full3by model; Abbreviated Results

VARIABLES	(1) Full3by	(2) female=0	(3) female=1	(4) Interact
Female				-0.0197
				(0.0354)
W2 Dad in USA	-0.193	-0.214	-0.152	-0.213
	(0.117)	(0.174)	(0.123)	(0.171)
Female X w2 Mig				0.0412
				(0.185)
W1 Dad in USA	-0.170	-0.160	-0.190	-0.181
	(0.142)	(0.190)	(0.170)	(0.190)
Female X w1 Mig				0.0129
				(0.238)
W2 Share life Dad in USA	1.737***	2.278**	1.453	2.524***
	(0.653)	(0.905)	(0.888)	(0.887)
Female X w2 lifeshare				-1.394
				(1.349)
Constant	0.801**	0.324	1.247**	0.798**
	(0.385)	(0.528)	(0.529)	(0.385)
Observations	2,768	1,380	1,388	2,768
R-squared	0.176	0.197	0.177	0.176

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.2 Cognition – Gender – FE

Cognition Effects by Gender using FE; Abbrev Results

VARIABLES	(1) Original FE	(2) female=0	(3) female=1	(4) Interact
Dad in USA	0.0142	0.0483	-0.0139	0.0424
	(0.105)	(0.156)	(0.142)	(0.155)
Female X Dad Migr				-0.0557
				(0.210)
Share of life Dad in USA	0.947	1.091	0.913	1.010
	(1.730)	(2.889)	(1.915)	(2.871)
Female X Lifeshare				-0.129
				(3.438)
Constant	-0.445***	-0.701***	-0.196	-0.446***
	(0.137)	(0.202)	(0.182)	(0.137)
Observations	5,704	2,840	2,864	5,704
R-squared	0.007	0.011	0.009	0.007
Number of id	2,885	1,434	1,451	2,885

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.3 Cognition – Consumption – VAM+

Cognition Effects by Consumption using VAM+ Full3by model; Abbreviated Results

VARIABLES	(1) Full3by	(2) w1 log hh per capita consumption_hi=0	(3) w1 log hh per capita consumption_hi=1	(4) Interact
hh log per capita cons				0.0595
				(0.0457)
W2 Dad in USA	-0.193	-0.180	-0.266*	-0.205
	(0.117)	(0.165)	(0.157)	(0.166)
pc Cons X W2 Mig				0.0276
				(0.218)
W1 Dad in USA	-0.170	-0.309	-0.000485	-0.325
	(0.142)	(0.200)	(0.125)	(0.210)
pc Cons X W1 Mig				0.324
				(0.236)
W2 Share life Dad in USA	1.737***	2.040*	1.168	2.260**
	(0.653)	(1.031)	(0.757)	(1.018)
pc Cons X W2 lifeshare				-1.175
				(1.085)
Constant	0.801**	0.616	1.758***	0.774*
	(0.385)	(0.465)	(0.644)	(0.392)
Observations	2,768	1,386	1,382	2,768
R-squared	0.176	0.166	0.149	0.177

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.4 Cognition – Consumption – FE

Cognition Effects by Consumption using FE; Abbrev Results

VARIABLES	(1) Original FE	(2) w1log hh per capita consumption_hi=0	(3) w1log hh per capita consumption_hi=1	(4) Interact
Dad in USA	0.0142	-0.0362	0.104	-0.0388
	(0.105)	(0.138)	(0.156)	(0.139)
pc Cons X Dad Mig				0.147
				(0.212)
Share life Dad in USA	0.947	0.0723	1.853	-0.194
	(1.730)	(3.546)	(1.922)	(3.594)
pc Cons X Lifeshare				1.883
				(4.066)
Constant	-0.445***	-0.573**	-0.196	-0.445***
	(0.137)	(0.228)	(0.168)	(0.137)
Observations	5,704	2,843	2,833	5,676
R-squared	0.007	0.009	0.013	0.008
Number of id	2,885	1,433	1,434	2,867

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.5 Cognition – Locality – VAM+

Cognition Effects by Locality using VAM+ Full3by model; Abbreviated Results

VARIABLES	(1) Full3by	(2) w1 Rural=0	(3) w1 Rural=1	(4) Interact
Rural				0.0888
				(0.116)
W2 Dad in USA	-0.193	-0.151	-0.230	-0.0921
	(0.117)	(0.218)	(0.149)	(0.200)
Rural X W2 Mig				-0.129
				(0.267)
W1 Dad in USA	-0.170	-0.392**	-0.113	-0.342*
	(0.142)	(0.192)	(0.189)	(0.199)
Rural X W1 Mig				0.229
				(0.262)
W2 Share life Dad in USA	1.737***	1.913*	1.839**	1.753
	(0.653)	(1.140)	(0.767)	(1.212)
Rural X W2 lifeshare				-0.0299
				(1.401)
Constant	0.801**	0.714	1.005*	0.793**
	(0.385)	(0.572)	(0.505)	(0.386)
Observations	2,768	1,358	1,410	2,768
R-squared	0.176	0.166	0.169	0.176

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.6 Cognition – Locality – FE

Cognition Effects by Locality using FE; Abbrev Results

VARIABLES	(1) Original FE	(2) w1rural=0	(3) w1rural=1	(4) Interact
Dad in USA	0.0142	0.383**	-0.0939	0.390**
	(0.105)	(0.189)	(0.122)	(0.192)
Rural X Dad Mig				-0.485**
				(0.227)
Share of life Dad in USA	0.947	3.803***	-0.133	3.698***
	(1.730)	(1.242)	(2.434)	(1.176)
Rural X Lifeshare				-3.845
				(2.688)
Constant	-0.445***	-0.164	-0.745***	-0.452***
	(0.137)	(0.141)	(0.236)	(0.137)
Observations	5,704	2,817	2,887	5,704
R-squared	0.007	0.008	0.014	0.009

Number of id	2,885	1,427	1,458	2,885

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.7 Cognition – Age – VAM+

Cognition Effects by Age using VAM+ Full3by model; Abbreviated Results

VARIABLES	(1) Full3by	(2) w1 Age<7=0	(3) w1 Age<7=1	(4) Interact
Young (Age<7)				-0.0307
				(0.0690)
W2 Dad in USA	-0.193	0.0111	-0.445***	-0.0180
	(0.117)	(0.129)	(0.152)	(0.129)
Young X W2 Mig				-0.434***
				(0.150)
W1 Dad in USA	-0.170	-0.213	-0.146	-0.210
	(0.142)	(0.150)	(0.244)	(0.153)
Young X W1 Mig				0.0868
				(0.264)
W2 Share life Dad in USA	1.737***	1.666**	2.088**	1.645*
	(0.653)	(0.829)	(1.012)	(0.837)
Young X W2 lifeshare				0.424
				(1.265)
Constant	0.801**	1.133**	0.831	0.878**
	(0.385)	(0.490)	(0.613)	(0.417)
Observations	2,768	1,679	1,089	2,768
R-squared	0.176	0.196	0.185	0.177

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.8 Cognition – Age – FE

Cognition Effects by Age using FE; Abbrev Results

VARIABLES	(1) Original FE	(2) Older (Age>=7)	(3) Young (Age<7)	(4) Interact
Dad in USA	0.0142	0.211	-0.270	0.209
	(0.105)	(0.130)	(0.166)	(0.130)
Young (Age<7)				-0.478**
				(0.213)
Share life Dad in USA	0.947	4.375***	-2.791	4.359***
	(1.730)	(1.646)	(2.882)	(1.653)
Young X Lifeshare				-7.135**
				(3.322)
Constant	-0.445***	-0.584***	-0.279	-0.449***
	(0.137)	(0.168)	(0.230)	(0.137)

Observations	5,704	3,457	2,247	5,704
R-squared	0.007	0.013	0.013	0.010
Number of id	2,885	1,749	1,136	2,885

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Attentiveness

Appendix Table A4.9 Attentiveness– Gender – VAM+

Attentiveness Effects by Gender using VAM+ Full3by model; Abbreviated Results

VARIABLES	(1) Full3by	(2) female=0	(3) female=1	(4) Interact
Female				0.0165
				(0.0203)
W2 Dad in USA	-0.195**	-0.162	-0.222**	-0.167
	(0.0833)	(0.103)	(0.0938)	(0.105)
Female X w2 Mig				-0.0582
				(0.0954)
W1 Dad in USA	-0.0215	-0.0377	-0.00907	-0.0299
	(0.0623)	(0.0789)	(0.0941)	(0.0741)
Female X w1 Mig				0.0225
				(0.114)
W2 Share life Dad in USA	0.846**	0.296	1.259**	0.260
	(0.393)	(0.550)	(0.603)	(0.549)
Female X w2 lifeshare				1.039
				(0.867)
Constant	3.409***	3.421***	3.349***	3.414***
	(0.247)	(0.299)	(0.345)	(0.247)
Observations	2,766	1,378	1,388	2,766
R-squared	0.050	0.053	0.065	0.051

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.10 Attentiveness – Gender – FE

Attentiveness Effects by Gender using FE; Abbrev Results

VARIABLES	(1) Original FE	(2) female==0	(3) female==1	(4) Interact
Dad in USA	-0.0223	0.0341	-0.0781	0.0363
	(0.0615)	(0.0898)	(0.0823)	(0.0894)
Female X Dad Migr				-0.114
				(0.121)
Share of life Dad in USA	1.824*	-0.207	3.835***	-0.174
	(0.957)	(1.304)	(1.401)	(1.278)
Female X Lifeshare				4.037**

				(1.897)
Constant	3.229***	3.200***	3.266***	3.228***
	(0.0819)	(0.113)	(0.117)	(0.0819)
Observations	5,700	2,836	2,864	5,700
R-squared	0.003	0.006	0.006	0.005
Number of id	2,883	1,432	1,451	2,883

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.11 Attentiveness – Consumption– VAM+

Attentiveness Effects by Gender using VAM+ Full3by model; Abbreviated Results

VARIABLES	(1) Full3by	(2) w1 log hh per capita consumption_hi=0	(3) w1 log hh per capita consumption_hi=1	(4) Interact
hh log per capita cons				0.0189
				(0.0275)
W2 Dad in USA	-0.195**	-0.253**	-0.130	-0.248**
	(0.0833)	(0.116)	(0.0961)	(0.117)
pc Cons X W2 Mig				0.122
				(0.162)
W1 Dad in USA	-0.0215	-0.0672	0.0133	-0.0758
	(0.0623)	(0.106)	(0.0897)	(0.103)
pc Cons X W1 Mig				0.103
				(0.148)
W2 Share life Dad in USA	0.846**	1.614**	0.279	1.756***
	(0.393)	(0.666)	(0.566)	(0.664)
pc Cons X W2 lifeshare				-1.650*
				(0.882)
Constant	3.409***	3.700***	2.947***	3.391***
	(0.247)	(0.268)	(0.394)	(0.246)
Observations	2,766	1,384	1,382	2,766
R-squared	0.050	0.077	0.052	0.052

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.12 Attentiveness – Consumption– FE

Attentiveness Effects by Gender using FE; Abbrev Results

VARIABLES	(1) Original FE	(2) w1log hh per capita consumption_hi==0	(3) w1log hh per capita consumption_hi==1	(4) Interact
Dad in USA	-0.0223	-0.0786	0.0754	-0.0801
	(0.0615)	(0.0804)	(0.0942)	(0.0798)
pc Cons X Dad Mig				0.154
				(0.123)
Share of life Dad in USA	1.824*	1.755	1.949*	1.808

	(0.957)	(1.942)	(1.084)	(1.942)
pc Cons X Lifeshare				0.178
				(2.231)
Constant	3.229***	3.125***	3.338***	3.235***
	(0.0819)	(0.137)	(0.102)	(0.0820)
Observations	5,700	2,839	2,833	5,672
R-squared	0.003	0.005	0.003	0.003
Number of id	2,883	1,431	1,434	2,865

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.13 Attentiveness – Locality –VAM+

Attentiveness Effects by Locality using VAM+ Full3by model; Abbreviated Results

VARIABLES	(1) Full3by	(2) w1 Rural=0	(3) w1 Rural=1	(4) Interact
Rural				0.0310
				(0.0789)
W2 Dad in USA	-0.195**	-0.106	-0.234**	-0.0891
	(0.0833)	(0.137)	(0.0998)	(0.118)
Rural X W2 Mig				-0.138
				(0.149)
W1 Dad in USA	-0.0215	0.0394	-0.0490	0.0657
	(0.0623)	(0.157)	(0.0757)	(0.150)
Rural X W1 Mig				-0.114
				(0.181)
W2 Share life Dad in USA	0.846**	0.372	1.040**	0.161
	(0.393)	(0.829)	(0.454)	(0.753)
Rural X W2 lifeshare				0.864
				(0.872)
Constant	3.409***	3.685***	3.173***	3.405***
	(0.247)	(0.406)	(0.291)	(0.248)
Observations	2,766	1,357	1,409	2,766
R-squared	0.050	0.053	0.072	0.050

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.14 Attentiveness – Locality – FE

Attentiveness Effects by Locality using FE; Abbrev Results

VARIABLES	(1) Original FE	(2) w1rural==0	(3) w1rural==1	(4) Interact
Dad in USA	-0.0223	0.00316	-0.0264	-3.96e-05
	(0.0615)	(0.132)	(0.0696)	(0.131)
Rural X Dad Mig				-0.0259

				(0.148)
Share of life Dad in USA	1.824*	3.915**	0.808	3.901**
	(0.957)	(1.941)	(1.070)	(1.917)
Rural X Lifeshare				-3.075
				(2.195)
Constant	3.229***	3.324***	3.125***	3.224***
	(0.0819)	(0.0956)	(0.134)	(0.0823)
Observations	5,700	2,815	2,885	5,700
R-squared	0.003	0.003	0.004	0.004
Number of id	2,883	1,426	1,457	2,883

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.15 Attentiveness – Age –VAM+

Attentiveness Effects by Age using VAM+ Full3by model; Abbreviated Results

VARIABLES	(1) Full3by	(2) w1 Age<7=0	(3) w1 Age<7=1	(4) Interact
Young (Age<7)				-0.0604
				(0.0439)
W2 Dad in USA	-0.195**	-0.177**	-0.203*	-0.178**
	(0.0833)	(0.0850)	(0.109)	(0.0802)
pc Cons X W2 Mig				-0.0341
				(0.0964)
W1 Dad in USA	-0.0215	-0.0780	0.121	-0.0779
	(0.0623)	(0.0566)	(0.117)	(0.0543)
pc Cons X W1 Mig				0.180
				(0.117)
W2 Share life Dad in USA	0.846**	0.968**	0.386	0.949**
	(0.393)	(0.465)	(0.680)	(0.471)
pc Cons X W2 lifeshare				-0.438
				(0.813)
Constant	3.409***	3.201***	3.739***	3.517***
	(0.247)	(0.336)	(0.329)	(0.249)
Observations	2,766	1,677	1,089	2,766
R-squared	0.050	0.067	0.060	0.051

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.16 Attentiveness – Age –FE

Attentiveness Effects by Age using FE; Abbrev Results

VARIABLES	(1) Original FE	(2) w1vyoung==0	(3) w1vyoung==1	(4) Interact
Dad in USA	-0.0223	0.0561	-0.150	0.0603
	(0.0615)	(0.0729)	(0.105)	(0.0733)
Young (Age<7)				-0.209
				(0.128)
Share of life Dad in USA	1.824*	2.568**	1.060	2.599**
	(0.957)	(1.227)	(1.424)	(1.245)
Young X Lifeshare				-1.544
				(1.872)
Constant	3.229***	3.321***	3.120***	3.227***
	(0.0819)	(0.107)	(0.127)	(0.0819)
Observations	5,700	3,453	2,247	5,700
R-squared	0.003	0.004	0.007	0.004
Number of id	2,883	1,747	1,136	2,883

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

BMI

Appendix Table A4.17 BMI– Gender –VAM+

BMI Effects by Gender using VAM+ Full3by model; Abbreviated Results

VARIABLES	(1) Full3by	(2) female=0	(3) female=1	(4) Interact
Female				0.0364
				(0.0272)
W2 Dad in USA	0.0483	0.0236	0.0523	0.0704
	(0.0598)	(0.0984)	(0.0778)	(0.101)
Female X w2 Mig				-0.0365
				(0.138)
W1 Dad in USA	-0.0464	-0.239***	0.100	-0.211**
	(0.0633)	(0.0765)	(0.107)	(0.0872)
Female X w1 Mig				0.328**
				(0.160)
W2 Share life Dad in USA	0.136	0.763**	-0.442	0.573
	(0.464)	(0.347)	(0.727)	(0.366)
Female X w2 lifeshare				-0.996
				(0.710)
Constant	-0.519	-0.248	-0.752*	-0.503
	(0.419)	(0.685)	(0.439)	(0.418)
Observations	3,931	1,930	2,001	3,931
R-squared	0.270	0.264	0.296	0.271

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.18 BMI– Gender –FE

BMI Effects by Gender using FE; Abbrev Results

VARIABLES	(1) Original FE	(2) female==0	(3) female==1	(4) Interact
Dad in USA	0.108**	0.147*	0.0817	0.132*
	(0.0522)	(0.0771)	(0.0698)	(0.0777)
Female X Dad Migr				-0.0442
				(0.105)
Share of life Dad in USA	1.111*	0.954	1.563	0.863
	(0.615)	(0.744)	(1.239)	(0.731)
Female X Lifeshare				0.898
				(1.439)
Constant	1.174*	1.755*	0.588	1.175*
	(0.698)	(0.974)	(0.998)	(0.698)
Observations	8,016	3,937	4,079	8,016
R-squared	0.009	0.010	0.013	0.009
Number of id	4,047	1,987	2,060	4,047

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.19 BMI– Consumption – VAM+

BMI Effects by Wealth (Consumption) using VAM+ Full3by model; Abbreviated Results

VARIABLES	(1) Full3by	(2) w1 log hh per capita consumption_hi=0	(3) w1 log hh per capita consumption_hi=1	(4) Interact
hh log per capita cons				0.0724**
				(0.0328)
W2 Dad in USA	0.0483	0.0530	0.0418	0.0837
	(0.0598)	(0.0824)	(0.0955)	(0.0856)
pc Cons X W2 Mig				-0.0811
				(0.127)
W1 Dad in USA	-0.0464	-0.0529	-0.0532	-0.0480
	(0.0633)	(0.0864)	(0.0784)	(0.0911)
pc Cons X W1 Mig				-0.0252
				(0.114)
W2 Share life Dad in USA	0.136	-0.334	0.651	-0.509
	(0.464)	(0.869)	(0.471)	(0.884)
pc Cons X W2 lifeshare				1.181
				(0.887)
Constant	-0.519	-0.871	-0.187	-0.560
	(0.419)	(0.596)	(0.629)	(0.410)
Observations	3,931	2,005	1,918	3,923

R-squared	0.270	0.232	0.322	0.272

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.20 BMI– Consumption –FE

BMI Effects by Wealth (Consumption) using FE; Abbrev Results

VARIABLES	(1) Original FE	(2) w1log hh per capita consumption_hi==0	(3) w1log hh per capita consumption_hi==1	(4) Interact
Dad in USA	0.108**	0.164**	0.0115	0.163**
	(0.0522)	(0.0744)	(0.0652)	(0.0751)
pc Cons X Dad Mig				-0.135
				(0.0999)
Share of life Dad in USA	1.111*	0.321	1.498	0.315
	(0.615)	(0.831)	(0.963)	(0.842)
pc Cons X Lifeshare				1.377
				(1.261)
Constant	1.174*	1.135	0.760	1.105
	(0.698)	(1.016)	(0.956)	(0.700)
Observations	8,016	4,069	3,906	7,975
R-squared	0.009	0.010	0.017	0.009
Number of id	4,047	2,048	1,973	4,021

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.21 BMI– Locality –VAM+

BMI Heterogeneous using by Locality VAM+ Full3by model; Abbreviated Results

VARIABLES	(1) Full3by	(2) w1 Rural=0	(3) w1 Rural=1	(4) Interact
Rural				0.0241
				(0.0742)
W2 Dad in USA	0.0483	-0.203	0.0876	-0.184
	(0.0598)	(0.163)	(0.0663)	(0.165)
pc Cons X W2 Mig				0.297*
				(0.178)
W1 Dad in USA	-0.0464	-0.0204	-0.0271	-0.0586
	(0.0633)	(0.130)	(0.0822)	(0.135)
pc Cons X W1 Mig				0.0280
				(0.164)
W2 Share life Dad in USA	0.136	-0.340	0.187	-0.131
	(0.464)	(0.863)	(0.435)	(0.887)
pc Cons X W2 lifeshare				0.352
				(0.765)

Constant	-0.519	0.592	-0.839	-0.493
	(0.419)	(0.687)	(0.588)	(0.409)
Observations	3,931	1,883	2,048	3,931
R-squared	0.270	0.304	0.249	0.271

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.22 BMI– Locality–FE

BMI Effects by Locality using FE; Abbrev Results

VARIABLES	(1) Original FE	(2) w1rural==0	(3) w1rural==1	(4) Interact
Dad in USA	0.108**	0.0189	0.136**	0.0264
	(0.0522)	(0.121)	(0.0580)	(0.121)
Rural X Dad Mig				0.102
				(0.134)
Share of life Dad in USA	1.111*	-0.340	1.609***	0.0212
	(0.615)	(1.766)	(0.613)	(1.742)
Rural X Lifeshare				1.500
				(1.841)
Constant	1.174*	0.941	1.317	1.173*
	(0.698)	(1.109)	(0.893)	(0.698)
Observations	8,016	3,864	4,152	8,016
R-squared	0.009	0.012	0.013	0.009
Number of id	4,047	1,955	2,092	4,047

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.23 BMI– Age –VAM+

BMI Effects by Age using VAM+ Full3by model; Abbreviated Results

VARIABLES	(1) Full3by	(2) w1 Age<7=0	(3) w1 Age<7=1	(4) Interact
Young (Age<7)				-0.0830
				(0.0704)
W2 Dad in USA	0.0483	0.0711	-0.00283	0.0554
	(0.0598)	(0.0737)	(0.102)	(0.0756)
pc Cons X W2 Mig				-0.0354
				(0.128)
W1 Dad in USA	-0.0464	-0.0753	-0.0517	-0.0748
	(0.0633)	(0.0650)	(0.101)	(0.0659)
pc Cons X W1 Mig				0.0262
				(0.120)
W2 Share life Dad in USA	0.136	1.111**	-0.138	1.020*
	(0.464)	(0.490)	(0.602)	(0.538)
pc Cons X W2 lifeshare				-1.216

				(0.849)
Constant	-0.519	0.464	-0.629	-0.380
	(0.419)	(0.616)	(0.685)	(0.437)
Observations	3,931	1,859	2,072	3,931
R-squared	0.270	0.423	0.182	0.271

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table A4.24 BMI– Age–FE

BMI Effects by Age using FE; Abbrev Results

VARIABLES	(1) Original FE	(2) w1vyoung==0	(3) w1vyoung==1	(4) Interact
Dad in USA	0.108**	0.0897	0.126	0.0981
	(0.0522)	(0.0631)	(0.0846)	(0.0638)
Young (Age<7)				0.0241
				(0.105)
Share of life Dad in USA	1.111*	1.463	0.864	1.747
	(0.615)	(1.028)	(0.766)	(1.070)
Young X Lifeshare				-0.916
				(1.314)
Constant	1.174*	2.453***	0.0259	1.173*
	(0.698)	(0.800)	(1.094)	(0.698)
Observations	8,016	3,793	4,223	8,016
R-squared	0.009	0.024	0.006	0.009
Number of id	4,047	1,917	2,130	4,047

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix 5: BMI and Overweight Prevalence by Paternal Migration

Wave 1 BMI

```
+-------------------+
| Key               |
|-------------------|
|     frequency     |
| column percentage |
+-------------------+

      AJPH |
Definition |
         : |
BMI<25kg/m |     w2_migusa_dad
        2) |         0          1 |     Total
-----------+----------------------+----------
Overweight |        32          1 |        33
           |      0.82       0.51 |      0.81
-----------+----------------------+----------
Not Overwt |     3,854        197 |     4,051
           |     99.18      99.49 |     99.19
-----------+----------------------+----------
     Total |     3,886        198 |     4,084
           |    100.00     100.00 |    100.00
```

Two-sample t test with equal variances of W1 "not overweight" by W2 Paternal Migration Status

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
Non-Mig Dad	3886	.9917653	.0014499	.0903824	.9889227	.9946079
Mig Dad	198	.9949495	.0050505	.0710669	.9849895	1.004909
combined	4084	.9919197	.0014011	.0895376	.9891728	.9946666
diff		-.0031842	.0065239		-.0159745	.0096061

```
    diff = mean(0) - mean(1)                                      t =  -0.4881
Ho: diff = 0                     degrees of freedom =     4082

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.3128         Pr(|T| > |t|) = 0.6255          Pr(T > t) = 0.6872
```

Wave 2 BMI

```
+-------------------+
| Key               |
|-------------------|
|     frequency     |
| column percentage |
+-------------------+

       Not |
Overweight |
      AJPH |
Definition |
         : |
BMI<25kg/m |     w2_migusa_dad
        2) |         0          1 |     Total
-----------+----------------------+----------
Overweight |       251         12 |       263
           |      6.46       6.06 |      6.44
-----------+----------------------+----------
Not Overwt |     3,635        186 |     3,821
```

```
           |     93.54      93.94 |     93.56
-----------+----------------------+----------
     Total |     3,886        198 |     4,084
           |    100.00     100.00 |    100.00
```

Two-sample t test with equal variances **of W2 "not overweight" by W2 Paternal Migration Status**

```
------------------------------------------------------------------------------
   Group   |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
-----------+------------------------------------------------------------------
Non-Mig Dad|    3886    .9354092    .0039436    .2458341    .9276775    .9431408
Mig Dad    |     198    .9393939        .017    .2392111    .9058686    .9729193
-----------+------------------------------------------------------------------
Combined   |    4084    .9356024    .0038414      .24549    .9280711    .9431336
-----------+------------------------------------------------------------------
    diff   |           -.0039848    .0178872               -.0390535     .031084
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -0.2228
Ho: diff = 0                                     degrees of freedom =     4082

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.4119         Pr(|T| > |t|) = 0.8237          Pr(T > t) = 0.5881
```