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# International Migration, Human Capital, and Entrepreneurship: Evidence from Philippine Migrants' Exchange Rate Shocks

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# International Migration, Human Capital, and Entrepreneurship: Evidence from Philippine Migrants' Exchange Rate Shocks

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**Abstract**

Millions of households in developing countries receive financial support from family members working overseas. How do the economic prospects of overseas migrants affect origin-household investments—in particular, in child human capital and household enterprises? This paper examines Philippine households' responses to overseas members' economic shocks. Overseas Filipinos work in dozens of foreign countries, which experienced sudden (and heterogeneous) changes in exchange rates due to the 1997 Asian financial crisis. Appreciation of a migrant's currency against the Philippine peso leads to increases in household remittances received from overseas. The estimated elasticity of Philippine-peso remittances with respect to the Philippine/foreign exchange rate is 0.60. In addition, these positive income shocks lead to enhanced human capital accumulation and entrepreneurship in origin households. Favorable migrant shocks lead to greater child schooling, reduced child labor, and increased educational expenditure in origin households. More favorable exchange rate shocks also raise hours worked in self-employment, and lead to greater entry into relatively capital-intensive enterprises by migrants' origin households.

(*JEL* D13, F22, I2, I3, J22, J23, J24, O12, O15)

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# 1 Introduction

Between 1965 and 2000, individuals living outside their countries of birth grew from 2.2% to 2.9% of world population, reaching a total of 175 million people in the latter year.[1] The remittances that these migrants send to origin countries are an important but relatively poorly understood type of international financial flow. In 2002, remittance receipts of developing countries amounted to US$79 billion.[2] This figure exceeded total official development aid (US$51 billion), and amounted to roughly four-tenths of foreign direct investment inflows (US$189 billion) received by developing countries in that year.[3] An understanding of how these migrant and remittance flows affect migrants' origin households is a core element in any assessment of how international migration affects origin countries,[4] and in weighing the benefits to origin countries of developed-country policies liberalizing inward migration (as proposed in Rodrik (2002) and Bhagwati (2003), for example).

What effects do migrant economic opportunities have on migrants' origin households—in particular, on investments in human capital and productive enterprises? An important body of research in economics examines the multiple roles migration can play for households in developing countries (Lucas and Stark (1985), Rosenzweig and Stark (1989), Stark (1991), and Poirine (1997), among others; see also Taylor and Martin (2001) for an overview). Accumulated migrant earnings can allow investments that would not have otherwise been made due to credit constraints and large up-front costs. Many studies find migration and remittance receipts to be positively correlated with various types of household investments in developing countries.[5] By contrast, others argue that resources received from overseas rarely fund productive investments, and mainly allow higher consumption.[6]

[1]Estimates of the number of individuals living outside their countries of birth are from United Nations (2002), while data on world population are from U.S. Bureau of the Census (2002).

[2]The remittance figure is the sum of the "workers' remittances", "compensation of employees", and "migrants' transfers" items in the IMF's International Financial Statistics database for all countries not listed as "high income" in the World Bank's country groupings.

[3]Aid and FDI figures are from World Bank (2004). While the figures for official development aid and FDI are likely to be accurate, by most accounts (for example, Ratha (2003)) national statistics on remittance receipts are considerably underreported. So the remittance figure may be taken as a lower bound.

[4]Borjas (1999) argues that the investigation of benefits accruing to migrants' source countries is an important and virtually unexplored area in research on migration.

[5]For example: Brown (1994), Massey and Parrado (1998), McCormick and Wahba (2001), Dustmann and Kirchkamp (2002), Woodruff and Zenteno (2003), and Mesnard (2004) on entrepreneurship and small business investment in a variety of countries; Adams (1998) on agricultural land in Pakistan; Cox-Edwards and Ureta (2003) on child schooling in El Salvador; Taylor, Rozelle, and de Brauw (2003) on agricultural investment in China; and others.

[6]For example, Lipton (1980), Reichert (1981), Grindle (1988), Massey et al. (1987), and Ahlburg (1991), among others.

A central methodological concern with existing work on this topic is that migrant economic opportunities are in general not randomly allocated across households, so that any observed relationship between migration or remittances and household outcomes may simply reflect the influence of unobserved third factors. For example, more ambitious households could have more migrants and receive larger remittances, and also have higher investment levels. Alternately, households that recently experienced an adverse shock to existing investments (say, the failure of a small business) might send members overseas to make up lost income, so that migration and remittances would be negatively correlated with household investment activity.

An experimental approach to establishing the impact of migrant economic opportunities on household outcomes could start by identifying a set of households that already had one or more members working overseas, assigning each migrant a randomly-sized economic shock, and then examining the relationship between changes in household outcomes and the size of the shock dealt to the household's migrants.

This paper takes advantage of a real-world situation akin to the experiment just described. A non-negligible fraction of households in the Philippines have one or more members working overseas at any one time.[7] These overseas Filipinos work in dozens of foreign countries, many of which experienced sudden changes in exchange rates due to the 1997 Asian financial crisis. Crucially for the analysis, the changes varied in magnitude across overseas Filipinos' locations. At the same time, the Philippine peso also depreciated substantially.

The net result was large variation in the size of the exchange rate shock experienced by migrants across source households. Between the year ending July 1997 and the year ending October 1998, the US dollar and currencies in the main Middle Eastern destinations of Filipino workers rose 50% in value against the Philippine peso. Over the same time period, by contrast, the currencies of Taiwan, Singapore, and Japan rose by only 26%, 29%, and 32%, while those of Malaysia and Korea actually fell slightly (by 1% and 4%, respectively) against the peso.[8]

Taking advantage of this variation in the size of migrant exchange rate shocks, I examine their impact on *changes* in household outcomes in migrants origin households, using detailed panel household survey data from before and after the Asian financial crisis. The focus on changes in household outcomes (rather than levels) is crucial, so that estimates are purged of any association between the exchange rate shocks and time-invariant household characteristics.

Appreciation of a migrant's currency against the Philippine peso was a positive income shock

[7] The figure was 6% in June 1997 in the dataset used in this paper.

[8] I describe the exchange rate shock variable in section 3.2 below.

for the migrant's origin household in the Philippines, and is (partly) reflected in changes in household remittance receipts from overseas. The greater the appreciation of a migrant's currency against the Philippine peso, the larger the increase in household remittance receipts (in pesos). Figure 1 displays the bivariate relationship between the percentage change in the exchange rate (Philippine pesos per unit of foreign currency) and the percentage change in mean remittance receipts for households with migrants in the top 20 destinations of Philippine overseas workers. The datapoints exhibit an obvious positive relationship. Regression analysis using household-level data implies an elasticity of Philippine-peso remittances with respect to the exchange rate of 0.60—a 10% increase in Philippine pesos per unit of foreign currency increases peso remittances by 6%.[9]

At the same time, appreciation of a migrant's currency against the peso led to enhanced human capital accumulation and entrepreneurship in origin households. Favorable exchange rate shocks led to improved child schooling, reduced child labor, increased educational expenditure, and increased durable good ownership (particularly vehicles). In terms of entrepreneurship, more favorable shocks led to differential increases in hours worked in self-employment, and to differential entry into what are likely to be relatively capital-intensive entrepreneurial activities (transportation/communication services and manufacturing).

A crucial question is whether the relationship between the exchange rate shocks and household investment outcomes reflects the causal impact of the shocks. The main concern is that migrants were not randomly assigned to overseas locations, and that households whose migrants experienced better shocks might have experienced differential improvements in household investment outcomes even in the absence of the shock. Such differential changes might be due to differential ongoing trends, or to correlation between the migrant exchange rate shocks and other types of household shocks (such as downturns in particular regions of the Philippines that happen to send migrants to particular countries). While such concerns are difficult to rule out completely, I address this issue by gauging the stability of the regression results to accounting for changes in outcomes that are correlated with a comprehensive set of households' pre-shock characteristics. The estimated impact of the exchange rate shock is little changed (and often becomes larger in magnitude) when pre-shock household characteristics are included in regressions, providing no

[9] As I discuss below in subsection 3.2, the total change in household income due to the exchange rate shock is only partly reflected in the observed change in remittances. The survey instruments used do not collect other information needed to quantify the total change in household income, such as overseas wages and the amount of savings held overseas. Thus the focus in this paper is simply on the reduced-form impact of the exchange rate shocks.

reason to question the causal interpretation of the results.

The shocks are most plausibly interpreted as *transitory* income shocks, as the vast majority of migrants are explicitly reported to be temporary migrants: their eventual return to the Philippines automatically puts an end to the period of foreign currency earnings.[10] I also argue that the household investment responses do not appear to be due to changes in the likelihood of migrant returns, since controlling for migrant returns has essentially no impact on the estimates. Finally, there is little indication that real economic shocks in overseas countries correlated with the exchange rate shocks are driving the results, as measures of real economic shocks in migrants' overseas locations do very poorly in explaining changes in household outcomes, compared to the exchange rate.

This paper also contributes more broadly to understanding how households in developing countries respond to unexpected, transitory changes in economic conditions. In focusing on a household-level shock, this paper is reminiscent of studies of the impact of household-level events such as crop loss (Beegle, Dehejia, and Gatti (2003)) or job loss (Duryea, Lam, and Levison (2003)) on child labor. The main distinguishing features of this study are, first, its use of a novel source of income variation (migrants' exchange rate shocks), and, second, its examination of entrepreneurial activity alongside human capital investment outcomes.[11] I am aware of no other study that examines the impact of exogenous income shocks on the entrepreneurial activities of developing-country households.

The remainder of this paper is organized as follows. Section 2 provides a brief discussion of the theoretical impact of income shocks on household investment activity. Section 3 describes the dispersion of Filipino household members overseas, and discusses the nature of the exchange rate shocks. Section 4 presents empirical results, and conducts a number of auxiliary analyses to clarify the interpretation of the results. Section 5 concludes. The Data Appendix describes the household surveys used and procedures followed for creating the sample for empirical analysis.

[10] In other words, even if the exchange rate changes persist, household income (denominated in Philippine pesos) ceases to depend on the exchange rate in the migrant's overseas location once the migrant returns home.

[11] Other studies of the impact of shocks on households differ in more substantial ways. Numerous studies examine the impact of *locality*-level shocks, such as weather shocks (Jacoby and Skoufias (1997), Jensen (2000), Rose (1999), Miguel (2003)) and heterogeneity in the local impact of the 1997 Asian crisis in Indonesia (Frankenberg, Smith, and Thomas (2003)). In such analyses, at least part of the effects found may be due to changes in locality-level economic conditions (such as wage rates), rather than merely due to changes in household income. Studies of the effects of the South African pension expansion (e.g., Case and Deaton (1998), Jensen (1998), Duflo (2003), Bertrand, Mullainathan, and Miller (2003), Edmonds (2003)) differ in that they refer to *anticipated* changes in pension receipt that affect household permanent income. The South Africa studies also differ in that they are conducted using cross-sectional (rather than panel) datasets.

# 2 Income shocks and household investments in theory

In theory, how should transitory income shocks (such as migrants' exchange rate movements) affect household investments in child human capital and in household enterprises? If households have complete access to credit, transitory shocks should have no effect on such investments, as borrowing allows households to separate the timing of investment from the timing of income.[12] But when household investments require fixed costs be paid in advance of the investment returns, and when households face credit constraints, the timing of household investments may depend on current income realizations. In particular, households may raise investments when experiencing positive income shocks.

A large body of theoretical work in economics makes predictions of this sort for households in developing-country (and, more generally, liquidity-constrained) environments. Economic models of child labor, such as Baland and Robinson (2000) or Basu and Van (1998), consider unitary households deciding on the amount of child labor in some initial period of life. Keeping children in school (and out of the labor force) leads children to have higher future wages, but such investments reduce current household income. When an absence of credit markets prevents households from shifting consumption from later to earlier periods via borrowing, keeping children out of the labor force (and in school) in initial periods can come at too high a utility cost from foregone consumption, and so it can be optimal for households to have children work. Temporary increases in household income in initial periods, then, can allow households to reduce child labor force participation and raise child schooling. The effect of such positive income shocks on child schooling is magnified if schooling involves large fixed costs, such as tuition.

Transitory income shocks can also affect household participation in entrepreneurial activities, if such activities are capital-intensive. When credit and formal savings mechanisms are poor or nonexistent, productive assets may play dual roles as savings mechanisms and as income sources. When households face positive income shocks, they may accumulate productive assets, and they may sell these same assets when they experience negative shocks. Of course, such accumulation and decumulation of productive assets comes at a cost in terms of maximizing income from household enterprises, but such behavior may be optimal for risk-averse households when other savings vehicles are absent. Rosenzweig and Wolpin (1993) is the canonical investigation of such

[12] However, if the shocks are large enough to materially affect *permanent* or lifetime income, income effects might lead households to change their investment behavior even when there are perfect credit markets. For example, child human capital may be a normal good for households, as in Becker (1965). Small business ownership may also be a normal good; the evidence provided by Hurst and Lusardi (2004) among U.S. households may be interpreted in this light.

behavior, in the context of rural Indian households who use bullocks (draft oxen) in this manner.

The empirical analysis to follow will examine the extent to which household investments in child human capital and entrepreneurial activity respond to unexpected migrant exchange rate shocks. Additional evidence will suggest that the exchange rate movements should largely be thought of as transitory rather than permanent shocks to household income, and that the exchange rate shocks are unlikely to be operating via channels other than household income.

# 3 Overseas Filipinos: characteristics and exposure to shocks

## 3.1 Characteristics of overseas Filipinos

Data on overseas Filipinos are collected in the Survey on Overseas Filipinos (SOF), conducted in October of each year by the National Statistics Office of the Philippines. The SOF asks a nationally-representative sample of households in the Philippines about members of the household who left for overseas within the last five years.

Table 1 displays the distribution of household members working overseas by country in June 1997, immediately prior to the Asian financial crisis.[13] Filipino workers are remarkably dispersed worldwide. Saudi Arabia is the largest single destination, with 28.4% of the total, and Hong Kong comes in second with 11.5%. But no other destination accounts for more than 10% of the total. The only other countries accounting for 6% or more are Taiwan, Japan, Singapore, and the United States. The top 20 destinations listed in the table account for 91.9% of overseas Filipino workers; the remaining 8.1% are distributed among 38 other identified countries or have an unspecified location.

Table 2 displays summary statistics on the characteristics of overseas Filipino workers in the same survey. 1,832 overseas workers were overseas in June 1997 in the households included in the empirical analysis (see the Data Appendix for details on the construction of the household sample). The overseas workers have a mean age of 34.5 years. 38% are single, and 53% are male. 'Production and related workers' and 'domestic servants' are the two largest occupational categories, each accounting for 31% of the total. 31% of overseas workers in the sample have achieved some college education, and a further 30% have a college degree. In terms of position in the household, the most common categories are male heads of household and daughters of the

[13] For 90% of individuals in the SOF, their location overseas in that month is reported explicitly. For the remainder, a few reasonable assumptions must be made to determine their June 1997 location. See the Appendix for the procedure used to determine the locations of overseas Filipinos in the SOF.

head, each accounting for 28% of overseas workers; sons of head account for 15%, female heads or spouses of heads 12%, and other relations 16% of overseas workers. As of June 1997, the bulk of overseas workers had been away for relatively short periods: 30% had been overseas for just 0-11 months, 24% for 12-23 months, and 16% for 24-35 months, 15% for 36-47 months, and 16% for 48 months or more.

## 3.2 Shocks generated by the Asian financial crisis

The geographic dispersion of overseas Filipinos meant that there was considerable variety in the shocks they experienced in the wake of the Asian financial crisis, starting in July 1997. The devaluation of the Thai baht in that month set off a wave of speculative attacks on national currencies, primarily (but not exclusively) in East and Southeast Asia.

Figure 2 displays monthly exchange rates for selected major locations of overseas Filipinos (expressed in Philippine pesos per unit of foreign currency, normalized to 1 in July 1996).[14] The sharp trend shift for nearly all countries after July 1997 is the most striking feature of this graph. An increase in a particular country's exchange rate should be considered a favorable shock to an overseas household member in that country: each unit of foreign currency earned would be convertible to more Philippine pesos once remitted.

I argue that a favorable migrant exchange rate movement is most appropriately interpreted as a transitory, positive income shock for the migrant's origin household in the Philippines. Most obviously, improvements in exchange rates raise the Philippine peso value of current overseas earnings, and of future earnings that the migrant expects for the remainder of the overseas stay. In addition, exchange rate improvements raise the Philippine peso value of accumulated migrant savings held in the currency of the overseas location.

The improvement in the Philippine-peso value of overseas earnings and savings might be expected to lead to higher remittances (and the empirical analysis will show this). That said, there is no reason to expect that the *entire* change in household income and savings due to the exchange rate shock will appear as higher remittances sent home by migrants. Migrants can continue to hold their savings overseas. What's more, some fraction of the change in household income is accounted for by future wages yet to be earned overseas in the appreciated currency. Therefore, any observed change in remittances will (perhaps substantially) understate the change in total household income associated with exchange rate movements.

[14] The exchange rates are as of the end of each month, and were obtained from Bloomberg L.P.

Unfortunately, overseas savings and overseas wages are not reported in the Philippine household dataset used in this paper. Due to the absence of complete data on the change in household income (and of any realistic way to estimate it), I do not attempt to use the exchange rate shock as an instrumental variable for the household income shock; rather, I focus solely on the reduced-form impact of the shock.

Why are the exchange rate shocks most plausibly interpreted as *transitory* (as opposed to permanent) shocks to household income? First of all, while the post-crisis exchange rate changes have been quite persistent through the present day, it is not clear that migrants would have expected this to be the case. They may indeed have placed some positive probability that exchange rates would have returned to previous levels.

Second, it is reasonable to expect that the vast majority of migrants included in the dataset will eventually return to the Philippines, ending the period of foreign-currency earnings and thus making the exchange rate shock transitory in practice in its effect on household income. The great majority of migrants (95.6%) are explicitly reported in the survey as being some category of temporary overseas worker, while only 2.8% are reported to be "immigrants".[15] In the cross-section, most migrants are reported to have been away for relatively short periods: 84 percent of migrants were reported to have been away for less than 48 months as of mid-1997 (see Table 2).[16] Migrants' temporary labor contracts typically stipulate that they must return to the Philippines upon completion of their work abroad. Although some migrants do illegally overstay their contracts, a substantial fraction of migrants are located in places where permanent migration is unlikely to be seen as attactive due to cultural distance (more than a third of migrants go to the Middle East, for example), and many have left spouses and children behind (Table 2 indicates that 40% of migrants are either heads of household or spouses of heads). Thus, the bulk of Philippine labor migrants are likely to see their overseas stays as temporary periods, during which they accumulate savings and eventually return home.[17] While the empirical analysis does show that migrants extend their overseas stays somewhat in response to favorable exchange rate shocks, the magnitude of this effect is not large enough to alter the point that overseas stays are finite for the vast majority of migrants.[18]

[15] These data refer to the question in the SOF on "reason for migration". The remaining categories are "tourist", "student", and "other".

[16] This is not because overseas labor migration is a recent phenomenon, so that there has not been enough time for migrants to accumulate time overseas. On the contrary, overseas labor migration from the Philippines has been substantial since the 1970s (see Cariño (1998)).

[17] Yang (2004) provides a more detailed treatment of the interrelationships among migrants' savings, investment, and return decisions.

[18] Moreover, re-estimating the effect of the exchange rate on the child human capital and on entrepreneurial

In the empirical section, I will also provide evidence that the changes in household investment do not appear to be due to a non-income channel, the change in the likelihood of migrant returns. In addition, I provide evidence that the impact on household investment does not appear to be due to real economic shocks (such as job terminations) that might have been correlated with the exchange rate shocks.[19]

### 3.3 The exchange rate shock measure

For each country $j$, I construct the following measure of the exchange rate change between the year preceding July 1997 and the year preceding October 1998:

$$ERCHANGE_j = \frac{\text{Average country } j \text{ exchange rate from Oct. 1997 to Sep. 1998}}{\text{Average country } j \text{ exchange rate from Jul. 1996 to Jun. 1997}} - 1. \tag{1}$$

A 50% improvement would be expressed as 0.5, a 50% decline as -0.5. Exchange rate changes for the 20 major destinations of Filipino workers are listed in the third column of Table 1. The changes for the major Middle Eastern destinations and the United States were all at least 0.50. By contrast, the exchange rate shocks for Taiwan, Singapore, and Japan were 0.26, 0.29, and 0.32, while for Malaysia and Korea they were actually negative: -0.01 and -0.04, respectively. Workers in Indonesia experienced the worst exchange rate change (-0.54), while those in Libya experienced the most favorable change (0.57) (not shown in table).

I construct a household-level exchange rate shock variable as follows. Let the countries in the world where overseas Filipinos work be indexed by $j \in \{1, 2, ..., J\}$. Let $n_{ij}$ indicate the number of overseas workers a household $i$ has in a particular country $j$ in June 1997 (so that $\sum_{j=1}^{J} n_{ij}$ is its total number of household workers overseas in that month). The exchange rate shock measure for household $i$ is:

$$ERSHOCK_i = \frac{\sum_{j=1}^{J} n_{ij} ERCHANGE_j}{\sum_{j=1}^{J} n_{ij}} \tag{2}$$

In other words, for a household with just one worker overseas in a country $j$ in June 1997, the exchange rate shock associated with that household is simply $ERCHANGE_j$. For households with workers in more than one foreign country in June 1997, the exchange rate shock associated

outcomes in a sample that excludes households whose migrants are reported to be immigrants yields estimates essentially identical to those reported in the main results tables. (Results available from author upon request.)

[19] This last point is not necessary for arguing that the exchange rate shocks are correctly interpreted as income shocks, as a real economic shock such as a job termination is also an income shock. However, ruling out the impact of correlated real economic shocks is useful if this paper is to shed light more broadly on the likely impact of exchange rate fluctuations on the families of migrants.

with that household is the *weighted average* exchange rate change across those countries, with each country's exchange rate weighted by the number of household workers in that country.[20] Because the research question of interest is the impact of shocks experienced by migrants on outcomes in the migrants' source households, the sample for analysis is restricted to households with one or more members working overseas prior to the Asian financial crisis (in June 1997).[21] It is crucial that $ERSHOCK_i$ is defined solely on the basis of migrants' locations *prior to* the crisis, to eliminate concerns about reverse causation (for example, households experiencing positive shocks to their Philippine-source income might be better positioned to send members to work in places that experienced better exchange rate shocks).

In addition, the Philippine economy experienced a decline in economic growth after the onset of the crisis. Annual real GDP contracted by 0.8% in 1998, as compared to growth of 5.2% in 1997 and 5.8% in 1996 (World Bank 2004). The urban unemployment rate (unemployed as a share of total labor force) rose from 9.5% to 10.8% between 1997 and 1998, while the rural unemployment rate went from 5.2% to 6.9% over the same period (Philippine Yearbook (2001), Table 15.1). Any effects of the domestic economic downturn common to all sample households (as well as effects of the crisis that differ according to households' observed pre-crisis characteristics) will be accounted for in the empirical analysis, as described in the next section.

# 4 Empirics: impact of migrant shocks on households

In this section, I describe the data and sample construction, the characteristics of sample households, the regression specification and some empirical issues, and then present empirical results.

## 4.1 Data and sample construction

The empirical analysis uses data from four linked household surveys conducted by the National Statistics Office of the Philippine government, covering a nationally-representative household sample: the Labor Force Survey (LFS), the Survey on Overseas Filipinos (SOF), the Family Income and Expenditure Survey (FIES), and the Annual Poverty Indicators Survey (APIS).

The LFS is administered quarterly to inhabitants of a rotating panel of dwellings in January, April, July, and October, and the other three surveys are administered with lower frequency as

[20] Of the 1,646 households included in the analysis, 1,485 (90.2%) had just one member working overseas in June 1997. 140 households (8.5%) had two, 18 households (1.1%) had three, and three households (0.2%) had four members working overseas in that month.

[21] $ERSHOCK_i$ is obviously undefined for a household without any members working overseas prior to the crisis.

riders to the LFS. Usually, one-fourth of dwellings are rotated out of the sample in each quarter, but the rotation was postponed for five quarters starting in July 1997, so that three-quarters of dwellings included in the July 1997 round were still in the sample in October 1998 (one-fourth of the dwellings had just been rotated out of the sample). The analysis of this paper takes advantage of this fortuitous postponement of the rotation schedule to examine changes in households over the 15-month period from July 1997 to October 1998.

Survey enumerators note whether the household currently living in the dwelling is the same as the household surveyed in the previous round; only dwellings inhabited continuously by the same household from July 1997 to October 1998 are included in the sample for analysis.[22] Households are only included in the sample for empirical analysis if they reported having one or more members overseas in June 1997 (immediately prior to the Asian financial crisis). The survey does not include unique identifiers for surveyed individuals; for analysis of individual outcomes, individuals must be matched over time (within households) on the basis of age and gender.

See the Data Appendix for details regarding the contents of the surveys, the construction of the sample for analysis, and the procedure for matching individuals across survey rounds.

## 4.2 Characteristics of sample households

Table 3 presents summary statistics for the 1,646 households used in the empirical analysis. The top row displays summary statistics for the exchange rate shock. The mean change in the shock index was 0.41, with a standard deviation of 0.16.

The mean number of household overseas workers in June 1997 is 1.11. Median cash receipts from overseas was 26,000 pesos (US$1,000) in Jan-Jun 1997. Pre-crisis cash receipts from overseas were substantial as a share of household income, with a median of 0.37.

Households in the sample tend to be wealthier than other Philippine households in terms of their initial (Jan-Jun 1997) income per capita. 51% of sample households are in the top quartile of the national household income per capita distribution, and 28% are in the next-highest quartile. Median pre-crisis income per capita in the household is 15,236 pesos (US$586).[23] Mean pre-crisis household size is 6.16 members (including overseas members).[24] 68% of sample households are

[22] As discussed in the Data Appendix (and illustrated in Appendix Table 2), there is no evidence that attrition from the sample between July 1997 and October 1998 is correlated with a household's exchange rate shock.

[23] When I report US dollars, they are converted from Philippine pesos at the first-half 1997 exchange rate of roughly 26 pesos per US$1.

[24] The corresponding pre-crisis (Jan-Jun 1997) national median of income per capita for all households is 7,944 pesos. The national mean household size in July 1997 was 5.27.

urban, compared to the national figure of 59%.

Reflecting the importance of remittances from overseas, sample households tend to rely less on wage/salary, entrepreneurial, and agricultural income than the typical Philippine household. The mean of pre-crisis wage and salary income as a share of total income is 0.23 (compared with a national average of 0.41). The mean of pre-crisis entrepreneurial income as a share of total income is 0.17 (compared with a national average of 0.31). 50 percent of sample households have nonzero entrepreneurial income, compared with a national average of 59 percent. The mean of pre-crisis agricultural income as a share of total income is 0.10 (compared with a national average of 0.27). Only 23 percent of sample household heads work in agriculture, compared with a national average of 37 percent.

## 4.3 Regression specification

In investigating the impact of exchange rate shocks on changes in outcome variables between 1997 and 1998, a first-differenced regression specification is natural:

$$\Delta Y_{it} = \beta_0 + \beta_1 (ERSHOCK_i) + \varepsilon_{it} \quad (3)$$

For household $i$, $\Delta Y_{it}$ is the change in an outcome of interest. $ERSHOCK_i$ is the exchange rate shock for household $i$, as defined above in (2). First-differencing of household-level variables is equivalent to the inclusion of household fixed effects in a levels regression; the estimates are therefore purged of time-invariant differences across households in the outcome variables. $\varepsilon_{it}$ is a mean-zero error term. Standard errors are clustered according to the June 1997 location of overseas worker.[25]

The constant term, $\beta_0$, accounts for the average change in outcomes across all households in the sample. This is equivalent to including a year fixed effect in a regression where outcome variables are expressed in levels (not changes), and accounts for the shared impact across households of the decline in Philippine economic growth after the onset of the crisis.

The coefficient of interest is $\beta_1$, the impact of a unit change in the exchange rate shock on the outcome variable. The identification assumption is that if the exchange rate shocks faced by households had all been of the same magnitude (instead of varying in size), then changes in outcomes would not have varied systematically across households on the basis of their overseas

[25] For households that had more than one overseas worker overseas in June 1997, the household is clustered according to the location of the *eldest* overseas worker. This results in 55 clusters.

workers' locations.

While this parallel-trend identification assumption is not possible to test directly, a partial test is possible. An important type of violation of the parallel-trend assumption would be if households with migrants in countries with more favorable shocks were different along certain pre-crisis characteristics from households whose migrants had less favorable shocks, *and* if changes in outcomes would have varied according to these same characteristics even in the absence of the migrant shocks.

In fact, households experiencing more favorable migrant shocks do differ along a number of pre-crisis characteristics from households experiencing less-favorable shocks. Appendix Table 1 presents coefficient estimates from a regression of the household's exchange rate shock on a number of pre-shock characteristics of households and their overseas workers. Several individual variables are statistically significantly different from zero, indicating that households experienced more favorable exchange rate shocks if they had fewer members, heads who were more educated, less educated migrants, and migrants who had been away for longer periods prior to the crisis. F-tests reject the null that some subgroups of variables are jointly equal to zero: indicators for household per capita income percentiles; indicators for household head's education level; indicators for household geographic location in the Philippines; overseas workers' months away variables; overseas workers' education variables; and overseas workers' occupation variables.

This correlation between pre-crisis characteristics and the exchange rate shock is only problematic if pre-crisis characteristics are *also* associated with differential changes in outcomes independent of the exchange rate shocks (that is, if pre-crisis characteristics were correlated with the residual $\varepsilon_{it}$ in equation 3). For example, suppose that the 1997-98 domestic economic downturn caused small household enterprises to be more likely to fail in households with less-educated heads, so that entrepreneurial incomes rise differentially for better-educated households than for less-educated households in the wake of the crisis. Appendix Table 1 indicates that households with better-educated heads also experienced more-favorable exchange rate shocks. Then the estimated impact of the exchange rate shocks on household entrepreneurial income would be biased upwards.

To check whether the regression results are in fact contaminated by changes associated with pre-crisis characteristics, I also present coefficient estimates that include a vector of pre-crisis household characteristics $\mathbf{X}_{it-1}$ on the right-hand-side of the estimating equation:

$$\Delta Y_{it} = \beta_0 + \beta_1 \left(ERSHOCK_i\right) + \boldsymbol{\delta}' \left(\mathbf{X}_{it-1}\right) + \varepsilon_{it} \tag{4}$$

$\mathbf{X}_{it-1}$ includes household geographic indicators and a range of pre-crisis household and migrant characteristics.[26] Inclusion of $\mathbf{X}_{it-1}$ controls for changes in outcome variables related to households' pre-crisis characteristics. Examining whether coefficient estimates on the exchange rate shock variable change when the pre-crisis household characteristics are included in the regression can shed light on whether changes in outcome variables related to these characteristics are correlated with households' exchange rate shocks, constituting a partial test of the parallel-trend identification assumption.

In addition, to the extent that $\mathbf{X}_{it-1}$ includes variables that explain changes in outcomes but that are themselves uncorrelated with the exchange rate shocks, their inclusion simply can reduce residual variation and lead to more precise coefficient estimates.

In most results tables, I therefore present regression results without and with the vector of controls for pre-crisis household characteristics, $\mathbf{X}_{it-1}$ (equations 3 and 4). In nearly all cases, inclusion of the initial household characteristics controls makes little difference to the coefficient estimates, and on occasion actually makes the coefficient estimates larger in absolute value (suggesting that, in these cases, changes in outcome variables related to households' pre-crisis characteristics bias the estimated effect of the shock towards zero). Inclusion of these pre-crisis characteristics controls also often reduces standard errors on the exchange rate shock coefficients.

## 4.4 Regression results

This subsection examines the impact of household exchange rate shocks on the following outcomes in sequence: remittance receipts; migrant return rates; household income and expenditures; household durable good ownership; child schooling, child labor, and household educational expenditure; household labor supply by type of work; and specific types of entrepreneurial activities. At the end, I also examine heterogeneity in the impact of the shocks by pre-crisis household per capita

[26] Household geographic controls are 16 indicators for regions within the Philippines and their interactions with an indicator for urban location. Household-level controls are as follows. Income variables as reported in Jan-Jun 1997: log of per capita household income; indicators for being in 2nd, 3rd, and top quartile of the sample distribution of household per capita income. Demographic and occupational variables as reported in July 1997: number of household members (including overseas members); five indicators for head's highest level of education completed (elementary, some high school, high school, some college, and college or more; less than elementary omitted); head's age; indicator for 'head's marital status is single'; six indicators for head's occupation (professional, clerical, service, production, other, not working; agricultural omitted).

Migrant controls are means of the following variables across household's overseas workers away in June 1997: indicators for months away as of June 1997 (12-23, 24-35, 36-47, 48 or more; 0-11 omitted); indicators for highest education level completed (high school, some college, college or more; less than high school omitted); occupation indicators (domestic servant, ship's officer or crew, professional, clerical, other service, other occupation; production omitted); relationship to household head indicators (female head or spouse of head, daughter, son, other relation; male head omitted); indicator for single marital status; years of age.

income quartile.

### 4.4.1 Remittance receipts

I first document that migrants' positive exchange rate shocks in fact were associated with improvements in households' finances, in particular via the remittances households received from their overseas members.

The first row of Table 4, Panel A presents coefficient estimates from estimating equations 3 and 4 when the outcome variable is the change in remittances (cash receipts, gifts, etc. from overseas). The change in remittances variable is the change between the January-June 1997 and April-September 1998 reporting periods, divided by pre-crisis (January-June 1997) household income. (For example, a change amounting to 10% of initial income is expressed as 0.1.) The change in *log* remittances would have been a natural specification, except for the fact that a large number of households (44.5%) report receiving zero remittances either before or after the crisis.[27]

Remittance receipts as a fraction of total household income in the pre-crisis period was 0.395 on average. The mean change in remittances (as a share of pre-crisis total household income) was 0.151 over the period of analysis (i.e., growth in peso remittances amounted to 15.1% of initial household income).

Each cell in the regression results columns presents the coefficient estimate on the exchange rate shock variable in a separate regression. Regression column 1 presents results without the inclusion of any other right-hand-side variables, while regression column 2 includes household location fixed effects and the control variables for pre-crisis household and migrant characteristics. (This format—presenting regression results with and without control variables alongside each other—will also be followed in Tables 5, 6, and 7.)

The coefficients on the exchange rate shock in the regressions for cash receipts from overseas are positive in both specifications, and larger in absolute value (36% larger) and more precisely measured when control variables are included (in column 2). It seems that households experiencing more favorable exchange rate shocks also have pre-shock characteristics that are associated with *declines* in remittances over the study period; controlling for these characteristics raises the estimated impact of the exchange rate shock on remittances.

The coefficient on the exchange rate shock in the second column indicates that a one-standard-

[27] Dividing by pre-crisis household income achieves something similar to taking the log of an outcome: normalizing to take account of the fact that households in the sample have a wide range of income levels, and allowing coefficient estimates to be interpreted as fractions of initial household income.

deviation increase the size of the exchange rate shock (0.16) is associated with a differential increase in remittances of 3.8 percentage points of pre-shock (Jan-Jun 1997) household income. The exchange rate shock is specified as the change in the exchange rate as a fraction of the pre-shock exchange rate, so the coefficient on the exchange rate shock in column 2 can be used to calculate the implied elasticity of remittances with respect to the exchange rate. This implied elasticity is 0.60 (the coefficient, 0.238, divided by remittances as a share of pre-crisis household income, 0.395).[28]

A 10% improvement in the exchange rate faced by a household's migrants (in Philippine pesos per unit of foreign currency) raises household remittance receipts by 6%. If the amount of foreign currency sent by migrants to their origin households had remained stable from the pre- to post-crisis periods, the elasticity of remittances would have been unity.[29] So favorable exchange rate movements actually lead remittances to *decline* when denominated in the foreign currency. The Philippine-peso-remittance elasticity of 0.6 implies that the foreign-currency-remittance elasticity is -0.40.

#### 4.4.2 Migrant return rates

Migrants were also less likely to return to the Philippines when they experienced more positive exchange rate shocks, providing another (indirect) indication that they faced more attractive economic conditions overseas. In the second row of Table 4, Panel A, the outcome variable is the migrant return rate during the 15 months after the crisis (the number of migrants who returned between July 1997 and September 1998, divided by the number of migrants away in June 1997). The mean migrant return rate over the period was 0.136.

The coefficients on the exchange rate shock in these regressions for the migrant return rate are negative, although the coefficient falls somewhat in magnitude when pre-crisis controls are added. The coefficients are statistically significantly different from zero on both specifications. The coefficient on the exchange rate shock in the second column indicates that a one-standard-deviation increase the size of the exchange rate shock (0.16) is associated with a differential decline of 2.0 percentage points in the return rate of household migrants.[30]

[28] An alternative approach to estimating the exchange rate elasticity of remittances would be to regress the change in log remittances on the change in the log exchange rate, while controlling for all pre-crisis variables as in column 2 of Table 4. To deal with cases of zero reported remittances, I replace zero remittances with the 10th percentile of the pre-crisis distribution of nonzero remittances (7,000 pesos) before taking logs. The estimated coefficient on the log change in the exchange rate is 0.64, with a standard error of 0.30.

[29] A coefficient on the exchange rate shock of 0.395 would have implied unit elasticity. The hypothesis that the coefficient on the exchange rate shock in column 2 is equal to 0.395 is rejected at the 10% confidence level.

[30] For a more detailed theoretical and empirical treatment of overseas workers' return decisions in these house-

### 4.4.3 Household income and expenditures

What impact do migrant exchange rate shocks have on aggregate household income and expenditures? Table 4, Panel B presents coefficient estimates on the exchange rate shock when the outcome variables are total household income and its major components, and total household expenditures. Changes in income (expenditure) items are changes between the January-June 1997 and April-September 1998 reporting periods, divided by pre-crisis (January-June 1997) household income (expenditures).

It is important to reiterate a previous point that these income figures refer only to income received by the household *within specific reporting periods*. As such, the impact of the exchange rate shocks on within-period household income will give only a partial picture of the true impact on household income, which includes the change in the peso value of future overseas earnings, as well as the change in the peso value of savings that are held overseas (that may not be remitted within the reporting period). Also, it is important to note that expenditures data are for current consumption only, and do not include durable goods purchases or capital investment in household enterprises.

Household income and expenditures all experience substantial growth over the period. On average across households, the growth in household income amounts to 25.1% of initial total household income, while the growth in household expenditures amounts to 10.9% of initial total household expenditures.

The coefficients on the exchange rate shock in the regressions for total household income are positive in both specifications, and essentially the same in absolute value (within 1% in size) and more precisely measured when control variables are included (in column 2). Essentially all of the impact of the shock on total household income comes through the change in the 'other sources of income' category, which includes remittances. In turn, the impact of the shock on 'other sources of income' appears to work entirely through the change in remittances: the coefficients and significance levels in the regressions for other sources of income (in Panel B) are essentially the same as those for remittance receipts (in Panel A). The estimated impacts of the exchange rate shocks on wage and salary income and on entrepreneurial income are small in magnitude and not statistically significantly different from zero in all specifications.

The coefficients on the exchange rate shock in the total household expenditures regressions are (surprisingly) negative in sign, although not statistically significantly different from zero. Because

holds, see Yang (2004). (The estimated impact of exchange rates on return rates in that paper differ slightly in that they focus on return rates over 12 post-crisis months, rather than 15 months as analyzed here.)

expenditures by overseas migrants are explicitly *not* included in household expenditures in this survey, this (weak) negative relationship between the exchange rate shock and household consumption is likely to reflect the fact that the exchange rate shocks lead to fewer migrant returns (and thus smaller household size in the Philippines). Indeed, when the outcome is instead household expenditures *per capita* (not including overseas members), the coefficients on the exchange rate shock become positive in sign. However, the coefficients remain statistically insignificant. All told, there is no indication that aggregate household expenditures were substantially affected by the exchange rate shocks.

The coefficient on the exchange rate shock in the second column indicates that a one-standard-deviation increase the size of the exchange rate shock (0.16) is associated with a differential increase in total household income of 4.2 percent of pre-shock (Jan-Jun 1997) household income.

Given the lack of a strong relationship between the exchange rate shocks and household current consumption expenditures, the key question arises as to how improvements in households' resources are used. The subsequent results tables will show that the exchange rate shocks led to increases in the ownership of durable goods, increased investment in child human capital, and increased entry into capital-intensive entrepreneurship.

### 4.4.4 Durable good ownership

Table 4, Panel C presents coefficient estimates on the exchange rate shock when the outcome variables are changes in an indicator for household ownership of the six durable goods that were recorded in the survey: radio, television, living room set, dining set, refrigerator, and vehicle. The outcome variables take on the values -1, 0, and 1.[31]

In the initial period, radios are the most commonly-owned durable good, and vehicles the least commonly-owned; the fraction of households reporting ownership of these goods is 0.836 and 0.129, respectively. Ownership of all the observed durable goods increases over the course of the period of analysis, with the largest increases in ownership observed in radios (a 0.105 increase in the fraction owning) and vehicles (a 0.134 increase).

The coefficients on the exchange rate shock in all regressions except for refrigerators are positive. In the specification without control variables (the first column), the coefficients for television and vehicle ownership are statistically significantly different from zero at conventional

[31] As described in the Data Appendix, durable good ownership data were not recorded in July 1997, so changes in the ownership indicators are between January 1998 and October 1998. If durable good ownership changed by January 1998 in response to the July-December 1997 economic shocks experienced by migrants, the empirical estimates reported for these outcomes are likely to be lower bounds of the true effects.

levels (respectively, the 10% and 1% levels). In the specification with control variables (the second column), the coefficients for television, living room set, and vehicle ownership are statistically significantly different from zero at conventional levels (respectively, the 1%, 10%, and 1% levels).

For ownership of televisions and living room sets, the coefficients become substantially larger and attain higher levels of statistical significance in the specifications with control variables.

In the regression for vehicle ownership, the coefficient becomes slightly smaller in absolute value, falling in magnitude by 14%. It appears that households experiencing more favorable exchange rate shocks also have pre-shock characteristics that are associated with *increases* in vehicle ownership over the study period. Controlling for these characteristics reduces the estimated impact of the exchange rate shock on vehicle ownership, but the estimate remains substantial in magnitude and statistically significantly different from zero.

The coefficients on the exchange rate shock in the second column indicate that a one-standard-deviation increase the size of the exchange rate shock (0.16) is associated with a differential increase in the likelihood of television, living room set, and vehicle ownership of 1.5, 0.9, and 2.3 percentage points, respectively.

#### 4.4.5 Human capital investment

It is of great interest to understand the impact of migrant exchange rate shocks on several outcomes related to human capital accumulation: child schooling, child labor, and household educational expenditures. Table 5, Panel A presents coefficient estimates on the exchange rate shock when the outcome variables are individual-level changes in student status, total hours worked and hours worked in different types of employment in the week prior to the survey. The 'student indicator' variable is the change in an indicator for 'student' being the person's reported primary activity between July 1997 and October 1998 (this variable takes on the values -1, 0, and 1). In the analysis of hours worked by type of employment, a combined category for 'hours worked in self employment, as an employer, or as a worker with pay in a family-operated farm or business' is used, because children and young adults are reported to work very few hours in these types of employment separately. Individuals were included in the analysis if they were aged 10-17 in July 1997.

Results are presented for females and males together, and also separately for females and males. For each sample results are presented for specifications with and without control variables. Control variables for pre-crisis characteristics include the same household and migrant variables used in Table 4. Because these are individual-level regressions, the controls also include pre-crisis individual characteristics.[32]

In the initial period, the fraction of children aged 10-17 classified as 'student' is 0.94, and the mean hours worked in the past week is 1.1. On average over the period of analysis, there is some transition out of student status and into the labor force: the mean change in the 'student' indicator is -0.036 (standard deviation 0.007), and the mean change in hours worked is 0.971 (standard deviation 0.221).

The coefficients on the exchange rate shock in the regressions for the student indicator are all positive in sign, and are statistically significantly different from zero specification with control variables in the pooled sample (male and female) and the female subsample. Standard errors are too large, however, to rule out that the coefficient on the exchange rate shock in the male subsample differs from that in the female subsample. In both subsamples, the coefficient on the shock is larger in absolute value in the specification with control variables.

The coefficients on the exchange rate shock in the regressions for total hours worked are all negative in sign, and the coefficient is statistically significantly different from zero in the pooled male and female sample (in both specifications), and in the specification with control variables for males. Again, standard errors are too large to reject the hypothesis that the male and female coefficients are identical. In the pooled sample, and for males and females separately, more favorable exchange rate shocks lead to statistically significantly fewer hours of work without pay in family enterprises. In the pooled sample, and for males, more favorable exchange rate shocks lead to statistically significant increases in hours worked in self employment, as an employer, or as a worker with pay in a family-operated farm or business, but this increase is not large enough to offset the overall decline in hours worked. For all statistically significant results related to labor supply, the magnitude of the estimated coefficient is either larger in absolute value or essentially the same in specifications with control variables than in specifications without control variables.

Changes in household educational expenditure associated with the exchange rate shocks are complementary to the observed changes in child schooling and child labor. In the initial period, educational expenditure as a fraction of total household expenditure was 0.054 on average, and over the period of analysis this fraction rose by 0.020.

Table 5, Panel B examines the impact of exchange rate shocks on household educational expen-

[32] Fixed effects for each year of age, a gender indicator, indicator for single marital status, indicator for 'student' being the person's primary activity, indicator for 'not in labor force', and five indicators for highest schooling level completed.

ditures, expressed as a fraction of initial (Jan-Jun 1997) household consumption. More favorable exchange rate shocks lead to statistically significant increases in expenditures on education, and the coefficient is larger in absolute value in the specification that includes control variables for pre-crisis household characterisitics.

In sum, more favorable shocks are associated with more child schooling, less child labor, and higher household educational expenditure. The coefficients on the exchange rate shock in the pooled-sample regressions with control variables indicate that a one-standard-deviation increase in the size of the exchange rate shock (0.16) is associated with a differential increase in the likelihood of being a student of 1.6 percentage points, a differential decline in hours worked in the past week of 0.35 hours, and an increase in household educational expenditures of 0.4 percentage points of pre-crisis household consumption.

#### 4.4.6 Household labor supply

Table 6 presents coefficient estimates on the exchange rate shock when the outcome variables are changes in total hours worked and changes in hours worked in different types of employment in the week prior to the survey, including self-employment and work in household enterprises. In the initial period, mean total hours worked across households is 72.6 hours. Hours worked at the household level is roughly stable over the period of analysis: on average, this figure declines by just -0.68 hours (standard deviation 1.199).

The coefficients on the exchange rate shock in the regressions for total hours worked are positive but not statistically significantly different from zero. The same is true in regressions for hours worked for employers outside the household.

Migrant exchange rate shocks do affect entrepreneurial labor supply. In particular, more favorable exchange rate shocks are associated with increases in hours worked in self employment: the coefficients in these regressions are positive and statistically significantly different from zero. In the specification with control variables (column 2), the coefficient estimate becomes 19% larger in absolute value and attains the 5% significance level, compared with the specification without controls (column 1).

The coefficient on the exchange rate shock in the second column indicates that a one-standard-deviation increase the size of the exchange rate shock (0.16) is associated with a differential increase in hours worked in self employment of 1.6 hours per week.

There is also suggestive evidence that hours worked without pay in family-operated farms or businesses declines with more favorable exchange rate shocks (the coefficients for this outcome are negative in sign and relatively large in magnitude), but these results are not statistically significantly different from zero. It may be that better migrant economic conditions are associated with differential shifts out of work without pay and into self employment in household enterprises.

### 4.4.7 Entrepreneurial activities

How did the exchange rate shock affect household entrepreneurial activities? Panel A, Table 7 presents coefficient estimates on the exchange rate shock when the outcome variables are the change in household entrepreneurial income, and the change in an indicator for entrepreneurial activity.[33] The change in entrepreneurial income is the change between the January-June 1997 and April-September 1998 reporting periods, divided by pre-crisis (January-June 1997) total household income.

Prior to the crisis, 50% of households reported engaging in some entrepreneurial enterprise, and on average the fraction of household income coming from entrepreneurial activities was 0.17. On average over the sample period, entrepreneurial income rose slightly (as a fraction of pre-crisis household income) by 0.023, and the fraction engaging in any type of entrepreneurship also rose somewhat, by 0.014.

The exchange rate shock has only a small positive (and statistically insignificant) effect on household entrepreneurial income. While the coefficient on the exchange rate shock in the entrepreneurial activity indicator regression is positive in both specifications, it is not statistically significantly different from zero in the specification with control variables. All told, there is little evidence of a clear, strong relationship between the exchange rate shock and entrepreneurial activity overall.

However, "entrepreneurial activity" is a catch-all term for any type of self employment. It encompasses activities as diverse as farming one's own land, operating a taxi, and running a grocery store. Even if the exchange rate shocks do not have strong effects on entrepreneurship overall, they could affect the *types* of entrepreneurial activities that households engage in. (Information on households' entrepreneurial activities in the survey are divided into 11 specific types, listed in Appendix Table 2.)

Indeed, it does appear that the exchange rate shocks are significantly associated entry into *new* entrepreneurial activities. Panel B of Table 7 presents coefficient estimates on the exchange

[33] The exact same entrepreneurial income result also appears in Panel B, Table 4. It is simply repeated here for emphasis.

rate shock when the outcome variables are indicators for entry into a new entrepreneurial activity, and for exit from an old entrepreneurial activity.[34]

The exchange rate shock has a positive impact on the likelihood that a household enters a new entrepreneurial activity over the period of analysis, and this effect is statistically significantly different from zero in the specification with control variables. A one-standard-deviation increase the size of the exchange rate shock (0.16) is associated with a differential increase in the likelihood of entering a new entrepreneurial activity of 2.2 percentage points. In the regression for exit from old activities, the coefficients on the exchange rate shock are negative, but in neither specification are the coefficients statistically significantly different from zero.

What types of activities are households entering when they experience more favorable exchange rate shocks? One might expect that a household income shock should have its main effect on entrepreneurial activities that require some substantial investment of capital, by alleviating credit constraints that may have limited past investment. It therefore makes sense to look at specific types of entrepreneurship in greater detail, to see whether activities that are likely to be more capital-intensive seem more responsive than others to exchange rate shocks. The main focus is on the impact of the shocks on the extensive margin of entrepreneurial activity—whether the household participates at all in specific types of entrepreneurship.

Table 8 examines the impact of the exchange rate shocks on the 11 specific types of entrepreneurial activity listed in Appendix Table 2. The fraction of households that report nonzero income in each type of entrepreneurial activity in the pre-crisis period is displayed in the column prior to the first results column (households can report more than one activity). "Crop farming and gardening" is reported by the largest fraction of households, 21.9%, with "wholesale and retail trade" coming in a close second at 18.4%. "Transportation and communication services" (8.2% of households), "livestock and poultry raising" (5.5%), "community and personal services" (4.3%), and "manufacturing" (3.8%) round out the six most common entrepreneurial activities.

Regression column 1 presents regression results where the outcome variable is an indicator for *entry* into the given activity: it is equal to 1 if the household reported no income from the given activity prior to the crisis, but nonzero income after the crisis (and 0 otherwise). Column 2 presents regression results where the outcome variable is an indicator for *exit* from the activity,

[34] Entry into a new activity is defined as occurring when a household reports engaging in one or more activity from Appendix Table 2 in Apr-Sep 1998, when it was not engaging in the same activity or activities in the initial period (Jan-Jun 1997). Exit from an old activity is defined analogously. There appears to be substantial churn in the types of activities households in which households are engaged: the fraction engaging in a new activity is 0.237, and the fraction exiting from an old activity is 0.222.

taking a value of 1 if the household reported nonzero income prior to the crisis but zero income after the crisis (and 0 otherwise). And in column 3, the outcome is *net entry* into the activity: the indicator for new entry minus the indicator for exit (so that it takes on the values 1, 0, and -1). All regressions include the full set of control variables for household and migrant pre-crisis characteristics. Results reported are coefficients on the exchange rate shock (standard errors in parentheses).

Effects of the exchange rate shock on entrepreneurship are narrowly focused on a few activities. Positive exchange rate shocks lead to greater entry and less exit from entrepreneurship in transportation and communication services: the coefficient on the exchange rate shock for entry (column 1) is positive and statistically significant at the 10% level, and the coefficient in the exit regression (column 2) is negative and nearly the same magnitude (although not statistically significantly different from zero). This leads to a positive and statistically significant effect of the shocks on net entry (column 3). A similar pattern of coefficient signs and statistical significance holds for entry, exit, and net entry into manufacturing entrepreneurship.[35]

The magnitude of the impact of the shocks on net entry into these two activities is large. The relevant coefficients from column 3 indicate that a one-standard-deviation increase (0.16) in the exchange rate shock leads net entry into "transportation and communication services" and "manufacturing" to rise by 1.2 and 0.9 percentage points, respectively. These are sizable effects, considering that the percentage of households undertaking such activities prior to the crisis was just 8.2% and 3.8%, respectively.

The increase in net entry into transport/communication and manufacturing is also reflected in differential increases in income from these activities in households experiencing better exchange rate shocks. The fourth column of regression results is for regressions of the change in entrepreneurial income from the given activity (expressed as a share of total household income prior to the crisis) on the exchange rate shock. The exchange rate shock leads to positive and statistically significant increases in entrepreneurial income in both "transportation and communication services" and "manufacturing".[36]

[35] Interestingly, positive exchange rate shocks lead to statistically significant differential increases in *exit* from fishing and construction. It is not obvious why this should be the case, although one might speculate that households consider these activities particularly difficult or dangerous and take the opportunity to leave these activities when their economic prospects improve.

[36] At the same time, there is very tentative evidence of a decline in entrepreneurial income from "crop farming and gardening" and "wholesale and retail trade". Coefficients on the exchange rate shock in those regressions are both negative but not statistically significantly different from zero at conventional levels (although the coefficient for the "wholesale and retail trade" regression is marginally significant, with a p-value of 0.11). It is possible that—in response to positive exchange rate shocks—households undertaking multiple types of entrepreneurial activities shift resources away from crop farming/gardening and trading activities and towards transportation/communication

A likely explanation for the positive impact of the exchange rate changes on entrepreneurial activity in transportation/communications and manufacturing is that previous investment in these activities had been hampered by credit constraints, so positive income shocks provide households with the resources to make necessary fixed investments. These types of activities are likely to require non-trivial fixed up-front investments: vehicles are necessary for engaging in transportation services, and manufacturing activities will require physical equipment. Reductions in exit from these activities in response to positive exchange rate shocks are also consistent with alleviation of credit constraints. Improvements in households' economic prospects may allow them to avoid inefficient liquidation of their productive assets, a phenomenon that can arise when credit markets are imperfect.[37] The lack of responsiveness of other types of entrepreneurship (such as crop farming/gardening, and wholesale/retail trade) may be due to these activities' not requiring such large up-front fixed investments; indeed, the share of households undertaking these activities prior to the crisis is relatively large.

Also, recall from Table 4, Panel C that vehicle ownership rises more in households with more positive shocks. This finding supports the idea that exchange rate shocks led to a rise in entrepreneurial income from transportation services by facilitating vehicle purchases (or preventing vehicle disinvestment).[38]

#### 4.4.8 Clarifying the interpretation of the empirical results

I argue that the impacts of exchange rate shocks on the various outcomes in Tables 4 through 8 are most plausibly interpreted as household responses to transitory income shocks. In addition, the exchange rate shocks themselves appear to be the primary causal factor behind the income changes, rather than real economic shocks that might have been correlated with the exchange rate shocks. I present here empirical evidence that bolsters this interpretation of the results.

**4.4.8.1 Do the exchange rate shocks act via migrant returns?** More favorable exchange rate shocks also reduce migrants' return rates (as demonstrated in Panel A of Table 4), and this raises the concern that it might be inappropriate to interpret the exchange rate shocks as

and manufacturing.

[37] As in Rosenzweig and Wolpin (1993).

[38] An additional (and complementary) possibility is that improved insurance provided by distant migrants can allow origin households to engage in riskier income-generating activities, as emphasized by Stark and Levhari (1982). If transportation/communication services and manufacturing are perceived to be higher-risk activities than others, and more favorable exchange rate shocks improve the quality of insurance provided by migrants (by, for example, raising the Philippine-peso value of their overseas savings), then positive exchange rate shocks may foster these types of entrepreneurship via improved insurance.

acting solely via shocks to household income. In particular, a migrant's decision to delay return might affect household investments, in and of itself. Longer absences by migrant parents may detrimentally affect child schooling, for example. Also, a migrant who stays overseas cannot help with a household enterprise, potentially dampening household entrepreneurial effort (particularly when labor markets are imperfect). These examples suggest that the concurrent changes in migrant return rates would lead the positive impact of the exchange rate shocks to be *understated* (relative to a situation where migrant returns did not respond to the shocks, so that the shocks only affected household investments via an income channel).

To gauge the extent to which migrant returns (in and of themselves) might be clouding the income-shock interpretation of the exchange rate changes, it is useful to examine how the estimated impact of the exchange rate shocks changes when controlling for each household's migrant return rate from before to after the shock. As in Panel A, Table 4, the migrant return rate is the number of migrants who returned between July 1997 and September 1998, divided by the number of migrants away in June 1997.[39]

Table 9 presents the results of this exercise, for changes in five of the main household investment outcomes between 1997 and 1998. Three of the outcomes are at the household level: entry into a new entrepreneurial activity, net entry into transportation/communication entrepreneurship, and net entry into manufacturing entrepreneurship. The other two outcomes are at the individual child level: the change in student status, and the change in hours worked. Two regressions are presented for each of these outcomes: first, the original result from previous tables is presented for comparison; and second, the exact same regression but with an added control for the migrant return rate. All regressions in Table 9 are for the specification that includes control variables for household- and migrant-level pre-crisis characteristics (plus individual characteristics in the individual-level regressions). The question of interest is whether (and in what direction) the coefficient on the exchange rate shock changes when the control for the migrant return rate in the household is included in the regression.

It turns out that migrant returns do not appear to affect household entrepreneurial activity: the coefficient on the migrant return rate is small in magnitude and not statistically significantly different from zero in each of the household entrepreneurship regressions. Thus it is not surprising that the inclusion of the migrant return rate in the regression has essentially no effect on the coefficient on the exchange rate shock. In the regression for "entry into a new entrepreneurial

[39] For the vast majority of households the migrant return rate is either 0 or 1, and the variable has a mean of 0.136.

activity", for example, the coefficient is originally 0.140, and becomes 0.141 when the migrant return rate is included as a control variable. This analysis therefore suggests that, for the household entrepreneurial outcomes, the coefficient on the exchange rate shock is plausibly interpreted as reflecting changes in household income, rather than being due to changes in migrant return probabilities.

The conclusion is slightly different for the regressions for child human capital investments. Migrant returns appear to raise child schooling, and to reduce child labor, and the coefficients on the migrant return rate for both outcomes are statistically significantly different from zero. A migrant return rate of 1 (100%) is associated with an increase of 3.6 percentage points in the likelihood of staying in school, and a reduction in hours worked per week of about 1 hour for children aged 10-17. One interpretation of these results is that returned migrants devote labor hours to household enterprises in place of children, reducing child labor hours and raising their school attendance.

The inclusion of the migrant return rate in the child human capital regressions also makes the coefficients on the exchange rate shock slightly larger in magnitude. In the student status regression, the coefficient rises from 0.103 to 0.113, while in the hours worked regression the coefficient goes from -2.215 to -2.507 (in both cases the coefficients remain statistically significantly different from zero). This suggests that the exchange rate shock's effects acting via migrant returns somewhat *offset* the effects that operate through household income. That said, the changes in the coefficients on the exchange rate shock when controlling for the migrant return rate are relatively modest, and the new coefficients are not outside 95% confidence intervals of the original coefficients.

I conclude from this analysis that the estimated impact of the exchange rate shock on child human capital outcomes is plausibly interpreted as acting predominantly via changes in household income, rather than via the migrant return channel. In fact, the results suggest that if anything, not accounting for the migrant returns channel leads the effect of the exchange rate shock operating via the income channel alone to be *understated*.

**4.4.8.2 Controlling for changes in real economic conditions in overseas locations** If one believes that the estimated impact of the exchange rate shocks acts predominantly via changes in household income, an additional question remains: are the exchange rate shocks *themselves* the primary causal factor, or are the regression coefficients also influenced by real economic shocks (such as job terminations) that were correlated with the exchange rate movements during the

Asian financial crisis? This question is important for assessing the generality of this paper's empirical results. If the exchange rate shocks themselves are the primary causal factor (rather than real economic shocks), then this paper's results can be more readily applied to other cases where migrants experience exchange rate movements that are not accompanied by changes in real economic conditions.

To assess whether correlated changes in real economic conditions are contributing to the estimated effect of the exchange rate shocks, I examine how the estimated impact of the exchange rate shocks changes when controlling for measures of real economic shocks. I use two measures of real economic shocks. First, to account for job terminations overseas, I control for a "migrant job loss" indicator, which is equal to one if the household reported that migrant member(s) experienced a job loss in 1998 (the mean of this indicator is 0.075). Second, to measure changes in overall economic activity overseas, I use the change in the natural log of GDP between 1996 and 1998 in migrant member(s) June 1997 locations. This variable has a mean (std.dev.) of 0.003 (0.0387).[40] For the six largest location countries of Philippine migrants, the changes in log GDP are as follows: Saudi Arabia, 0.017; Hong Kong, -0.055; Taiwan, 0.045; Singapore, 0.001; Japan, -0.011; and United States, 0.043.

Table 10 presents the results of this exercise, for changes in five of the main household investment outcomes between 1997 and 1998. The variables and control variables are as in Table 9, with the difference that both the household- and individual-level samples are somewhat smaller because data on GDP are not available in all migrant locations overseas (such as the Northern Marianas Islands). Two regressions are presented for each of these outcomes: first, for comparison purposes I present the coefficient on the exchange rate shock without the real economic shock variables (the slightly smaller sample size makes these coefficients marginally different from previous tables); and second, the exact same regression but with the real economic shocks variables included as independent variables.

Neither of the real economic shock variables appears strongly associated with any of the investment outcomes in Table 10. The migrant job loss indicator is consistently of positive sign (and mostly modest in magnitude), the change in log GDP variable is inconsistently signed, and neither of these variables is statistically significantly different from zero in any of the regressions.

The inclusion of the real economic shock variables in the regressions leads to slight changes in the coefficients on the exchange rate shock, but the directions of these changes are inconsistent.

[40] In the few cases where a household has migrant members in multiple countries, I simply take the mean of the change in log GDP across migrant members.

For example, in the regression for "entry into a new entrepreneurial activity", the coefficient on the exchange rate shock falls slightly from 0.139 to 0.126. By contrast, in the regression for "net entry into transportation and communication services entrepreneurship", the coefficient rises somewhat from 0.087 to 0.101. Moreover, none of the changes are large in magnitude, so that the new coefficients are well within 95% confidence intervals of the original coefficients. Finally, for all the outcomes, the coefficients on the exchange rate shock variable remain statistically significantly different from zero after inclusion of the real economic shocks variables.

This analysis suggests that the exchange rate shocks themselves appear to be the predominant causal factor behind the observed effects on child human capital investment and household entrepreneurship, rather than real economic shocks that might be correlated with the exchange rate shocks. This is sensible, in that the exchange rate shocks affect essentially *all* migrants who are located in specific countries, while real economic shocks such as job terminations (even if correlated with the exchange rate shocks) are likely to only affect a substantially smaller fraction of migrants.

# 5 Conclusion

Due to their locations in a wide variety of countries, overseas Filipino workers were exposed to exchange rate shocks of various sizes in the wake of the Asian financial crisis. This paper takes advantage of this unusual natural experiment to identify the impact of migrant income shocks on a range of investment outcomes in Philippine households, such as child schooling, child labor, and entrepreneurial activity.

Appreciation of a migrant's currency against the Philippine peso leads to an increase in a household's remittances received from overseas, with an estimated elasticity of 0.60. In turn, these positive income shocks lead to enhanced human capital accumulation and entrepreneurship in origin households. Favorable exchange rate movements lead to greater child schooling, reduced child labor, and increased educational expenditure in origin households. More favorable exchange rate shocks also lead to differentially more hours worked in self-employment, and to differential entry into relatively capital-intensive enterprises by migrants' origin households (in particular, transportation/communication services and manufacturing).

The findings presented here shed light on how developed countries' policies affecting migrant workers can affect households in poor countries. This paper's findings are directly applicable to predicting the impact of reductions in the cost of sending remittances, as such cost reductions are effectively an improvement in the exchange rate faced by remittance senders. More generally, this paper suggests that rich-country policies expanding employment opportunities for workers from overseas can stimulate human capital investment and entrepreneurship in poor-country households. By contrast, increasing enforcement against illegal immigrants or eliminating temporary work permissions for overseas migrants should have the opposite effect. As such, this paper documents specific channels through which immigration and other policies in developed countries can help or hinder the economic development of poorer nations.

# 6 Data appendix

## 6.1 Data sets

Four linked household surveys were provided by the National Statistics Office of the Philippine government: the Labor Force Survey (LFS), the Survey on Overseas Filipinos (SOF), the Family Income and Expenditure Survey (FIES), and the Annual Poverty Indicators Survey (APIS).[41]

The Labor Force Survey (LFS) collects data on primary activity (including 'student'), hours worked in the past week, and demographic characteristics of household members aged 10 or above. These data refer to the household members' activities in the week prior to the survey. The survey defines a household as a group of people who live under the same roof and share common food. The definition also includes people currently overseas if they lived with the household before departure. As collected in the LFS, hours worked refers only to work for pay or profit, whether outside or within the household, or work without pay on a family farm or enterprise; it excludes housekeeping and repair work in one's own home.

The Survey on Overseas Filipinos (SOF) is administered in October of each year to households reporting in the LFS that any members left for overseas within the last five years. The SOF collects information on characteristics of the household's overseas members, their overseas locations and lengths of stay overseas, and the value of remittances received by the household from overseas in the last six months (April to September).

In the analysis, I use the July 1997 and October 1998 rounds of the LFS and the October 1997 and October 1998 rounds of the SOF. Because 1997 remittances in the SOF refer to an April-September reporting period, the SOF remittance data cannot be used to determine a household's level of remittances prior to the July 1997 Asian financial crisis. So I obtain data on cash receipts from overseas from the Family Income and Expenditure Survey (FIES), which was conducted in July 1997 and January 1998. This dataset records all household income sources (including cash receipts from overseas) separately for January to June 1997 and July to December 1997, neatly dividing the year into pre- and post-crisis halves. I obtain a household's initial (Jan-Jun 1997) remittances from the FIES.

Data on detailed income sources and expenditures are available for the pre-crisis period (Jan-Jun 1997) from the July 1997 FIES. Data on detailed income sources, expenditures, and durable good ownership are available for the post-crisis period (Apr-Sep 1998) from the October 1998 Annual Poverty Indicators Survey (APIS). Unfortunately, data on durable good ownership and

[41] Use of the data requires a user fee, and the datasets remain the property of the Philippine government.

housing unit amenities in the pre-crisis period is unavailable in the July 1997 round of the FIES; these data were only recorded in the January 1998 survey. So analyses of changes in assets examine changes from January 1998 (from the FIES) to October 1998 (from the APIS). To the extent that durable good ownership already changed by January 1998 in response to migrant shocks, the empirical estimates reported for these outcomes are likely to be lower bounds of the true effects.

Data on cash receipts from overseas (remittances) in the second reporting period (Apr-Sep 1998) are available in both the APIS and the SOF (both conducted in October 1998). All analyses of cash receipts from overseas use data from the SOF for the second reporting period because this source is likely to be more accurate (the SOF asks for information on amounts sent by each household member overseas, which are then added up to obtain total remittance receipts; by contrast, the APIS simply asks for total cash receipts from overseas). Total household income in Apr-Sep 1998 (obtained from the APIS) is adjusted so that the remittance component reflects data from the SOF.

Monthly exchange rate data (used in constructing the exchange rate shock variable) were obtained from Bloomberg L.P.

The sample used in the empirical analysis consists of all households meeting the following criteria:

1. *The household is inferred to have one or more members working overseas in June 1997.* Using the October 1997 SOF, I identify households that had one or more members working overseas in June 1997, and identify the locations of these overseas members. (See the next subsection for the exact procedure.)

2. *The household's dwelling was also included in the October 1998 LFS/SOF.* As mentioned above, one-quarter of households in the sample in July 1997 had just been rotated out of the sample in October 1998.

3. *The same household has occupied the dwelling between July 1997 and October 1998.* This criterion is necessary because the Labor Force Survey does not attempt to interview households that have changed dwellings. Usefully, the LFS dataset contains a field noting whether the household currently living in the dwelling is the same as the household surveyed in the previous round.

4. *The household has complete data on pre-crisis control and outcome variables (recorded July 1997).*

5. *The household has complete data on post-crisis outcome variables (recorded October 1998).*

Of 30,744 dwellings that the National Statistics Office did not rotate out of the sample between July 1997 and October 1998 (criterion 2), 28,152 (91.6%) contained the same household continuously over that period (criterion 3). Of these households, 27,768 (98.6%) had complete data for all variables used in the analysis (criteria 4 and 5). And of these 27,768, 1,646 (5.9%) had a member overseas in June 1997 (criterion 1). These 1,646 households are the sample used in the empirical analysis.

Constructing the sample on the basis of Criteria 1, 2, and 4 does not threaten the validity of the empirical estimate of the impact of the migrant economic shocks on households. Criteria 1 and 4 are based on pre-shock characteristics of the surveyed households, and criterion 2 comes from the predetermined rotation schedule established by the National Statistics Office.

It is important to check whether sample selection on the basis of Criteria 3 or 5 may have been affected by the independent variable of interest (shocks experienced by migrant members) because household propensities to change dwellings or to misreport information in the survey may have been affected by the shocks. Attrition from the household sample due to these criteria should not generate biased coefficient estimates if such attrition is uncorrelated with the shocks.

Appendix Table 3 (Part A) presents results from household-level regressions where the dependent variable is an indicator for attrition from the sample due to Criteria 3 or 5. The sample in the regression is all households satisfying Criteria 1, 2, and 4. 5.6% of households satisfying Criteria 1, 2, and 4 fail to satisfy either Criteria 3 or 5. The reported coefficient is that on the migrant exchange rate shock variable. The regression controls for location fixed effects and pre-crisis household and overseas worker characteristics (see Table 4 for a list of these control variables). The coefficient is not statistically significantly different from zero and is very small in magnitude (.008). There is no indication that attrition due to Criteria 3 or 5 is associated with the shocks, and so allowing these criteria play a role in determining the sample for analysis should not threaten the internal validity of the estimates.

## 6.2 Determining pre-crisis location of overseas household members

In this subsection I describe the rules used to determine if a particular individual in the October 1997 Survey on Overseas Filipinos was overseas in June 1997, and if so, what country the person was in. Among other questions, the SOF asks:

1. When did the family member *last* leave for overseas?
2. In what country did the family member intend to stay when he/she *last* left?
3. When did the family member return home from his/her *last* departure (if at all)?

These questions unambiguously identify individuals as being away in June 1997 (and their overseas locations) if they left for overseas in or before that month, and returned afterwards (or have not yet returned). Unfortunately, the survey does not collect information on stays overseas *prior* to the most recent one. So there are individuals who most recently left for overseas between June 1997 and the survey date in October 1997, but who were likely to have been overseas before then as well. Fortunately, there is an additional question in the SOF that is of use:

4. How many months has the family member worked/been working abroad during the last five years?

Using this question, two reasonable assumptions allow me to proceed. First, assume all stays overseas are continuous (except for vacations home in the midst of a stay overseas). Second, assume no household member moves between countries overseas. When making these two assumptions, the questions asked on the SOF are sufficient to identify whether a household had a member in a particular country in June 1997.

For example, a household surveyed in October 1997 might have a household member who *last* left for Saudi Arabia in July 1997 and had not yet returned from that stay overseas. If that household member is reported as having worked overseas for 4 months or more, the first assumption implies the person first left for overseas in or before June 1997. The second assumption implies that the person was in Saudi Arabia.

89.8% of individuals identified as being away in June 1997 (and their overseas locations) were classified as such using just questions 1 to 3 above. The remaining 10.2% of individuals identified as being away in June 1997 (and their locations) relied on question 4 above and the two allocation assumptions just described.[42]

[42] Empirical results are not substantially affected when analyses are conducted only on the households where all overseas workers are unambiguously assigned to overseas locations using questions 1, 2, and 3 above.

## 6.3 Matching individuals across survey rounds

In the surveys used in the empirical analysis, it is possible to follow households over time as long as they remain in the same dwelling. However, these data do not explicitly track *individuals* across survey rounds (there is no unique identifier for individuals). Therefore, when the outcome of interest in the empirical analysis is a change for individual children (schooling and labor supply), I match children within households between the July 1997 and October 1998 survey rounds using their reported age and gender.

Because children of the household head should be more likely to remain resident in the household between the two survey rounds (and thus should generate a higher-quality match), I limit the samples in each period to children of household heads. I first look for 'perfect matches', matches between individuals in the two survey rounds who have the same gender, and where the individual observed in October 1998 reports being one year older (age $t + 1$) than the person observed in July 1997 (age $t$).

Because there is likely to be substantial reporting/measurement error in age, I also allow 'imperfect matches': matches between an individual observed in July 1997 (age $t$) and the same-gendered individual in the household in October 1998 who is *closest* in to the July 1997 individual's age plus one (closest to age $t + 1$). I allow imperfect matches only if the matched child's age in October 1998 is no more than 2 years different from age $t + 1$. I make no attempt to match individuals below the age of 10 in July 1997, as no data is collected on these individuals for the outcome variables of interest.

Whenever more than one match occurs for a particular child within a household (if one individual in July 1997 matches with two or more individuals in the same household in October 1998, or if more than one person in the household in July 1997 has the same age-gender combination), I do not attempt to resolve the match ambiguity and simply drop the given household from the sample altogether. These situations are rare, and in any case should be uncorrelated with migrant exchange rate shocks. As a quality check, I make sure each matched child's education levels across the two survey rounds are reasonable: I disallow matches where education levels change by more than two levels between the two rounds.

Of all children observed in July 1997, 68% were matched with an individual in the same household in October 1998 using the procedure just described. This figure includes attrition of entire households (due to Criteria 3 and 5 described in Appendix section 6.1 above) as well as unsuccessful individual matches. The successful matches used in the empirical analysis are roughly evenly split between 'perfect' and 'imperfect' matches.

Attrition from the sample of children (due to failed matches) should not generate biased coefficient estimates if attrition is random with respect to the independent variable of interest, the migrant exchange rate shock. Indeed, there is no indication that the incidence of failed matches is associated with these shocks among children who would have been included in the sample for analysis if not for the failed match. Appendix Table 2 (in Panels B and C) presents results from individual-level regressions where the dependent variable is an indicator for attrition from the sample due to failed matching, for males and females separately. (Children are included in this regression if the individual's household satisfied Criteria 1, 2, and 4, as described in Appendix section 6.1 above, and if the individual had complete data on individual characteristics in July 1997.) Reported coefficients are those on the migrant exchange rate shock. All regressions control for location fixed effects and pre-crisis individual, household, and overseas worker characteristics. Neither coefficient is statistically significantly different from zero, providing no reason to worry that sample selection on the basis of the exchange rate shock is occurring.

# 7 References

Adams, Richard H., Jr., ‘Remittances, Investment, and Rural Asset Accumulation in Pakistan,’ *Economic Development and Cultural Change*, Vol. 17, No. 1, 1998, pp. 155-173.

Ahlburg, Dennis, *Remittances and Their Impact : A Study of Tonga and Western Samoa*. Canberra: National Centre for Development Studies, Research School of Pacific Studies, the Australian National University, 1991.

Baland, Jean-Marie and James A. Robinson, ‘Is Child Labor Inefficient?’ *Journal of Political Economy*, Vol. 108, No. 4, 2000, pp. 663-679.

Basu, Kaushik and Pham Hoang Van, ‘The Economics of Child Labor,’ *American Economic Review*, Vol. 88, No. 3, June 1998, pp. 412-427.

Becker, Gary, "A Theory of the Allocation of Time," *Economic Journal*, Vol. 75, September 1965, pp. 493-517.

Beegle, Kathleen, Rajeev H. Dehejia, and Roberta Gatti, ‘Child Labor, Crop Shocks, and Credit Constraints’, NBER Working Paper 10088, November 2003.

Bertrand, Marianne, Sendhil Mullainathan, and Doug Miller, ‘Public Policy and Extended Families: Evidence from Pensions in South Africa,’ *World Bank Economic Review*, Vol. 17, No. 1, 2003.

Bhagwati, Jagdish, ‘Borders Beyond Control,’ *Foreign Affairs*, Vol. 82 (1), January/February 2003, pp. 98-104.

Borjas, George, ‘The Economic Analysis of Immigration,’ in Orley Ashenfelter and David Card, eds., *Handbook of Labor Economics*, Vol. 3A, North-Holland, 1999, pp. 1697-1760.

Brown, Richard P.C., ‘Migrants’ Remittances, Savings, and Investment in the South Pacific’, *International Labour Review*, Vol. 133, No. 3, 1994, pp. 347-367.

Cariño, Benjamin, ‘Introduction,’ in Benjamin Cariño, ed., *Filipino Workers on the Move: Trends, Dilemmas, and Policy Options*. Manila: Philippine Migration Research Network, 1998.

Case, Anne and Angus Deaton, ‘Large Cash Transfers to the Elderly in South Africa,’ *Economic Journal*, Vol. 108, September 1998, pp. 1330-1361.

Corsetti, Giancarlo, Paolo Pesenti, and Nouriel Roubini, ‘What Caused the Asian Currency and Financial Crisis? Part II: The Policy Debate,’ NBER Working Paper 6834, December 1998.

Cox-Edwards, Alexandra and Manuelita Ureta, ‘International Migration, Remittances, and Schooling: Evidence from El Salvador,’ *Journal of Development Economics*, Vol. 72, 2003, pp. 429-461.

Duflo, Esther, ‘Grandmothers and Granddaughters: Old Age Pension and Intra-Household Allocation in South Africa,’ *World Bank Economic Review*, Vol. 17, No. 1, 2003.

Duryea, Suzanne, David Lam, and Deborah Levison, 'Effects of Economic Shocks on Children's Employment and Schooling in Brazil,' Population Studies Center Research Report No. 03-541, Institute for Social Research, University of Michigan, December 2003.

Dustmann, Christian, and Olivier Kirchkamp, 'The Optimal Migration Duration and Activity Choice After Re-migration,' *Journal of Development Economics*, Vol. 67, 2002, pp. 351-372.

Edmonds, Eric, 'Does Illiquidity Alter Child Labor and Schooling Decisions? Evidence from Household Responses to Anticipated Cash Transfers in South Africa,' NBER Working Paper 10265, February 2004.

Frankenberg, Elizabeth, James P. Smith, and Duncan Thomas, 'Economic Shocks, Wealth, and Welfare,' *Journal of Human Resources*, 2003.

Grindle, Merilee, *Searching for Rural Development: Labor Migration and Employment in Mexico*. Ithaca: Cornell University Press, 1988.

Hurst, Eric and Annamaria Lusardi, 'Liquidity Constraints, Household Wealth, and Entrepreneurship,' *Journal of Political Economy*, Vol. 112, No. 2, April 2004, pp. 319-347.

Jacoby, Hanan, and Emmanuel Skoufias, 'Risk, Financial Markets, and Human Capital in a Developing Country,' *Review of Economics and Statistics*, Vol. 64, 1997, pp. 311-335.

Jensen, Robert, 'Public Transfers, Private Transfers, and the 'Crowding Out' Hypothesis: Evidence From South Africa,' Kennedy School of Government Faculty Research Working Paper #R98-08, 1998.

Jensen, Robert, 'Agricultural Volatility and Investments in Children,' *American Economic Association Papers and Proceedings*, May 2000, pp. 399-404.

Lipton, Michael, 'Migration from Rural Areas of Poor Countries: The Impact on Rural Productivity and Income Distribution', *World Development*, Vol. 8, No. 1, January 1980, pp. 1-24.

Lucas, Robert E.B., and Oded Stark, 'Motivations to Remit: Evidence from Botswana,' *Journal of Political Economy*, Vol. 93, No. 5, 1985, pp. 901-918.

Massey, Douglas S., Raul Alarcon, Jorge Durand, and H. Gonzalez, *Return to Aztlan: The Social Process of International Migration from Western Mexico*. Berkeley: University of California Press, 1987.

Massey, Douglas S. and Emilio A. Parrado, 'International Migration and Business Formation in Mexico,' *Social Science Quarterly*, Vol. 79, No. 1, March 1998, pp. 1-19.

McCormick, Barry and Jackline Wahba, 'Overseas Work Experience, Savings and Entrepreneurship Amongst Return Migrants to LDCs,' *Scottish Journal of Political Economy*, Vol. 48, No. 2, May 2001, pp. 164-178.

Mesnard, Alice, 'Temporary Migration and Capital Market Imperfections,' *Oxford Economic Papers*, Vol. 56, 2004, pp. 242-262.

Miguel, Edward, 'Poverty and Witch Killing,' BREAD Working Paper No. 041, August 2003.

Orozco, Manuel, 'Worker Remittances: An International Comparison,' working paper, Inter-American Development Bank, February 2003.

*Philippine Yearbook*, Manila: National Statistics Office, 2001.

Poirine, Bernard, 'A Theory of Remittances as an Implicit Family Loan Arrangement,' *World Development*, Vol. 25, No. 4, 1997, pp. 589-611.

Ratha, Dilip, "Workers' Remittances: An Important and Stable Source of External Development Finance," in *Global Development Finance 2003: Striving for Stability in Development Finance*. Washington, DC: International Monetary Fund, 2003, pp. 157-175.

Reichert, J., 'The Migrant Syndrome: Seasonal US Wage Labor and Rural Development in Central Mexico,' *Human Organization*, Vol. 40, No. 1, pp. 56-66.

Rodrik, Dani, 'Feasible Globalizations,' NBER Working Paper No. 9129, August 2002.

Rose, Eliana, 'Consumption Smoothing and Excess Female Mortality in Rural India,' *Review of Economics and Statistics*, Vol. 81, No. 1, 1999, pp. 41-49.

Rosenzweig, Mark and Oded Stark, 'Consumption Smoothing, Migration, and Marriage: Evidence from Rural India,' *Journal of Political Economy*, Vol. 97, No. 4, 1989, pp. 905-926.

Rosenzweig, Mark and Kenneth Wolpin, 'Credit Market Constraints, Consumption Smoothing and the Accumulation of Durable Production Assets in Low-Income Countries: Investments in Bullocks in India,' *Journal of Political Economy* 101, 1993, pp. 223-244.

Rosenzweig, Mark and Kenneth Wolpin, 'Natural 'Natural Experiments' in Economics,' *Journal of Economic Literature*, Vol. 38, December 2000, pp. 827-874.

Stark, Oded, *The Migration of Labor*. Oxford: Basil Blackwell, 1991.

Stark, Oded and David Levhari, 'On Migration and Risk in LDCs,' *Economic Development and Cultural Change*, 1982, pp. 191-196.

Taylor, J. Edward and Philip L. Martin, 'Human Capital: Migration and Rural Population Change,' in Bruce L. Gardner and Gordon C. Rausser, eds. *Handbook of Agricultural Economics*, Volume 1A. Amsterdam: Elsevier Science, North-Holland, 2001, pp. 457-511.

Taylor, J. Edward, Scott Rozelle, and Alan de Brauw, 'Migration and Incomes in Source Communities: A New Economics of Migration Perspective from China,' *Economic Development and Cultural Change*, Vol. 52, 2003, pp. 75-101.

United Nations, *International Migration Report 2002*, UN Population Division, New York.

United States Bureau of the Census, *International Data Base*, Washington, D.C., 2002.

Woodruff, Christopher and Rene Zenteno, 'Remittances and Microenterprises in Mexico,' mimeo, University of California, San Diego and ITESM, 2003.

World Bank, *World Development Indicators on CD-ROM 2004*, Washington, D.C.

Yang, Dean, "Why Do Migrants Return to Poor Countries? Evidence from Philippine Migrants' Responses to Exchange Rate Shocks," *Ford School of Public Policy Working Paper Series* 04-003, University of Michigan, 2004.

**Table 1** **Locations of overseas workers from sample households**
(June 1997)

| Location | Number of overseas workers | % of total | Exchange rate shock (June 1997- Oct 1998) |
|---|---|---|---|
| Saudi Arabia | 521 | 28.4% | 0.52 |
| Hong Kong, China | 210 | 11.5% | 0.52 |
| Taiwan | 148 | 8.1% | 0.26 |
| Singapore | 124 | 6.8% | 0.29 |
| Japan | 116 | 6.3% | 0.32 |
| United States | 116 | 6.3% | 0.52 |
| Malaysia | 65 | 3.5% | -0.01 |
| Italy | 52 | 2.8% | 0.38 |
| Kuwait | 51 | 2.8% | 0.50 |
| United Arab Emirates | 49 | 2.7% | 0.52 |
| Greece | 44 | 2.4% | 0.30 |
| Korea, Rep. | 36 | 2.0% | -0.04 |
| Northern Mariana Islands | 30 | 1.6% | 0.52 |
| Canada | 29 | 1.6% | 0.42 |
| Brunei | 22 | 1.2% | 0.30 |
| United Kingdom | 15 | 0.8% | 0.55 |
| Qatar | 15 | 0.8% | 0.52 |
| Norway | 14 | 0.8% | 0.35 |
| Australia | 14 | 0.8% | 0.24 |
| Bahrain | 13 | 0.7% | 0.52 |
| Other | 148 | 8.1% | |
| Total | 1,832 | 100.0% | |

NOTES -- Data are from Oct 1997 Survey on Overseas Filipinos. "Other" includes 38 additional countries plus a category for "unspecified" (total 58 countries explicitly reported). Overseas workers in table are those in households included in sample for empirical analysis (see Data Appendix for details on sample definition). Exchange rate shock: Change in Philippine pesos per currency unit where overseas worker was located in Jun 1997. Change is average of 12 months leading to Oct 1998 minus average of 12 months leading to Jun 1997, divided by the latter (e.g., 10% increase is 0.1).

**Table 2** **Characteristics of overseas workers from sample households**

| | Mean | Std. Dev. | 10th pctile | Median | 90th pctile |
|---|---|---|---|---|---|
| Age | 34.49 | 9.00 | 24.00 | 33.00 | 47.00 |
| Marital status is single (indicator) | 0.38 | | | | |
| Gender is male (indicator) | 0.53 | | | | |
| Occupation (indicators) | | | | | |
| Production and related workers | 0.31 | | | | |
| Domestic servants | 0.31 | | | | |
| Ship's officers and crew | 0.12 | | | | |
| Professional and technical workers | 0.11 | | | | |
| Clerical and related workers | 0.04 | | | | |
| Other services | 0.10 | | | | |
| Other | 0.01 | | | | |
| Highest education level (indicators) | | | | | |
| Less than high school | 0.15 | | | | |
| High school | 0.25 | | | | |
| Some college | 0.31 | | | | |
| College or more | 0.30 | | | | |
| Position in household (indicators) | | | | | |
| Male head of household | 0.28 | | | | |
| Female head or spouse of head | 0.12 | | | | |
| Daughter of head | 0.28 | | | | |
| Son of head | 0.15 | | | | |
| Other relation to head | 0.16 | | | | |
| Months overseas as of Jun 1997 (indicators) | | | | | |
| 0-11 months | 0.30 | | | | |
| 12-23 months | 0.24 | | | | |
| 24-35 months | 0.16 | | | | |
| 36-47 months | 0.15 | | | | |
| 48 months or more | 0.16 | | | | |

Number of individuals:
1,832

NOTE -- Data source is October 1997 Survey on Overseas Filipinos, National Statistics Office of the Philippines. "Other" occupational category includes "administrative, executive, and managerial workers" and "agricultural workers". Overseas workers in table are those in households included in sample for empirical analysis (see Data Appendix for details on sample definition).

**Table 3** **Initial characteristics of sample households**

Num. of obs.: 1,646

| | Mean | Std. Dev. | 10th pctile | Median | 90th pctile |
|---|---|---|---|---|---|
| Exchange rate shock *(see below for definition)* | 0.41 | 0.16 | 0.26 | 0.52 | 0.52 |
| Household financial statistics (Jan-Jun 1997) | | | | | |
| Total expenditures | 73,596 | 66,529 | 24,600 | 57,544 | 132,793 |
| Total income | 94,272 | 92,826 | 28,093 | 70,906 | 175,000 |
| Income per capita in household | 20,235 | 21,403 | 5,510 | 15,236 | 39,212 |
| Remittance receipts | 36,194 | 46,836 | 0 | 26,000 | 87,500 |
| Remittance receipts (as share of hh income) | 0.40 | 0.31 | 0.00 | 0.37 | 0.85 |
| Number of HH members working overseas in Jun 1997 | 1.11 | 0.36 | 1 | 1 | 1 |
| HH size (including overseas members, Jul 1997) | 6.16 | 2.42 | 3 | 6 | 9 |
| Located in urban area | 0.68 | | | | |
| HH position in national income per capita distribution, Jan- Jun 1997 (indicators) | | | | | |
| Top quartile | 0.51 | | | | |
| 3rd quartile | 0.28 | | | | |
| 2nd quartile | 0.14 | | | | |
| Bottom quartile | 0.07 | | | | |
| HH income sources (Jan-Jun 1997) | | | | | |
| Wage and salary, as share of total | 0.23 | 0.29 | 0.00 | 0.07 | 0.68 |
| Indicator: nonzero wage and salary income | 0.53 | | | | |
| Entrepreneurial income, as share of total | 0.17 | 0.25 | 0.00 | 0.00 | 0.58 |
| Indicator: nonzero entrepreneurial income | 0.50 | | | | |
| Agricultural income, as share of total | 0.10 | 0.21 | 0.00 | 0.00 | 0.42 |
| Indicator: nonzero agricultural income | 0.50 | | | | |
| Household head characteristics (Jul 1997): | | | | | |
| Age | 49.9 | 13.9 | 32 | 50 | 68 |
| Highest education level (indicators) | | | | | |
| Less than elementary | 0.17 | | | | |
| Elementary | 0.20 | | | | |
| Some high school | 0.10 | | | | |
| High school | 0.22 | | | | |
| Some college | 0.16 | | | | |
| College or more | 0.14 | | | | |
| Occupation (indicators) | | | | | |
| Agriculture | 0.23 | | | | |
| Professional job | 0.08 | | | | |
| Clerical job | 0.13 | | | | |
| Service job | 0.05 | | | | |
| Production job | 0.14 | | | | |
| Other | 0.38 | | | | |
| Does not work | 0.00 | | | | |
| Marital status is single (indicator) | 0.03 | | | | |

NOTES -- Data source: National Statistics Office, the Philippines. Surveys used: Labor Force Survey (Jul 1997 and Oct 1998), Survey on Overseas Filipinos (Oct 1997 and Oct 1998), 1997 Family Income and Expenditures Survey (for Jan-Jun 1997 income and expenditures), and 1998 Annual Poverty Indicators Survey (for Apr-Sep 1998 income and expenditures). Currency unit: Expenditure, income, and cash receipts from abroad are in Philippine pesos (26 per US$ in Jan-Jun 1997). Definition of exchange rate shock: Change in Philippine pesos per currency unit where overseas worker was located in Jun 1997. Change is average of 12 months leading to Oct 1998 minus average of 12 months leading to Jun 1997, divided by the latter (e.g., 10% increase is 0.1). If household has more than one overseas worker in Jun 1997, exchange rate shock variable is average change in exchange rate across household's overseas workers. (Exchange rate data are from Bloomberg L.P.) Sample definition: Households with a member working overseas in Jun 1996 (according to Oct 1997 Survey of Overseas Filipinos) and that also appear in 1998 Annual Poverty Indicators Survey, and excluding households with incomplete data (see Data Appendix for details).

**Table 4** **Impact of migrant exchange rate shocks, 1997-1998**

OLS regressions of change in outcome variable on exchange rate shock. Columns 1 and 2 report coefficients (standard errors) on exchange rate shock.

| | Initial mean of outcome | Mean (std.dev.) of change in outcome | Regressions (1) | Regressions (2) | Implied elasticity (coefficient in col. 2 divided by initial mean) |
|---|---|---|---|---|---|
| **Panel A: Remittances, migrant returns** | | | | | |
| Remittance receipts | 0.395 | 0.151 | 0.175 | 0.238 | 0.60 |
| | | (0.022) | (0.119) | (0.086)*** | |
| Migrant return rate (over 15 months) | *n.a.* | 0.136 | -0.155 | -0.125 | |
| | | (0.008) | (0.048)*** | (0.064)* | |
| **Panel B: Household income and expenditures** | | | | | |
| Household income | 1.000 | 0.251 | 0.258 | 0.26 | 0.26 |
| | | (0.030) | (0.162) | (0.126)** | |
| Wage and salary income | 0.234 | 0.063 | 0.027 | -0.008 | -0.03 |
| | | (0.010) | (0.044) | (0.049) | |
| Entrepreneurial income | 0.166 | 0.023 | 0.041 | 0.029 | 0.17 |
| | | (0.007) | (0.034) | (0.041) | |
| Other sources of income (includes remittances) | 0.6 | 0.165 | 0.189 | 0.239 | 0.40 |
| | | (0.023) | (0.137) | (0.100)** | |
| Household expenditures (total) | 1.000 | 0.109 | -0.042 | -0.048 | -0.05 |
| | | (0.011) | (0.066) | (0.069) | |
| Household expenditures (per capita) | 1.000 | 0.136 | 0.069 | 0.076 | 0.08 |
| | | (0.018) | (0.089) | (0.086) | |
| **Panel C: Durable good ownership** | | | | | |
| Radio | 0.836 | 0.105 | 0.04 | 0.088 | |
| | | (0.010) | (0.069) | (0.069) | |
| Television | 0.828 | 0.03 | 0.062 | 0.095 | |
| | | (0.006) | (0.035)* | (0.035)*** | |
| Living room set | 0.755 | 0.042 | 0.039 | 0.058 | |
| | | (0.009) | (0.045) | (0.030)* | |
| Dining set | 0.677 | 0.037 | 0.097 | 0.099 | |
| | | (0.015) | (0.076) | (0.064) | |
| Refrigerator | 0.636 | 0.07 | 0 | -0.01 | |
| | | (0.008) | (0.064) | (0.058) | |
| Vehicle | 0.129 | 0.134 | 0.168 | 0.144 | |
| | | (0.009) | (0.027)*** | (0.039)*** | |
| *Specification:* | | | | | |
| *Region*Urban controls* | | | - | Y | |
| *Controls for pre-crisis household and migrant characteristics* | | | - | Y | |
| Num. of obs. in all regressions: | | | 1,646 | | |

* significant at 10%; ** significant at 5%; *** significant at 1%

*(NOTES continue on next page.)*

**Continuation of Table 4**

NOTES -- Each cell in regression columns 1-2 presents coefficient estimate on exchange rate shock in a separate OLS regression. Standard errors in parentheses, clustered by location country of household's eldest overseas worker. All dependent variables (except migrant return rate) are first-differenced variables. Number of overseas members is change between June 1997 and October 1998. For remittance variable, change is between Jan-Jun 1997 and Apr-Sep 1998 reporting periods, expressed as fraction of initial (Jan-Jun 1997) household income. Income changes are between Jan-Jun 1997 and Apr-Sep 1998 reporting periods, expressed as fractions of initial (Jan-Jun 1997) household income. Expenditure changes between Jan-Jun 1997 and Apr-Sep 1998 reporting periods, expressed as fractions of initial (Jan-Jun 1997) expenditures. (Expenditures are only for current consumption, and do not include purchases of durable goods.) Durable goods variables are changes in indicator variables for ownership of given item between Jan 1998 and Oct 1998. See Table 3 for notes on sample definition and definition of exchange rate shock.

Migrant return rate is number of migrant returns between July 1997 and September 1998, divided by number of household migrants in June 1997. Region*Urban controls are 16 indicators for regions within the Philippines and their interactions with an indicator for urban location. Household-level controls are as follows. Income variables as reported in Jan-Jun 1997: log of per capita household income; indicators for being in 2nd, 3rd, and top quartile of sample distribution of household per capita income. Demographic and occupational variables as reported in July 1997: number of household members (including overseas members); five indicators for head's highest level of education completed (elementary, some high school, high school, some college, and college or more; less than elementary omitted); head's age; indicator for "head's marital status is single"; six indicators for head's occupation (professional, clerical, service, production, other, not working; agricultural omitted).

Migrant controls are means of the following variables across HH's overseas workers away in June 1997: indicators for months away (12-23, 24-35, 36-47, 48 or more; 0-11 omitted); indicators for highest education level completed (high school, some college, college or more; less than high school omitted); occupation indicators (domestic servant, ship's officer or crew, professional, clerical, other service, other occupation; production omitted); relationship to HH head indicators (female head or spouse of head, daughter, son, other relation; male head omitted); indicator for single marital status; years of age.

**Table 5** **Impact of migrant exchange rate shocks on human capital investment, 1997-1998**

OLS regressions of change in outcome variable on exchange rate shock. Table reports coefficients (standard errors) on exchange rate shock.

**Panel A: Schooling and labor supply of children aged 10-17 (individual-level regressions)**

| | Both females and males | | | | Females | | | | Males | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Regressions | | | | Regressions | | | | Regressions | |
| Outcomes | Initial mean of outcome | Mean (std. dev.) of change in outcome | (1) | (2) | Initial mean of outcome | Mean (std. dev.) of change in outcome | (3) | (4) | Initial mean of outcome | Mean (std. dev.) of change in outcome | (5) | (6) |
| Student indicator | 0.94 | -0.036 | 0.074 | 0.103 | 0.95 | -0.019 | 0.117 | 0.13 | 0.93 | -0.053 | 0.022 | 0.068 |
| | | (0.007) | (0.048) | (0.041)** | | (0.010) | (0.086) | (0.061)** | | (0.013) | (0.050) | (0.061) |
| Total hours worked | 1.10 | 0.971 | -2.194 | -2.215 | 0.64 | 0.339 | -2.753 | -2.14 | 1.53 | 1.573 | -1.448 | -3.234 |
| | | (0.221) | (1.072)** | (0.905)** | | (0.233) | (2.044) | (2.246) | | (0.414) | (1.710) | (1.407)** |
| Hours worked: | | | | | | | | | | | | |
| For employer outside household | 0.34 | 0.655 | -0.986 | -0.225 | 0.25 | 0.143 | -1.276 | -0.547 | 0.43 | 1.141 | -0.52 | -0.268 |
| | | (0.131) | (0.709) | (0.683) | | (0.154) | (1.392) | (2.023) | | (0.232) | (0.978) | (1.411) |
| In self-employment, as employer, or as worker with pay in own family-operated farm or business | 0.10 | 0.043 | 1.06 | 1.032 | 0.02 | 0.043 | 0.216 | 0.243 | 0.18 | 0.043 | 1.858 | 1.976 |
| | | (0.095) | (0.376)*** | (0.500)** | | (0.053) | (0.151) | (0.228) | | (0.158) | (0.639)*** | (1.100)* |
| As worker without pay in own family-operated farm or business | 0.66 | 0.274 | -2.268 | -3.022 | 0.38 | 0.152 | -1.693 | -1.837 | 0.93 | 0.389 | -2.786 | -4.942 |
| | | (0.176) | (0.639)*** | (0.739)*** | | (0.123) | (0.793)** | (0.936)* | | (0.322) | (1.296)** | (1.523)*** |
| *Specification:* | | | | | | | | | | | | |
| *Region*Urban controls* | | | - | Y | | | - | Y | | | - | Y |
| *Controls for pre-crisis individual, household and migrant characteristics* | | | - | Y | | | - | Y | | | - | Y |
| Num. of obs. in all regs. in column: | | | 1,188 | 1,188 | | | 579 | 579 | | | 609 | 609 |

**Panel B: Household educational expenditures (household-level regressions)**

| | | | Regressions | |
|---|---|---|---|---|
| | Initial mean of outcome | Mean (std. dev.) of change in outcome | (1) | (2) |
| Education expenditures (as fraction of initial household income) | 0.054 | 0.020 | 0.016 | 0.026 |
| | | (0.002) | (0.010) | (0.013)** |
| *Specification:* | | | | |
| *Region*Urban controls* | | | - | Y |
| *Controls for pre-crisis household and migrant characteristics* | | | - | Y |
| Num. of obs.: | | | 1,646 | 1,646 |

* significant at 10%; ** significant at 5%; *** significant at 1%

NOTE -- Each cell in regression columns presents coefficient estimate on exchange rate shock in a separate OLS regression. Standard errors in parentheses, clustered by location country of household's eldest overseas worker. Unit of observation is individuals in Panel A, households in Panel B. Individuals are relations of the household head who are not overseas in Jul 1997 (from households with a migrant overseas in June 1997) and who are successfully matched (on the basis of age and gender) with an individual in the same household in Oct 1998. See Data Appendix for details of match process. Individual-level dependent variables are changes between Jul 1997 and Oct 1998. "Student indicator" is change in an indicator that student is person's primary occupation (values are -1, 0, or 1). "Hours worked" variables are changes in numbers of hours in respective type of work. Initial means are of levels of respective outcome variables prior to crisis. Educational expenditure variable is change between Jan-Jun 1997 and Apr-Sep 1998 reporting periods, expressed as fraction of initial (Jan-Jun 1997) household consumption.

See notes to Table 4 for list of household and migrant control variables. Individual characteristics controls (as reported in July 1997) included in Panel A's regressions: fixed effects for each year of age; gender indicator, indicator for "marital status is single", indicator for "primary activity is student", indicator for "not in labor force", and five indicators for highest schooling level completed (elementary, some high school, high school, some college, and college or more).

**Table 6** **Impact of migrant exchange rate shocks on household labor supply by worker category, 1997-1998**

OLS regressions of change in outcome variable on exchange rate shock. Table reports coefficients (standard errors) on exchange rate shock.

| Outcomes | Initial mean of outcome | Mean (std. dev.) of change in outcome | Regressions (1) | (2) |
|---|---|---|---|---|
| Total hours worked | 72.6 | -0.68 | 9.276 | 5.266 |
| | | (1.199) | (9.934) | (8.806) |
| Hours worked: | | | | |
| For employer outside household | 39.6 | -3.633 | 5.103 | 0.645 |
| | | (1.210) | (8.102) | (8.882) |
| In self employment | 21.5 | 0.534 | 8.365 | 9.966 |
| | | (0.775) | (4.469)* | (4.746)** |
| As employer in own family-operated farm or business | 3.2 | 1.601 | 1.153 | 0.829 |
| | | (0.280) | (1.800) | (2.320) |
| As worker *with pay* in own family-operated farm or business | 0.8 | -0.147 | -0.126 | -0.538 |
| | | (0.175) | (0.806) | (0.735) |
| As worker *without pay* in own family-operated farm or business | 7.6 | 0.965 | -5.219 | -5.636 |
| | | (0.516) | (3.464) | (3.761) |
| *Specification:* | | | | |
| *Region*Urban controls* | | | - | Y |
| *Controls for pre-crisis household and migrant characteristics* | | | - | Y |
| Num. of obs. in all regressions: | | | 1,646 | |

* significant at 10%; ** significant at 5%; *** significant at 1%

NOTE -- Each cell in regression columns 1-2 presents coefficient estimate on exchange rate shock in a separate OLS regression. Standard errors in parentheses, clustered by location country of household's eldest overseas worker. All dependent variables are changes in hours worked in past week by non-overseas household members, between Jul 1997 and Oct 1998 surveys. See Table 3 for notes on sample construction and variable definitions, and notes to Table 4 for list of control variables.

**Table 7** **Impact of migrant exchange rate shocks on entrepreneurship, 1997-1998**

OLS regressions of outcome variable on exchange rate shock. Table reports coefficients (standard errors) on exchange rate shock.

**Panel A: Entrepreneurial activities in general**

(Regression outcomes are changes in given variable.)

| | Initial mean of outcome | Mean (std. dev.) of change in outcome | Regressions (1) | (2) |
|---|---|---|---|---|
| Entrepreneurial income (as share of initial hh income) | 0.17 | 0.023 | 0.041 | 0.029 |
| | | (0.007) | (0.034) | (0.041) |
| Entrepreneurial activity (indicator) | 0.50 | 0.014 | 0.084 | 0.061 |
| | | (0.013) | (0.050)* | (0.051) |
| *Specification:* | | | | |
| *Region*Urban controls* | | | - | Y |
| *Controls for pre-crisis household and migrant characteristics* | | | - | Y |
| Num. of obs. in all regressions: | | | 1,646 | 1,646 |

**Panel B: Entry into new entrepreneurial activities, and exit from old ones**

| Outcomes | Mean of outcome variable | Regressions (1) | (2) |
|---|---|---|---|
| Entry into a new entpreneurial activity (indicator) | 0.237 | 0.111 | 0.14 |
| | | (0.070) | (0.046)*** |
| Exit from an old entrepreneurial activity (indicator) | 0.222 | -0.094 | -0.042 |
| | | (0.061) | (0.069) |
| *Specification:* | | | |
| *Region*Urban controls* | | - | Y |
| *Controls for pre-crisis household and migrant characteristics* | | - | Y |
| Num. of obs. in all regressions: | | 1,646 | 1,646 |

* significant at 10%; ** significant at 5%; *** significant at 1%

NOTE -- Each cell in regression columns 1-2 presents coefficient estimate on exchange rate shock in a separate OLS regression. Standard errors in parentheses, clustered by location country of household's eldest overseas worker. Entrepreneurial income change is between Jan-Jun 1997 and Apr-Sep 1998 reporting periods, expressed as fraction of initial (Jan-Jun 1997) household income. Indicator for entrepreneurial activity equal to one if household reports engaging in any entrepreneurial activity. "Entry into a new entrepreneurial activity" indicator equal to one if household reported engaging in one or more specific types of activities in Apr-Sep 1998 that were not reported in Jan-Jun 1997, and zero otherwise. "Exit from an old entrepreneurial activity" indicator equal to one if household ceased engaging in one or more specific types of activities in Apr-Sep 1998 that were reported in Jan-Jun 1997, and zero otherwise. (See Appendix Table 2 for list of specific types of entrepreneurial activities.) See Table 3 for notes on sample construction and variable definitions, and notes to Table 4 for list of control variables.

**Table 8** **Impact of migrant exchange rate shocks on specific types of entrepreneurial activities, 1997-1998**
OLS regressions of outcome variable on exchange rate shock. Table reports coefficients (standard errors) on exchange rate shock.

| | | | Regressions (1) | Regressions (2) | Regressions (3) | | | Regression (4) |
|---|---|---|---|---|---|---|---|---|
| | Initial fraction of hhs with nonzero income from this source | Mean (std.dev.) of net entry into this activity | Indicator: Entry into this activity (a) | Indicator: Exit from this activity (b) | Net entry into this activity (a) - (b) | Initial income from this source (as share of hh income) | Mean (std.dev.) change in income from this source (as share of hh income) | Change in entrepreneurial income (as share of initial hh income) |
| Crop farming and gardening | 0.219 | -0.016 | 0.018 | 0.01 | 0.007 | 0.066 | -0.01 | -0.017 |
| | | (0.007) | (0.019) | (0.026) | (0.036) | | (0.003) | (0.017) |
| Wholesale and retail trade | 0.184 | 0.004 | 0.003 | -0.014 | 0.017 | 0.047 | 0.012 | -0.044 |
| | | (0.006) | (0.027) | (0.054) | (0.070) | | (0.004) | (0.028) |
| Transportation and communication | 0.082 | 0.007 | 0.045 | -0.031 | 0.076 | 0.019 | 0.011 | 0.055 |
| services | | (0.009) | (0.025)* | (0.025) | (0.031)** | | (0.004) | (0.022)** |
| Livestock and poultry raising | 0.055 | 0.016 | 0.028 | -0.049 | 0.077 | 0.006 | 0.002 | 0.014 |
| | | (0.007) | (0.040) | (0.030) | (0.058) | | (0.001) | (0.010) |
| Community and personal services | 0.043 | 0.01 | -0.005 | 0.017 | -0.022 | 0.011 | 0.004 | -0.008 |
| | | (0.006) | (0.020) | (0.020) | (0.024) | | (0.002) | (0.011) |
| Manufacturing | 0.038 | -0.006 | 0.046 | -0.013 | 0.058 | 0.006 | 0.000 | 0.016 |
| | | (0.004) | (0.016)*** | (0.019) | (0.025)** | | (0.002) | (0.008)** |
| Fishing | 0.015 | 0.004 | 0.008 | 0.014 | -0.006 | 0.007 | -0.001 | 0.009 |
| | | (0.002) | (0.009) | (0.005)*** | (0.010) | | (0.001) | (0.007) |
| Forestry | 0.008 | -0.004 | 0.006 | 0.001 | 0.005 | 0.000 | 0.001 | 0.001 |
| | | (0.002) | (0.004)* | (0.006) | (0.008) | | (0.001) | (0.003) |
| Construction | 0.002 | 0.004 | -0.003 | 0.005 | -0.008 | 0.001 | 0.001 | -0.003 |
| | | (0.002) | (0.008) | (0.003)* | (0.008) | | (0.001) | (0.003) |
| Mining and quarrying | 0.002 | 0.000 | -0.003 | 0.001 | -0.004 | 0.000 | 0.000 | -0.001 |
| | | (0.001) | (0.002) | (0.001) | (0.003) | | (0.000) | (0.001) |
| Activities not elsewhere classified | 0.008 | -0.002 | 0.002 | 0.006 | -0.004 | 0.002 | 0.000 | 0.001 |
| | | (0.002) | (0.010) | (0.008) | (0.012) | | (0.000) | (0.002) |
| *Specification:* | | | | | | | | |
| *Region*Urban controls* | | | Y | Y | Y | | | Y |
| *Controls for pre-crisis household and migrant characteristics* | | | Y | Y | Y | | | Y |
| Num. of obs. in all regressions in column: | | | 1,646 | 1,646 | 1,646 | | | 1,646 |

* significant at 10%; ** significant at 5%; *** significant at 1%
NOTE -- Each cell in regression columns 1-4 presents coefficient estimate on exchange rate shock in a separate OLS regression. Standard errors in parentheses, clustered by location country of household's eldest overseas worker. Outcome in regression column 1 (entry indicator) equal to 1 if household reported no income from the given activity prior to the crisis, but nonzero income after the crisis (and 0 otherwise). Outcome in regression column 2 (exit indicator) is equal to 1 if household reported nonzero income prior to the crisis but zero income after the crisis (and 0 otherwise). Outcome in column 3 (net entry) is column 1's outcome minus column 2's outcome. Outcome in regression column 4 is change in entrepreneurial income from given activity between Jan-Jun 1997 and Apr-Sep 1998 reporting periods, expressed as fraction of initial (Jan-Jun 1997) household income. All regressions include control variables for household and migrant pre-crisis characteristics (listed in notes to Table 4). See Table 3 for notes on sample construction and variable definitions.

**Table 9: Impact of migrant exchange rate shocks, 1997-1998 (additional specifications)**
OLS regressions of change in outcome variable on exchange rate shock, including control for migrant returns.

| Independent variables: | Dependent variables: Entry into a new entrepreneurial activity | | Net entry into "transportation and communication services" entrepreneurship | | Net entry into "manufacturing" entrepreneurship | | Change in student status (children aged 10-17) | | Change in hours worked (children aged 10-17) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Exchange rate shock | 0.140 | 0.141 | 0.076 | 0.074 | 0.058 | 0.058 | 0.103 | 0.113 | -2.215 | -2.507 |
| | (0.046)*** | (0.044)*** | (0.031)** | (0.031)** | (0.025)** | (0.024)** | (0.041)** | (0.040)*** | (0.905)** | (0.989)** |
| Migrant return rate | | 0.007 | | -0.016 | | -0.004 | | 0.036 | | -1.077 |
| in household | | (0.032) | | (0.015) | | (0.017) | | (0.014)** | | (0.402)*** |
| R-squared | 0.06 | 0.06 | 0.04 | 0.04 | 0.06 | 0.06 | 0.27 | 0.27 | 0.15 | 0.15 |
| Num. of obs.: | 1,646 | 1,646 | 1,646 | 1,646 | 1,646 | 1,646 | 1,188 | 1,188 | 1,188 | 1,188 |

* significant at 10%; ** significant at 5%; *** significant at 1%
NOTE -- Each column of table is a separate OLS regression. Standard errors in parentheses, clustered by location country of household's eldest overseas worker. Sample restricted to observations where GDP data are available in 1996 and 1998 for migrants' overseas locations. Entrepreneurial outcomes are household-level, and child outcomes are individual-level regressions. Changes between 1997 and 1998. "Migrant return rate in household" is number of migrants who returned between July 1997 and September 1998, divided by number of migrants away in June 1997. Each regression includes household location fixed effects and controls for household and migrant characteristics (see notes to Table 4 for list). Regressions for child outcomes include controls for individual-level control variables (see notes to Table 5 for list).

**Table 10: Impact of migrant exchange rate shocks, 1997-1998 (additional specifications)**
OLS regressions of change in outcome variable on exchange rate shock, including controls for real economic conditions overseas.

| | Dependent variables: | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Independent variables: | Entry into a new entrepreneurial activity | | Net entry into "transportation and communication services" entrepreneurship | | Net entry into "manufacturing" entrepreneurship | | Change in student status (children aged 10-17) | | Change in hours worked (children aged 10-17) | |
| Exchange rate shock | 0.139 | 0.126 | 0.087 | 0.101 | 0.053 | 0.06 | 0.091 | 0.085 | -2.104 | -1.872 |
| | (0.046)*** | (0.068)* | (0.032)*** | (0.027)*** | (0.025)** | (0.024)** | (0.037)** | (0.034)** | (1.007)** | (1.017)* |
| Migrant job loss | | 0.053 | | 0.006 | | 0.015 | | 0.03 | | 0.652 |
| (indicator) | | (0.046) | | (0.035) | | (0.014) | | (0.024) | | (1.012) |
| Change in ln(gross | | 0.179 | | -0.143 | | -0.064 | | 0.117 | | -1.721 |
| domestic product) | | (0.391) | | (0.155) | | (0.103) | | (0.269) | | (6.081) |
| R-squared | 0.07 | 0.07 | 0.04 | 0.04 | 0.05 | 0.06 | 0.27 | 0.27 | 0.16 | 0.16 |
| Num. of obs.: | 1,580 | 1,580 | 1,580 | 1,580 | 1,580 | 1,580 | 1,119 | 1,119 | 1,119 | 1,119 |

* significant at 10%; ** significant at 5%; *** significant at 1%
NOTE -- Each column of table is a separate OLS regression. Standard errors in parentheses, clustered by location country of household's eldest overseas worker. Sample restricted to observations where GDP data are available in 1996 and 1998 for migrants' overseas locations. Entrepreneurial outcomes are household-level, and child outcomes are individual-level regressions. Changes between 1997 and 1998. "Migrant job loss" indicator equal to one if household reported that migrant member(s) experienced a job loss in 1998 (mean is 0.075). "Change in ln(gross domestic product)" is change between 1996 and 1998 in natural log of GDP in migrant member(s) June 1997 locations (variable is mean across migrant members for households with migrants in multiple countries); mean (std.dev.) of variable is 0.003 (0.0387). Each regression includes household location fixed effects and controls for household and migrant characteristics (see notes to Table 4 for list). Regressions for child outcomes include controls for individual-level control variables (see notes to Table 5 for list).

**Appendix Table 1 Predicting migrant shocks with pre-shock household characteristics**
(Ordinary least-squares regression results)

Dependent variable: Exchange rate shock

| | |
|---|---|
| Num. of observations | 1,646 |
| R-squared | 0.09 |

**Household per capita income percentile** (indicators, lowest quartile excluded)

| | |
|---|---|
| 25th-50th | 0.032 |
| | (0.020) |
| 50th-75th | 0.008 |
| | (0.021) |
| Above 75th | 0.001 |
| | (0.032) |
| *F-stat: joint signif of these vars.:* | *3.532* |
| *P-value:* | *0.021* |

**Household head's highest education level** (indicators, less than elementary excluded)

| | |
|---|---|
| Elementary | 0.022 |
| | (0.014) |
| Some high school | 0.024 |
| | (0.021) |
| High school | 0.042 |
| | (0.018)** |
| Some college | 0.048 |
| | (0.031) |
| College or more | 0.053 |
| | (0.036) |
| *F-stat: joint signif of these vars.:* | *2.589* |
| *P-value:* | *0.036* |

**Household head's occupation** (indicators, agriculture excluded)

| | |
|---|---|
| Professional | 0.004 |
| | (0.013) |
| Clerical | -0.001 |
| | (0.016) |
| Service | -0.014 |
| | (0.025) |
| Production | -0.012 |
| | (0.013) |
| Other | 0.003 |
| | (0.009) |
| Not working | 0.067 |
| | (0.047) |
| *F-stat: joint signif of these vars.:* | *1.033* |
| *P-value:* | *0.414* |

| | |
|---|---|
| Household size | -0.005 |
| | (0.003)* |

**Household location indicators**
(16 region indicators interacted with urban location indicator)

| | |
|---|---|
| *F-stat: joint signif of these vars.:* | *14.284* |
| *P-value:* | *0.000* |

**Overseas workers' months away** (fraction of HH overseas workers in each category, less than 12 months excluded)

| | |
|---|---|
| 12-23 months | 0.013 |
| | (0.008) |
| 24-35 months | 0.036 |
| | (0.010)*** |
| 36-47 months | 0.041 |
| | (0.015)*** |
| 48 months or more | 0.043 |
| | (0.019)** |
| *F-stat: joint signif of these vars.:* | *4.128* |
| *P-value:* | *0.005* |

**Overseas workers' education** (fraction of HH overseas workers in each category, less than high school excluded)

| | |
|---|---|
| High school | -0.013 |
| | (0.012) |
| Some college | -0.038 |
| | (0.022)* |
| College or more | -0.021 |
| | (0.022) |
| *F-stat: joint signif of these vars.:* | *2.658* |
| *P-value:* | *0.057* |

**Overseas workers' occupation** (fraction of HH overseas workers in each category, production worker excluded)

| | |
|---|---|
| Domestic servant | 0.039 |
| | (0.046) |
| Ship's officer or crew | -0.057 |
| | (0.050) |
| Professional | -0.005 |
| | (0.043) |
| Clerical | 0.05 |
| | (0.044) |
| Other service | 0.031 |
| | (0.029) |
| Other occupation | -0.064 |
| | (0.044) |
| *F-stat: joint signif of these vars.:* | *3.284* |
| *P-value:* | *0.008* |

**Overseas workers' position in household** (fraction of HH overseas workers in each cat male household head excluded)

| | |
|---|---|
| Female head or spouse of head | -0.027 |
| | (0.039) |
| Daughter of head | -0.012 |
| | (0.050) |
| Son of head | -0.009 |
| | (0.023) |
| Other relation | -0.001 |
| | (0.029) |
| *F-stat: joint signif of these vars.:* | *0.340* |
| *P-value:* | *0.850* |

* significant at 10%; ** significant at 5%; *** significant at 1%

NOTE -- All coefficient estimates are from a single OLS regression. Standard errors in parentheses, clustered by location country of household's eldest overseas worker. Dependent variable is household-specific exchange rate shock. Income variables are as of Jan-Jun 1997. Head's characteristics and household size are as of July 1997. Household size includes overseas members. Overseas workers' characteristics are for those away in June 1997 (reported in Oct 1997). Coefficients on household location indicators not reported. See Table 3 for definition of exchange rate shock and definition of sample households.

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**Appendix Table 2: Descriptions of specific types of entrepreneurial activity**

| Type of entrepreneurial activity | Description/examples given in survey |
|---|---|
| **Crop farming and gardening** | Growing of *palay* [rice], corn, roots and tubers, vegetables, fruits, nuts, orchids, ornamental plants, etc. |
| **Wholesale and retail trade** | Includes market vending, sidewalk vending, and peddling. |
| **Transportation and communication services** | Such as operation of *jeepneys* [a type of small bus] or taxis, storage and warehousing activities, messenger services, etc. |
| **Livestock and poultry raising** | Such as raising of *carabaos* [water buffaloes], cattle, hogs, horses, chicken, ducks, etc. and the production of fresh milk, eggs, etc. |
| **Community and personal services** | Such as medical and dental practice, practice of trade, operation of schools, restaurants and hotels, etc. |
| **Manufacturing** | Such as mat weaving, tailoring, dressmaking, *bagoong* [fermented shrimp paste] making, fish drying, etc. |
| **Fishing** | Such as capture fishing (with a boat of three tons or less); gathering fry, shells, seaweeds, etc.; and culturing fish, oyster, mussel, etc. |
| **Forestry** | Cultivation or collection of forest products. |
| **Construction** | Includes repair of a house, building or any structure. |
| **Mining and quarrying** | Such as mineral extraction like salt making, gold mining, gravel, sand, and stone quarrying, etc. |
| **Activities not elsewhere classified** | Including electricity, gas and water; financing, insurance, real estate and business service. |

Note: Examples are as given in administering the Family Income and Expenditure Survey.

**Appendix Table 3 Impact of migrant shocks on attrition from household and individual panels, Jul 1997- Oct 1998**
(Coefficients on exchange rate shock in OLS regression)

**Panel A: Households**

| | Mean of outcome | Coef. on shock |
|---|---|---|
| Outcome: attrition indicator | 0.056 | 0.008 |
| | | (0.032) |
| Number of obs. | | 1,743 |

**Panel B: Individual males, aged 10-17**

| | Mean of outcome | Coef. on shock |
|---|---|---|
| Outcome: attrition indicator | 0.238 | -0.091 |
| | | (0.102) |
| Number of obs. | | 800 |

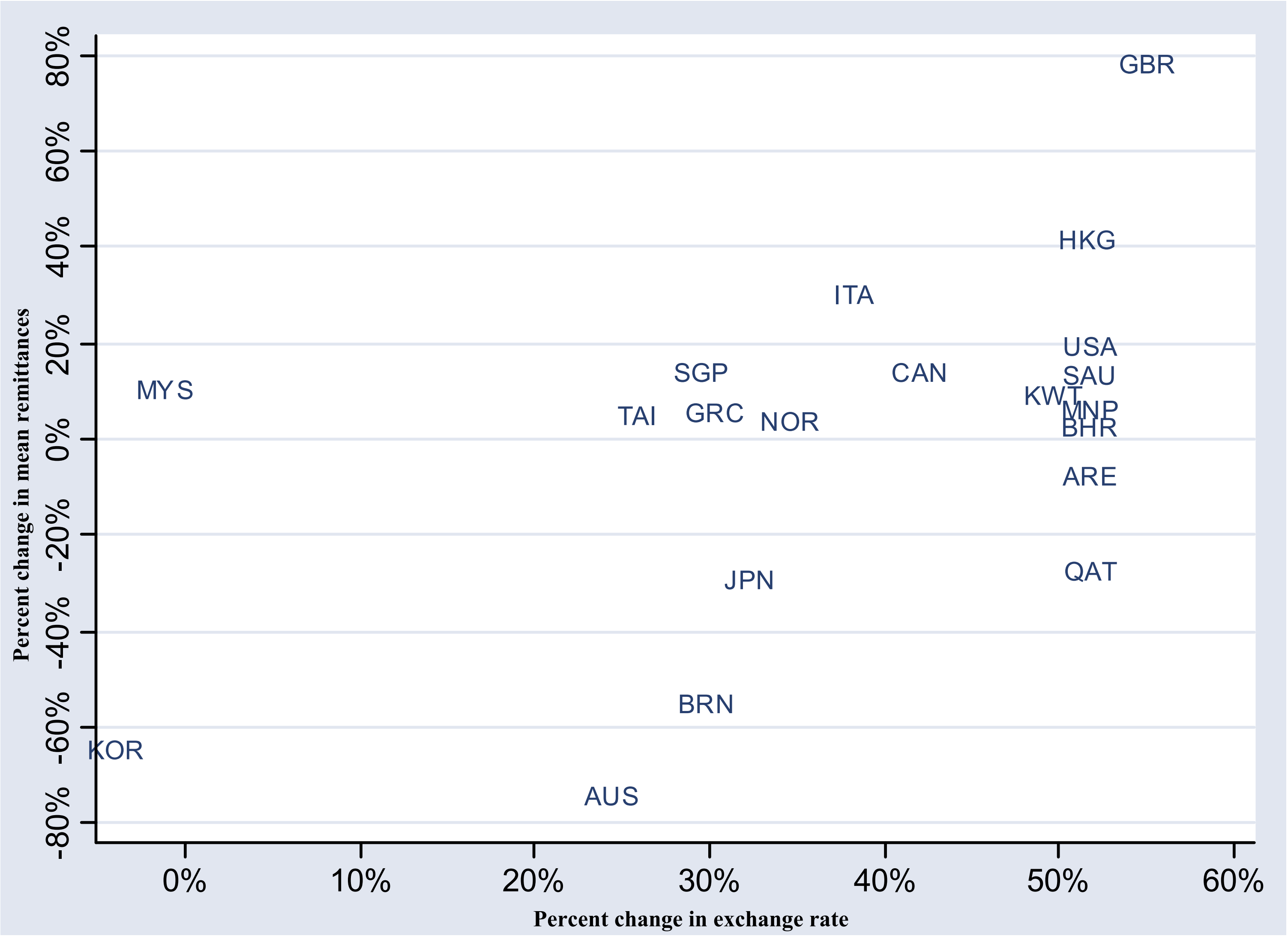
**Panel C: Individual females, aged 10-17**

| | Mean of outcome | Coef. on shock |
|---|---|---|
| Outcome: attrition indicator | 0.23 | 0.018 |
| | | (0.111) |
| Number of obs. | | 752 |

* significant at 10%; ** significant at 5%; *** significant at 1%
NOTE -- Each cell of table presents coefficient estimate on exchange rate shock in a separate OLS regression. Standard errors in parentheses, clustered by location country of household's eldest overseas worker. Unit of observation is the household in Part A, and the individual in Parts B and C. Individuals are those observed in Jul 1997 (from households with a migrant overseas in June 1997). For households, attrition indicator equal to 1 if household was excluded from sample because it changed dwellings between July 1997 and October 1998, or had missing data on outcome variables in October 1998. For individuals, attrition indicator equal to 1 if individual is not successfully matched (on the basis of age and gender) with an individual in the same household in Oct 1998, and 0 otherwise (see Data Appendix for details of match process).

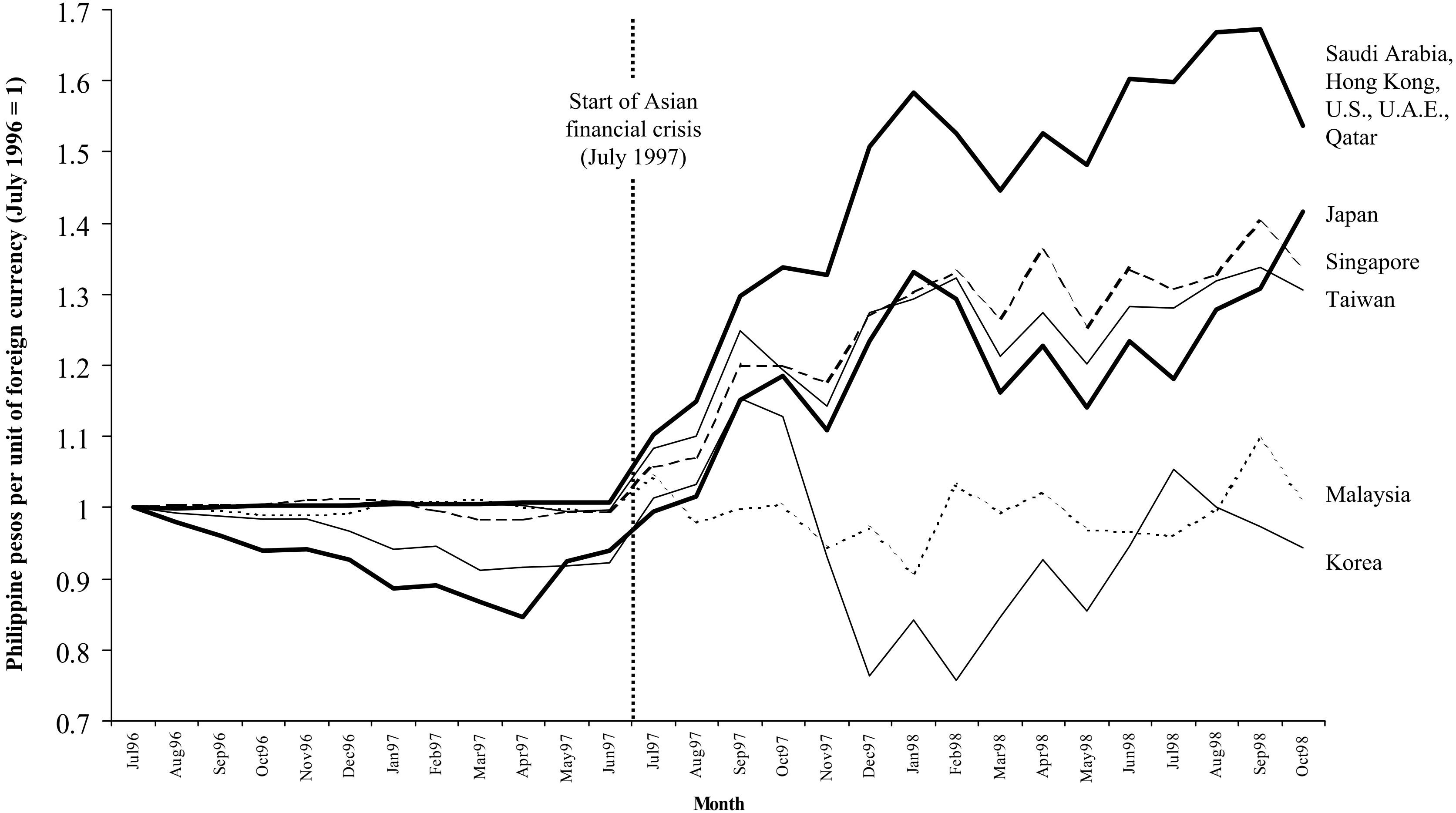
Each regression includes household location fixed effects and controls for household and overseas worker characteristics. Individual-level regressions also include control variables for the following individual characteristics (as reported in July 1997): gender indicator, indicator for single marital status, indicator for "primary activity is student", indicator for "not in labor force", and five indicators for highest schooling level completed (elementary, some high school, high school, some college, and college or more). See notes to Table 4 for list of household and migrant control variables.

**Figure 1**: Impact of migrant exchange rate shocks on Philippine household remittance receipts (1997-1998)




NOTES–Exchange rates are in Philippine pesos per unit of foreign currency. Percent change in exchange rate is mean exchange rate from Oct 1997 to Sep 1998 minus mean exchange rate from July 1996 to June 1997, divided by the latter. Mean remittances are calculated among all households with a single migrant in given overseas location. Percent change in mean remittances is between Jan - Jun 1997 and Apr-Sep 1998 reporting periods. Datapoints are the top 20 locations of Philippine overseas workers (as listed in Table 1).

**<u>Figure 2</u>: Exchange Rates in Selected Locations of Overseas Filipinos, July 1996 to October 1998**
**(Philippine pesos per unit of foreign currency, normalized to 1 in July 1996)**




NOTES-- Exchange rates are as of last day of each month. Data source is Bloomberg L.P.