

INTERNATIONAL MIGRATION, REMITTANCES AND HOUSEHOLD INVESTMENT: EVIDENCE FROM PHILIPPINE MIGRANTS' EXCHANGE RATE SHOCKS*

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How do households respond to overseas members' economic shocks? Overseas Filipinos in dozens of countries experienced sudden, heterogeneous changes in exchange rates during the 1997 Asian financial crisis. Appreciation of a migrant's currency against the Philippine peso leads to increases in household remittances from overseas. The estimated elasticity of Philippine-peso remittances with respect to the exchange rate is 0.60. Positive migrant shocks lead to enhanced human capital accumulation and entrepreneurship in origin households. Child schooling and educational expenditure rise, while child labour falls. Households also work more hours in self-employment, and become more likely to start relatively capital-intensive household enterprises.

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 40% 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, and in weighing the benefits to origin countries of developed-country policies liberalising inward migration; as proposed in Birdsall *et al.* (2005) and Bhagwati (2003), for example.

What effects do migrant earnings have on migrants' origin households – in particular, on human capital and enterprise investments? 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

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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 US 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).

receipts to be positively correlated with various types of household investments in developing countries.⁴ By contrast, others argue that resources received from overseas rarely fund productive investments and mainly allow higher consumption.⁵

A central methodological concern with existing work on this topic is that migrant earnings 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. Alternatively, 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 article 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. (The figure was 6% in June 1997 in the dataset used in this article.) 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 were unexpected and varied in magnitude across overseas Filipinos' locations. 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.⁶

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 for the migrant's origin household in the Philippines and is (partly)

⁴ For example: Brown (1994), Massey and Parrado (1998), McCormick and Wahba (2001), Dustmann and Kirchkamp (2002), Woodruff and Zenteno (2007), 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 *et al.* (2003) on agricultural investment in China; and others.

⁵ For example, Lipton (1980), Reichert (1981), Grindle (1988), Massey *et al.* (1987), Ahlburg (1991), Brown and Ahlburg (1999) and references cited in Durand *et al.* (1996).

⁶ I describe the exchange rate shock variable in subsection 2.1 below.

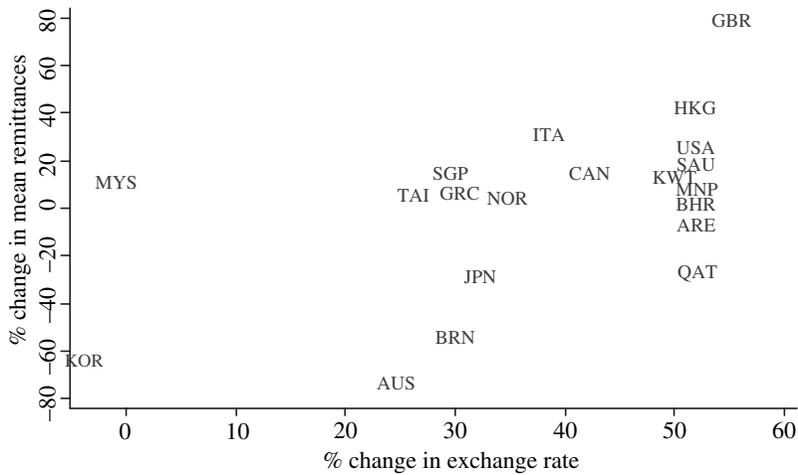


Fig. 1. *Impact of Migrant Exchange Rate Shocks on Philippine Household Remittance Receipts (1997–1998)*

Notes: Exchange rates are in Philippine pesos per unit of foreign currency. Percentage change in exchange rate is mean exchange rate from October 1997 to September 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. Percentage change in mean remittances is between January–June 1997 and April–September 1998 reporting periods. Datapoints are the top 20 locations of Philippine overseas workers (as listed in Table 1).

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%.⁷

These exogenous increases in migrant resources are used primarily for investment in origin households, rather than for current consumption. Households experiencing more favourable exchange rate shocks raise their non-consumption disbursements in several areas likely to be investment-related (in particular in educational expenditures) and show enhanced human capital accumulation and entrepreneurship. Child schooling and educational expenditure rise, while child labour falls. In the area of entrepreneurship, households raise hours worked in self-employment and become more likely to start relatively capital-intensive household enterprises (transportation/

⁷ As I discuss below in subsection 2.1, 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 article is simply on the reduced-form impact of the exchange rate shocks.

communication services and manufacturing). By contrast, there is no large or statistically significant effect of the exchange rate shocks on current household consumption.

A crucial question is whether the relationship between the exchange rate shocks and household investment 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 increases in household investment 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). 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, supporting the causal interpretation of the results.

This article 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 article is reminiscent of studies of the impact of household-level events such as crop loss (Beegle *et al.*, 2006) or job loss (Duryea *et al.*, 2003) on child labour. 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. 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 article is organised as follows. Section 1 provides a brief discussion of the theoretical impact of income shocks on household investment activity. Section 2 describes the dispersion of Filipino household members overseas and discusses the nature of the exchange rate shocks. Section 3 presents empirical results and conducts a number of auxiliary analyses to clarify the interpretation of the results. Section 4 concludes. The Data Appendix describes the household surveys used and procedures followed for creating the sample for empirical analysis.

1. 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.⁸ But when household investments require fixed costs be paid in advance of the investment returns and when households face credit

⁸ However, if the shocks are large enough to affect *permanent* or lifetime income materially, income effects might lead households to change their investment behaviour 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 US households may be interpreted in this light.

constraints, the timing of household investments may depend on current income realisations. 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 labour, such as Baland and Robinson (2000) or Basu and Van (1998), consider unitary households deciding on the amount of child labour in some initial period of life. Keeping children in school (and out of the labour 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 labour 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 labour 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 non-existent, productive assets may play dual roles as savings mechanisms and as income sources (Rosenzweig and Wolpin, 1993). 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 maximising income from household enterprises but such behaviour may be optimal for risk-averse households when other savings vehicles are absent.

2. Overseas Filipinos: Characteristics and Exposure to Shocks

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.⁹ Filipino workers are remarkably dispersed worldwide. Saudi Arabia is the largest single destination, with 28.4% of the total. 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 US. 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

⁹ 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.

Table 1
Locations of Overseas Workers from Sample Households (June 1997)

| <i>Location</i> | <i>Number of overseas workers</i> | <i>% of total</i> | <i>Exchange rate shock (June 1997–Oct 1998)</i> |
|--------------------------|-----------------------------------|-------------------|---|
| 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 the October 1997 Survey on Overseas Filipinos. ‘Other’ includes 38 additional countries plus a category for ‘unspecified’ (total 58 countries explicitly reported). Overseas workers in the 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 June 1997. Change is average of 12 months leading to October 1998 minus average of 12 months leading to June 1997, divided by the latter (e.g., 10% increase is 0.1).

same survey. 1,832 individuals 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).

2.1. *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. Crucially for the analysis in this article, the crisis was quite unexpected by market participants and analysts (Radelet and Sachs, 1998).

Figure 2 displays monthly exchange rates for selected major locations of overseas Filipinos (expressed in Philippine pesos per unit of foreign currency, normalised to 1 in July 1996). 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 favourable shock to an overseas household member in that country: each unit of foreign currency earned would be convertible to more Philippine pesos once remitted.

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 | | | | |
| <i>Occupation (indicators)</i> | | | | | |
| 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 | | | | |
| <i>Highest education level (indicators)</i> | | | | | |
| Less than high school | 0.15 | | | | |
| High school | 0.25 | | | | |
| Some college | 0.31 | | | | |
| College or more | 0.30 | | | | |
| <i>Position in household (indicators)</i> | | | | | |
| 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 | | | | |
| <i>Months overseas as of June 1997 (indicators)</i> | | | | | |
| 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 the Table are those in households included in sample for empirical analysis (see Data Appendix for details on sample definition).

I argue that a favourable 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 is 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)

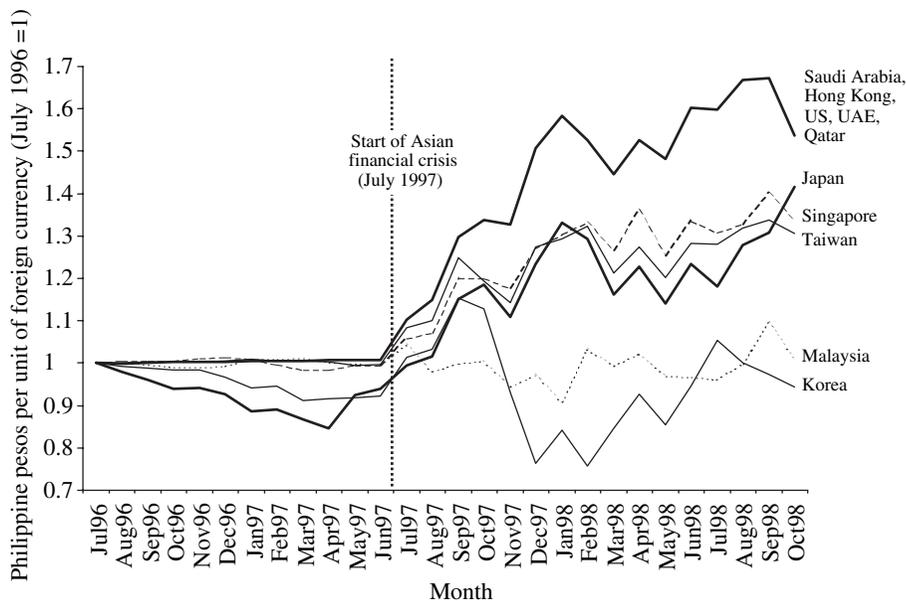


Fig. 2. Exchange Rates in Selected Locations of Overseas Filipinos, July 1996 to October 1998 (Philippine pesos per unit of foreign currency, normalised to 1 in July 1996)
 Notes: Exchange rates are as of last day of each month. Data source is Bloomberg L.P.

understate the change in total household income associated with exchange rate movements.

Unfortunately, overseas savings and overseas wages are not reported in the Philippine household dataset used in this article. 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 nominal 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 on exchange rates returning to previous levels. Indeed, real exchange rates have converged over time due to differentials in inflation.

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'.¹⁰ In the cross-section, most migrants are reported to have been away for relatively short periods: 84% of migrants were reported to have been

¹⁰ These data refer to the question in the SOF on 'reason for migration'. The remaining categories are 'tourist', 'student', and 'other'.

away for less than 48 months as of mid-1997 (see Table 2).¹¹ Migrants' temporary labour 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 attractive 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 labour migrants are likely to see their overseas stays as temporary periods, during which they accumulate savings and eventually return home.¹² While the empirical analysis does show that migrants extend their overseas stays somewhat in response to favourable 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. Moreover, re-estimating the effect of the exchange rate on child human capital and on entrepreneurial 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.)

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.¹³

2.2. *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:

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

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.

I construct a household-level exchange rate shock variable as follows. Let the countries in the world where overseas Filipinos work be indexed by $j \in \{1, 2, \dots, J\}$. Let n_{ij} indicate the number of overseas workers a household i has in a particular country j

¹¹ This is not because overseas labour migration is a recent phenomenon, so that there has not been enough time for migrants to accumulate time overseas. On the contrary, overseas labour migration from the Philippines has been substantial since the 1970s; see Cariño (1998).

¹² Yang (2006b) provides a more detailed treatment of the interrelationships among migrants' savings, investment and return decisions.

¹³ 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 article is to shed light more broadly on the likely impact of exchange rate fluctuations on the families of migrants.

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:

$$ERSHOCK_i = \frac{\sum_{j=1}^J n_{ij} ERCHANGE_j}{\sum_{j=1}^J n_{ij}}. \quad (2)$$

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 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.¹⁴

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).¹⁵ 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).

3. Empirics: Impact of Migrant Shocks on Households

3.1. 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 Labour 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 riders to the LFS. Usually, a quarter 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-quarter of the dwellings had just been rotated out of the sample). The analysis of this article 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

¹⁴ 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.

¹⁵ $ERSHOCK_i$ is obviously undefined for a household without any members working overseas prior to the crisis.

the sample for analysis. 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.

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 analysis focuses on migrant households because migrant households are different (as described in the next subsection) from households without migrants, so the most natural comparison group for a migrant household is the set of other migrant households. In addition, non-migrant households by definition do not experience the exogenous shock of interest (the overseas exchange rate shock). Table 3 presents summary statistics for the 1,646 households used in the empirical analysis.

Because of the need to match households and individuals across survey rounds, it is important to consider attrition within the sample. At the household level, a mere 5.6% cannot be followed from July 1997 to October 1998. This is a very low attrition rate for a panel survey, particularly one in a developing country. At the individual level, on the other hand, attrition is higher (23.0% for girls, 23.8% for boys) because tracking must rely on observable individual characteristics rather than a unique code for each individual. See the Data Appendix for details on tracking of households and individuals across survey rounds, and for additional information on the surveys.

Attrition is potentially worrisome if it is correlated with the independent variable of interest, the exchange rate shock. Sample selectivity could then lead to biased estimates. As it turns out, however, there is no evidence that attrition is correlated with the exchange rate shock. I run regressions where the sample is households or individuals that I attempt to track from 1997 to 1998. The dependent variable is an indicator variable equal to 1 if the household or individual cannot be tracked through 1998 (and 0 otherwise) and the independent variable of interest is the exchange rate shock. In no regression is the coefficient on the exchange rate shock large in magnitude or statistically significantly different from zero.¹⁶

3.2. 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 , ΔY_{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. ε_{it} is a mean-zero error term. In all results tables,

¹⁶ The details of this analysis are discussed in the NBER Working Paper version of this article, Yang (2006a).

Table 3
Initial Characteristics of Sample Households

| | <i>Mean</i> | <i>Std. Dev.</i> | <i>10th pctile</i> | <i>Median</i> | <i>90th pctile</i> |
|---|-------------|------------------|--------------------|---------------|--------------------|
| Number of observations: 1,646 | | | | | |
| Exchange rate shock (<i>see below for definition</i>) | 0.41 | 0.16 | 0.26 | 0.52 | 0.52 |
| <i>Household financial statistics (January–June 1997)</i> | | | | | |
| Total expenditures | 68,913 | 63,070 | 23,814 | 53,909 | 123,388 |
| 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 June 1997 | 1.11 | 0.36 | 1 | 1 | 1 |
| HH size (including overseas members, July 1997) | 6.16 | 2.42 | 3 | 6 | 9 |
| Located in urban area | 0.68 | | | | |
| <i>HH position in national income per capita distribution, Jan–June 1997 (indicators)</i> | | | | | |
| Top quartile | 0.51 | | | | |
| 3rd quartile | 0.28 | | | | |
| 2nd quartile | 0.14 | | | | |
| Bottom quartile | 0.07 | | | | |
| <i>HH income sources (January–June 1997)</i> | | | | | |
| 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 | | | | |
| <i>Household head characteristics (July 1997):</i> | | | | | |
| Age | 49.9 | 13.9 | 32 | 50 | 68 |
| <i>Highest education level (indicators)</i> | | | | | |
| 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 | | | | |
| <i>Occupation (indicators)</i> | | | | | |
| 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 | | | | |
| <i>Marital status is single (indicator)</i> | 0.03 | | | | |

Notes. Data source: National Statistics Office, the Philippines. *Surveys used:* Labour Force Survey (July 1997 and October 1998), Survey on Overseas Filipinos (October 1997 and October 1998), 1997 Family Income and Expenditures Survey (for January–June 1997 income and expenditures), and 1998 Annual Poverty Indicators Survey (for April–September 1998 income and expenditures). *Currency unit:* Expenditure, income, and cash receipts from abroad are in Philippine pesos (26 per US\$ in January–June 1997). *Definition of exchange rate shock:* Change in Philippine pesos per currency unit where overseas worker was located in June 1997. Change is average of 12 months leading to October 1998 minus average of 12 months leading to June 1997, divided by the latter (e.g., 10% increase is 0.1). If household has more than one overseas worker in June 1997, the exchange rate shock variable is average change in exchange rate across household's overseas workers. (Exchange rate data are from Bloomberg LP.) *Sample definition:* Households with a member working overseas in June 1996 (according to October 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).

regressions are ordinary-least-squares, with standard errors clustered according to the June 1997 location of overseas worker.^{17,18}

The constant term, β_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.¹⁹

The coefficient of interest is β_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, then changes in outcomes would not have varied systematically across households on the basis of their overseas 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 favourable shocks were different along certain pre-crisis characteristics from households whose migrants had less favourable shocks *and* if changes in outcomes would have varied according to these same characteristics even in the absence of the migrant shocks.²⁰

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 ε_{it} in equation (3). For example, suppose that the 1997–8 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. If households with better-educated heads also experienced more-favourable 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

¹⁷ 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.

¹⁸ Several outcomes of interest are categorical variables taking on the values 1, 0 and -1 (such as changes in the asset indicators and net entry into various kinds of entrepreneurship). For all such outcomes in the article, results from estimation of an ordered probit model are highly consistent with the OLS results.

¹⁹ 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 labour 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).

²⁰ In fact, households experiencing more favourable migrant shocks do differ along a number of pre-crisis characteristics from households experiencing less-favourable shocks. Appendix Table 1 of the NBER Working Paper version of this article (Yang 2006a) 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 favourable 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.

vector of pre-crisis household characteristics \mathbf{X}_{it-1} on the right-hand side of the estimating equation:

$$\Delta Y_{it} = \beta_0 + \beta_1(ERSHOCK_t) + \delta'(\mathbf{X}_{it-1}) + \varepsilon_{it}. \quad (4)$$

\mathbf{X}_{it-1} includes household geographic indicators and a range of pre-crisis household and migrant characteristics.²¹ 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.²²

3.3. Regression Results

This subsection examines the impact of household exchange rate shocks on the following outcomes in sequence: remittance receipts; migrant return rates; household

²¹ 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 January–June 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.

²² It is also possible to test the parallel-trend identification assumption by asking whether changes in outcome variables *prior* to the Asian financial crisis are correlated with the *future* exchange rate shocks in migrant locations after July 1997 (a 'false experiment'). Surveys did not collect data on all outcomes of interest in the pre-crisis period but it is possible to conduct this false experiment for a subset of outcome variables. The Empirical Appendix of the NBER Working Paper version of this article (Yang, 2006a) finds no evidence that changes in outcome variables in the immediately prior 12-month period (July 1996–July 1997) are correlated with *future* exchange rate shocks occurring after July 1997.

income, consumption, and other disbursements, including educational expenditures; household durable good ownership; child schooling and child labour; household labour supply by type of work; and specific types of entrepreneurial activities.

3.3.1. *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(a) presents coefficient estimates from estimating (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.²³

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 will also be followed in Tables 5, 6 and 7.)

The coefficient on the exchange rate shock in the regressions for cash receipts from overseas is 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 favourable 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-deviation increase in 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 (January–June 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).

²³ Dividing by pre-crisis household income achieves something similar to taking the log of an outcome: normalising 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.

Table 4

Impact of Migrant Exchange Rate Shocks, 1997–8

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 | | Implied elasticity (coefficient in col. 2 divided by initial mean) |
|---|-------------------------------|--|----------------------|---------------------|---|
| | | | (1) | (2) | |
| <i>(a) Remittances, migrant returns</i> | | | | | |
| Remittance receipts | 0.395 | 0.151 (0.022) | 0.175 (0.119) | 0.238 (0.086)*** | 0.60 |
| Migrant return rate (over 15 months) | <i>n.a.</i> | 0.136 (0.008) | -0.155 (0.048)*** | -0.125 (0.064)* | |
| <i>(b) Income and consumption</i> | | | | | |
| Household income | 1.000 | 0.251 (0.030) | 0.258 (0.162) | 0.26 (0.126)** | 0.26 |
| Wage and salary income | 0.234 | 0.063 (0.010) | 0.027 (0.044) | -0.008 (0.049) | -0.03 |
| Entrepreneurial income | 0.166 | 0.023 (0.007) | 0.041 (0.034) | 0.029 (0.041) | 0.17 |
| Other sources of income (includes remittances) | 0.6 | 0.165 (0.023) | 0.189 (0.137) | 0.239 (0.100)** | 0.40 |
| Household consumption | 1.000 | 0.093 (0.012) | -0.063 (0.068) | -0.083 (0.074) | -0.08 |
| <i>(c) Non-consumption disbursements</i> | | | | | |
| Disbursements, potentially investment-related | 0.178 | 0.066 (0.012) | 0.235 (0.124)* | 0.244 (0.130)* | 1.37 |
| Educational expenditures | 0.066 | 0.018 (0.002) | 0.023 (0.013)* | 0.036 (0.016)** | 0.55 |
| Purchases of real property | 0.019 | 0.01 (0.006) | 0.13 (0.101) | 0.13 (0.100) | 6.84 |
| Repayments of loans | 0.024 | 0.001 (0.004) | 0.027 (0.025) | 0.009 (0.020) | 0.38 |
| Bank deposits | 0.069 | 0.036 (0.008) | 0.055 (0.040) | 0.069 (0.044) | 1.00 |
| Other non-consumption disbursements | 0.071 | 0.042 (0.013) | -0.003 (0.071) | -0.003 (0.059) | -0.04 |
| <i>(d) Durable good ownership</i> | | | | | |
| Radio | 0.836 | 0.105 (0.010) | 0.04 (0.069) | 0.088 (0.069) | |
| Television | 0.828 | 0.03 (0.006) | 0.062 (0.035)* | 0.095 (0.035)*** | |
| Living room set | 0.755 | 0.042 (0.009) | 0.039 (0.045) | 0.058 (0.030)* | |
| Dining set | 0.677 | 0.037 (0.015) | 0.097 (0.076) | 0.099 (0.064) | |
| Refrigerator | 0.636 | 0.07 (0.008) | 0 (0.064) | -0.01 (0.058) | |
| Vehicle | 0.129 | 0.134 (0.009) | 0.168 (0.027)*** | 0.144 (0.039)*** | |

Table 4
(Continued)

| | Initial mean of outcome | Mean (std.dev.) of change in outcome | Regressions | | Implied elasticity (coefficient in col. 2 divided by initial mean) |
|--|-------------------------------|---|-------------|-----|---|
| | | | (1) | (2) | |
| <i>Specification:</i> | | | | | |
| Region × Urban controls | | | – | Y | |
| Controls for pre-crisis household and migrant characteristics | | | – | Y | |
| Number of observations in all regressions: | | | 1,646 | | |

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

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 January–June 1997 and April–September 1998 reporting periods, expressed as fraction of initial (January–June 1997) household income. Income changes are between January–June 1997 and April–September 1998 reporting periods, expressed as fractions of initial (January–June 1997) household income. Changes in consumption and disbursements are between January–June 1997 and April–September 1998 reporting periods, expressed as fractions of initial (January–June 1997) consumption.

'Other non-consumption disbursements' include installment payments on items purchased before 1997, loans provided to non-family members, and other payments. Durable goods variables are changes in indicator variables for ownership of given item between January 1998 and October 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 January–June 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.

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 4.²⁴ The estimated coefficient on the log change in the exchange rate is 0.64, with a standard error of 0.30. (Results available from author on request.)

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

²⁴ To deal with cases of zero reported remittances, I replace zero remittances with the 10th percentile of the pre-crisis distribution of non-zero remittances (7,000 pesos) before taking logs.

Table 5
Impact of Migrant Exchange Rate Shocks on Schooling and Labour Supply of Children aged 10–17, 1997–8
 Individual-level OLS regressions of change in outcome variable on exchange rate shock. The Table reports coefficients (standard errors) on exchange rate shock.

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

Table 5
(Continued)

| | Both females and males | | | Females | | | Males | | | | | | | | | |
|---|-------------------------|---------------------------------------|-------|-------------------------|---------------------------------------|-----|-------------------------|---------------------------------------|-----|-------------------------|---------------------------------------|-----|-------------------------|---------------------------------------|-----|-----|
| | Regressions | | | Regressions | | | Regressions | | | | | | | | | |
| | Initial mean of outcome | Mean (std. dev.) of change in outcome | (1) | Initial mean of outcome | Mean (std. dev.) of change in outcome | (2) | Initial mean of outcome | Mean (std. dev.) of change in outcome | (3) | Initial mean of outcome | Mean (std. dev.) of change in outcome | (4) | Initial mean of outcome | Mean (std. dev.) of change in outcome | (5) | (6) |
| Outcomes: | | | | | | | | | | | | | | | | |
| Change in... | | | | | | | | | | | | | | | | |
| Specification: | | | | | | | | | | | | | | | | |
| Region × Urban controls | | | - | | | Y | | | - | | Y | | | | - | Y |
| Controls for pre-crisis individual, household and migrant characteristics | | | - | | | Y | | | - | | Y | | | | - | Y |
| Number of observations in all regs. in column: | 1,188 | | 1,188 | | | | 579 | | 579 | | | 579 | | | 609 | 609 |

*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 individual. Individuals are relations of the household head who are not overseas in July 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 October 1998. See Data Appendix for details of match process. Changes are between July 1997 and October 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.
 See notes to Table 4 for list of household and migrant control variables. Individual characteristics controls (as reported in July 1997): 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 labour 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 Labour Supply by Worker Category, 1997–8

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

| Outcomes: Change in... | | | Regressions | |
|---|----------------------------|---|-------------------|--------------------|
| | Initial mean of outcome | Mean (std. dev.) of change in outcome | (1) | (2) |
| Total hours worked | 72.6 | -0.68 (1.199) | 9.276 (9.934) | 5.266 (8.806) |
| <i>Hours worked:</i> | | | | |
| For employer outside household | 39.6 | -3.633 (1.210) | 5.103 (8.102) | 0.645 (8.882) |
| In self employment | 21.5 | 0.534 (0.775) | 8.365 (4.469)* | 9.966 (4.746)** |
| As employer in own family-operated farm or business | 3.2 | 1.601 (0.280) | 1.153 (1.800) | 0.829 (2.320) |
| As worker <i>with pay</i> in own family-operated farm or business | 0.8 | -0.147 (0.175) | -0.126 (0.806) | -0.538 (0.735) |
| As worker <i>without pay</i> in own family-operated farm or business | 7.6 | 0.965 (0.516) | -5.219 (3.464) | -5.636 (3.761) |
| <i>Specification:</i> | | | | |
| Region × Urban controls | | | - | Y |
| Controls for pre-crisis household and migrant characteristics | | | - | Y |
| Number of observations 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 July 1997 and October 1998 surveys. See Table 3 for notes on sample construction and variable definitions, and notes to Table 4 for list of control variables.

have been unity.²⁵ So favourable 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 .

3.3.2. 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(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

²⁵ 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.

Table 7

Impact of Migrant Exchange Rate Shocks on Entrepreneurship, 1997–8

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

| <i>(a) Entrepreneurial activities in general</i> (Regression outcomes are changes in given variable.) | | | | |
|---|------------------------------------|--|-------------------|--------------------|
| | <i>Initial mean of outcome</i> | <i>Mean (std. dev.) of change in outcome</i> | Regressions | |
| | | | (1) | (2) |
| Entrepreneurial income (as share of initial hh income) | 0.17 | 0.023 (0.007) | 0.041 (0.034) | 0.029 (0.041) |
| Entrepreneurial activity (indicator) | 0.50 | 0.014 (0.013) | 0.084 (0.050)* | 0.061 (0.051) |
| <i>Specification:</i> | | | | |
| Region × Urban controls | | | – | Y |
| Controls for pre-crisis household and migrant characteristics | | | – | Y |
| Number of observations in all regressions: | | | 1,646 | 1,646 |
| <i>(b) Entry into new entrepreneurial activities and exit from old ones</i> | | | | |
| <i>Outcomes</i> | | <i>Mean of outcome variable</i> | Regressions | |
| | | | (1) | (2) |
| Entry into a new entrepreneurial activity (indicator) | | 0.237 | 0.111 (0.070) | 0.14 (0.046)*** |
| Exit from an old entrepreneurial activity (indicator) | | 0.222 | –0.094 (0.061) | –0.042 (0.069) |
| <i>Specification:</i> | | | | |
| Region × Urban controls | | | – | Y |
| Controls for pre-crisis household and migrant characteristics | | | – | Y |
| Number of observations 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 January–June 1997 and April–September 1998 reporting periods, expressed as fraction of initial (January–June 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 April–September 1998 that were not reported in January–June 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 April–September 1998 that were reported in January–June 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.

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.²⁶

3.3.3. Household income, consumption and other disbursements

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

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). Consumption expenditures do not include educational expenditures, durable goods purchases or capital investment in household enterprises.

Household income and consumption 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 consumption amounts to 9.3% of initial household consumption.

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.

There is no indication that aggregate household consumption expenditures were substantially affected by the exchange rate shocks. The coefficients on the exchange rate shock in the household consumption regressions are actually negative in sign, although not statistically significantly different from zero.

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

²⁶ For a more detailed theoretical and empirical treatment of overseas workers’ return decisions in these households, see Yang (2006b). (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 analysed here.)

If exchange rate shocks show no strong relationship with household consumption, how are improvements in households' resources used? In the remainder of Table 4, and in subsequent Tables, I provide evidence that favourable exchange rate shocks lead to increases in various types of household investment activity.

Table 4(c) examines the impact of exchange rate shocks on households' non-consumption disbursements, expressed as a fraction of initial (January–June 1997) household consumption. Surveyed households are not explicitly asked about investment-related purchases. I therefore construct a variable which is the sum of several potentially investment-related items: educational expenses, purchases of real property, repayments of loans, and bank deposits. The first row of Panel (c) presents coefficient estimates on the exchange rate shock in regressions with this dependent variable. In both specifications, the coefficient is positive and statistically significant at the 10% level. When the individual components of this variable are the dependent variables of the regression (in the next four rows), the coefficient on the exchange rate shock is consistently positive in sign and is statistically significantly different from zero in the regressions for educational expenditures.

The coefficient on the exchange rate shock in the second column indicates that a one-standard-deviation increase in the size of the exchange rate shock (0.16) is associated with a differential increase in potentially investment-related disbursements of 3.9% of pre-shock (January–June 1997) household consumption. The increase in educational expenditures alone associated with such a shock amounts to 0.6% of pre-shock household consumption.

The last column of the Table displays the elasticity of the given dependent variable with respect to the exchange rate. There is a dramatic difference between the exchange-rate elasticities of consumption versus non-consumption disbursements. The elasticity of consumption with respect to the exchange rate is small in size (and actually negative in sign) and is based on an exchange rate coefficient that is not statistically significantly different from zero. By contrast, the implied elasticity of potentially investment-related disbursements is large, at 1.37, and the elasticity for educational expenditures is 0.55 (elasticities for real property purchases, loan payments and bank deposits are also large but are based on coefficient estimates that are not statistically significantly different from zero). A 10% improvement in the exchange rate faced by a household's migrants leads to a 13.7% increase in potentially investment-related disbursements. These results stand in stark contrast with research that finds migrant earnings are primarily spent on consumption (Brown and Ahlburg, 1999) and are more in line with existing research documenting a positive relationship between migrant earnings and investment activity, such as Durand *et al* (1996), Taylor *et al*. (2003) and Woodruff and Zenteno (2007).

With the exception of educational expenditures, it is admittedly far from certain that the other disbursements I have identified as potentially investment-related are actually used for investment. It therefore makes sense to examine the impact of exchange rate shocks on other items reported in the surveys that may also reveal investment in human capital and entrepreneurship.

3.3.4. *Durable good ownership*

Table 4(d) 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 .²⁷

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 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 favourable 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 in 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.

3.3.5. *Human capital investment*

It is of great interest to understand the impact of migrant exchange rate shocks on outcomes related to human capital accumulation: child schooling and child labour. Table 5 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

²⁷ 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.

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: fixed effects for each year of age, a gender indicator, an indicator for single marital status, an indicator for 'student' being the person's primary activity, indicator for 'not in labour force' and five indicators for highest schooling level completed.

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 labour 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 in the 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 is the same as the coefficient 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 favourable exchange rate shocks lead to statistically significantly fewer hours of work without pay in family enterprises. In the pooled sample, and for males, more favourable 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 labour 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.

In sum, more favourable shocks are associated with more child schooling and less child labour. 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 and a differential decline in hours worked in the past week of 0.35 hours.

3.3.6. Household labour supply

Table 6 presents coefficient estimates on the exchange rate shock when the outcome variables are changes in total hours worked in the household (the sum across all household members) 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 labour supply. In particular, more favourable 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 in 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.

3.3.7. Entrepreneurial activities

How did the exchange rate shock affect household entrepreneurial activities? Table 7(a) 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.²⁸ 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

²⁸ The exact same entrepreneurial income result also appears in Table 4(b). It is simply repeated here for emphasis.

households engage in. Household entrepreneurial activities in the survey are divided into 11 specific types.²⁹

Indeed, it does appear that the exchange rate shocks are significantly associated with entry into *new* entrepreneurial activities. Table 7(b) presents coefficient estimates on the exchange rate shock when the outcome variables are indicators for entry into a new entrepreneurial activity, and for exit from an old entrepreneurial activity.³⁰ 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 in 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 favourable 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. The fraction of households that report non-zero 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 non-zero income after the crisis (and 0 otherwise). Column 2 presents regression results where the outcome variable is an indicator for *exit* from the activity, taking a value of 1 if the household reported non-zero income prior to the crisis but zero income after the crisis (and 0 otherwise).

²⁹ For detailed descriptions of the different entrepreneurial activities, see Appendix Table 2 of Yang (2006a).

³⁰ Entry into a new activity is defined as occurring when a household reports engaging in one or more activities from Appendix Table 2 in April–September 1998, when it was not engaging in the same activity or activities in the initial period (January–June 1997). Exit from an old activity is defined analogously. There appears to be substantial churn in the types of activities 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.

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.

| | (1) | | (2) | | (3) | (4) | | |
|--|--|---|---|--|---|---|--|--|
| | Initial fraction of hhs with non-zero 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) | Regression (4) Change in entrepreneurial income (as share of initial hh income) |
| Crop farming and gardening | 0.219 | -0.016 (0.007) | 0.018 (0.019) | 0.01 (0.026) | 0.007 (0.036) | 0.066 | -0.01 (0.003) | -0.017 (0.017) |
| Wholesale and retail trade | 0.184 | 0.004 (0.006) | 0.003 (0.027) | -0.014 (0.054) | 0.017 (0.070) | 0.047 | 0.012 (0.004) | -0.044 (0.028) |
| Transportation and communication services | 0.082 | 0.007 (0.009) | 0.045 (0.025)* | -0.031 (0.025) | 0.076 (0.031)** | 0.019 | 0.011 (0.004) | 0.055 (0.022)** |
| Livestock and poultry raising | 0.055 | 0.016 (0.007) | 0.028 (0.040) | -0.049 (0.030) | 0.077 (0.058) | 0.006 | 0.002 (0.001) | 0.014 (0.010) |
| Community and personal services | 0.043 | 0.01 (0.006) | -0.005 (0.020) | 0.017 (0.020) | -0.022 (0.024) | 0.011 | 0.004 (0.002) | -0.008 (0.011) |
| Manufacturing | 0.038 | -0.006 (0.004) | 0.046 (0.016)*** | -0.013 (0.019) | 0.058 (0.025)** | 0.006 | 0.000 (0.002) | 0.016 (0.008)** |
| Fishing | 0.015 | 0.004 (0.002) | 0.008 (0.009) | 0.014 (0.005)*** | -0.006 (0.010) | 0.007 | -0.001 (0.001) | 0.009 (0.007) |
| Forestry | 0.008 | -0.004 (0.002) | 0.006 (0.004)* | 0.001 (0.006) | 0.005 (0.008) | 0.000 | 0.001 (0.001) | 0.001 (0.003) |
| Construction | 0.002 | 0.004 (0.002) | -0.003 (0.008) | 0.005 (0.003)* | -0.008 (0.008) | 0.001 | 0.001 (0.001) | -0.003 (0.003) |
| Mining and quarrying | 0.002 | 0.000 (0.001) | -0.003 (0.002) | 0.001 (0.001) | -0.004 (0.003) | 0.000 | 0.000 (0.000) | -0.001 (0.001) |

Table 8
(Continued)

| | Regressions (2) | | (3) | Regression (4) | | |
|--|---|---|---|---|--|---|
| | Mean (std.dev.) of net entry into this activity | Indicator: Entry into this activity (a) | 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) |
| Initial fraction of hhs with non-zero income from this source | 0.008 | | | | | |
| Activities not elsewhere classified | -0.002 (0.002) | 0.002 (0.010) | -0.004 (0.012) | 0.002 | 0.000 (0.000) | 0.001 (0.002) |
| Region × Urban controls | | Y | | | | Y |
| Controls for pre-crisis household and migrant characteristics | | Y | | Y | | Y |
| Number of observations 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 the 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. The outcome in regression column 1 (entry indicator) is 1 if household reported no income from the given activity prior to the crisis, but non-zero income after the crisis (and 0 otherwise). The outcome in regression column 2 (exit indicator) is equal to 1 if household reported non-zero 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 January-June 1997 and April-September 1998 reporting periods, expressed as fraction of initial (January-June 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.

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.³¹

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'. 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 and manufacturing.

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 manu-

³¹ 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.

facturing 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. 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.³²

3.3.8. Discussion

The impacts of exchange rate shocks on the various outcomes discussed above 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.

More favourable exchange rate shocks also reduce migrants' return rates, as demonstrated in Table 4(a), and this raises the concern that it might be inappropriate to interpret the exchange rate shocks as 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 supply labour to a household enterprise, potentially dampening household entrepreneurial effort (particularly when labour markets are imperfect). These examples suggest that the concurrent changes in migrant return rates could 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 whether 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 between 1997 and 1998. If migrant decisions to delay return have negative effects on other outcome variables, then because the exchange rate shock and migrant returns are negatively related, inclusion of a control for migrant returns would make the coefficient on the exchange rate shock larger in absolute value. As in Table 4(a), 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.

Even if one believes that the estimated impact of the exchange rate shocks acts predominantly via changes in household income, an additional issue of interpretation remains: are the exchange rate shocks *themselves* the primary causal factor, or are the

³² In the NBER Working Paper version of this article (Yang 2006a), I present suggestive evidence consistent with initial lump-sum investments being particularly large in transportation/communications and manufacturing household enterprises. Households engaging in transportation/communications and manufacturing entrepreneurship have higher income and wealth levels than households engaging in most other types of entrepreneurship.

regression coefficients also influenced by real economic shocks that were correlated with the exchange rate movements during the Asian financial crisis? This question is important for assessing the generality of this article's empirical results. If the exchange rate shocks themselves are the primary causal factor (rather than real economic shocks), then this article'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, it makes sense to 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 1 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 members' June 1997 locations. This variable has a mean (std.dev.) of 0.003 (0.0387).³³ 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 US, 0.043.

Of course, the migrant return rate and (potentially) migrant job loss are household choice variables, so including them as independent variables can lead to biased estimates of the coefficient on the exchange rate shock (Angrist and Krueger, 1999), adding additional ambiguity to the interpretation of the empirical results. That said, if inclusion of these household choice variables in the regressions leads to little or no change in the coefficient on the exchange rate shock, it would lend support for rejecting the various alternative interpretations just outlined. (In this case, it is also possible – albeit unlikely – that several sources of potential bias *exactly* offset each other, so that the coefficient on the exchange rate shock is unchanged.)

Table 9 presents the results of this exercise, for changes in remittances as well as five of the main household investment outcomes between 1997 and 1998. Four of the outcomes are at the household level: the change in remittances, 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. Both the household and individual-level samples are slightly smaller than in previous Tables 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, the coefficient on the exchange rate shock in a regression without the additional control variables is presented for comparison; and second, the exact same regression but with the added controls. To maximise comparability of the exchange rate shock coefficients, the first regression in each pair excludes observations with missing data on the added control variables. All regressions in the Table are for the specification that includes control variables for household and migrant-level

³³ 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.

Table 9
Impact of Migrant Exchange Rate Shocks, 1997–8 (additional specifications)

OLS regressions of change in outcome variable on exchange rate shock, including controls for migrant return rate, migrant job loss, and real economic conditions overseas.

| Independent variables: | Dependent variables: Change in... | | | | | | | | | | |
|---------------------------------------|-----------------------------------|-------------------------------------|---|---|--|--|--|--------------------|---------------------|----------------------|----------------------|
| | Remittance receipts | Entry into 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 student status (children aged 10–17) | Change in hours worked (children aged 10–17) | | | | |
| Exchange rate shock | 0.234 (0.088)** | 0.139 (0.046)*** | 0.128 (0.065)** | 0.087 (0.032)*** | 0.099 (0.028)*** | 0.053 (0.025)** | 0.059 (0.024)** | 0.091 (0.037)** | 0.093 (0.033)*** | -2.104 (1.007)** | -2.199 (1.057)** |
| Migrant return rate in household | 0.275 (0.089)*** | 0.018 (0.034) | 0.018 (0.034) | -0.017 (0.013) | -0.017 (0.013) | -0.006 (0.018) | -0.006 (0.018) | 0.038 (0.016)** | 0.038 (0.016)** | -1.426 (0.371)*** | -1.426 (0.371)*** |
| Migrant job loss (indicator) | -0.197 (0.078)** | 0.05 (0.048) | 0.05 (0.048) | 0.009 (0.035) | 0.009 (0.035) | 0.016 (0.014) | 0.016 (0.014) | 0.028 (0.022) | 0.028 (0.022) | 0.756 (0.951) | 0.756 (0.951) |
| Change in ln (gross domestic product) | -0.39 (0.647) | 0.187 (0.398) | 0.187 (0.398) | -0.15 (0.152) | -0.15 (0.152) | -0.067 (0.100) | -0.067 (0.100) | 0.13 (0.265) | 0.13 (0.265) | -2.211 (6.093) | -2.211 (6.093) |
| R-squared | 0.1 | 0.07 | 0.07 | 0.04 | 0.04 | 0.06 | 0.06 | 0.27 | 0.27 | 0.16 | 0.16 |
| Number of observations: | 1,580 | 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 the 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 are between 1997 and 1998. For remittance dependent variable, change is between January–June 1997 and April–September 1998 reporting periods, expressed as fraction of initial (January–June 1997) household income.
 '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.
 '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).

pre-crisis characteristics (plus individual characteristics in the individual-level regressions). The question of interest is whether the coefficient on the exchange rate shock changes when the added controls are included in the regression.

It turns out that including controls for migrant returns, migrant job loss and the change in log GDP has quite modest effects on the exchange rate shock coefficient. For example, in the remittance regressions, the coefficient on the exchange rate shock is 0.234 in the regression without the additional controls and 0.296 with the additional controls. In the regressions for net entry into new entrepreneurial activity, the corresponding coefficients are 0.139 and 0.128; in the schooling regressions the coefficients are 0.091 and 0.093, respectively. In all cases, the coefficient on the exchange rate shock remains statistically significantly different from zero at conventional levels when the additional controls are added.

Two conclusions emerge from this analysis. First, the estimated impact of the exchange rate shock on the dependent variables of interest are plausibly interpreted as acting predominantly via changes in household income, rather than via the migrant return channel. Second, the exchange rate shocks themselves are likely to be the primary causal factor behind the changes in household investment outcomes, rather than the real economic shocks (such as job terminations or the change in economic output) that might be correlated with the exchange rate shocks.

Some of the coefficients on the added controls are also worth noting. Migrant returns are associated with increases in child schooling and reductions in child labour; the coefficients on the migrant return rate for both dependent variables are statistically significantly different from zero. A migrant return rate of 1 (100%) is associated with an increase of 3.8 percentage points in the likelihood of staying in school and a reduction in hours worked per week of 1.4 hours for children aged 10–17. One interpretation of these results is that returned migrants devote labour hours to household enterprises in place of children, reducing child labour hours and raising their school attendance.³⁴ Migrant returns are also associated with statistically significant increases in remittance receipts. Migrant job losses are associated with statistically significant declines in remittances sent home but have little relationship with the household investment outcomes. The change in log GDP variable is inconsistently signed and is not statistically significantly different from zero in any of the regressions.

At first blush, it may be surprising that migrant returns and migrant job losses are associated with changes in remittances but for the most part are not associated with corresponding changes in household investment. However, these patterns may be sensible for several reasons. The positive relationship between remittances and migrant returns may simply reflect the fact that migrants transfer accumulated overseas savings to their origin households upon returning home. If this is the case, then the only aspect of the household's finances that changes when migrants return is the location – and

³⁴ Additional analysis (not reported in the Tables but available from author on request) reveals that the return of *mothers* has a larger positive association with schooling than the return of other family members. In particular, returns of mothers have statistically significantly larger relationships with child schooling than returns of either fathers or sons. The coefficient on mother returns is larger than that on daughter returns but the difference is not statistically significantly different from zero. (The coefficient on daughter returns is larger than that on returns of fathers or sons but these differences are also not statistically significant.)

not the amount – of household wealth. Thus it should not be surprising if household investments remain relatively constant as well.

When it comes to migrant job losses, migrants may in practice be able to find replacement jobs quite rapidly. While job loss does increase the likelihood of return, it is far from true that job loss *always* leads to return: in 70% of households reporting a migrant job loss, *no* migrants return. (Results available from author on request.) In other words, it is likely that the majority of migrants who experience a job loss find or expect to find other overseas jobs. Remittances may thus decline temporarily but may be expected to increase again subsequently. Furthermore, migrant job loss affects only current earnings but has no direct effect on past savings accumulated overseas. By contrast, exchange rate shocks affect not just current earnings but also the Philippine-peso value of savings held overseas. For all these reasons, it is sensible that exchange rate shocks have a greater effect on household investments than do job losses.

4. 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 article 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 labour and entrepreneurial activity.

A number of studies of international migration conclude that remittances are primarily consumed and not invested. By contrast, this article finds that large, exogenous shocks to the income and wealth of Philippine migrant households, which manifest themselves in part via changes in remittances, have negligible effects on household consumption but large effects on various types of household investments. Households experiencing more favourable exchange rate shocks raise their non-consumption disbursements in several areas likely to be investment-related (in particular in educational expenditures), keep children in school longer, take children out of the labour force, raise their hours worked in self-employment and are more likely to start relatively capital-intensive entrepreneurial enterprises.

The findings presented here shed light on how developed countries' policies affecting migrant workers can affect households in poor countries. This article'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 article suggests that rich-country policies expanding employment opportunities for workers from overseas can stimulate human capital investment and entrepreneurship in poor-country households. For example, policies that allow currently undocumented workers to obtain legal working papers, such as those currently being debated in the US, should expand the earnings opportunities of migrants in the US and thus human capital and entrepreneurial investments in migrants' origin households. By contrast, increasing enforcement against illegal immigrants or eliminating temporary work permissions for overseas migrants should reduce migrant earnings opportunities and thereby discourage such origin-household investments.

In addition, for migrant source countries in the developing world, this article sheds light on the potential impact of policies that facilitate migrant savings overseas and stimulate remittances. For example, the Mexican government issues official identity cards (*matriculas consulares*) to its nationals in the US that many financial institutions accept as proof of identity for the purpose of opening a bank account. If *matriculas consulares* lead to increases in migrant savings rates and remittances sent home, this article's results suggest that the Mexican government's policy could also bolster origin-household investments in children and small enterprises.

Further research taking advantage of exchange rate shocks as exogenous variation should be worth pursuing, in particular those related to the migration flows themselves. Yang (2006*b*) examines in greater detail the interrelationship between return migration and household investment activities in response to the exchange rate shocks.

Migration outflows are also of interest. Are new migrant outflows biased towards countries whose currencies appreciated more post-1997? Do existing migrants shift their locations from countries experiencing negative exchange rate shocks (like Korea and Malaysia) to those where exchange rates remained stable (such as Saudi Arabia)? Are certain types of migrants, such as the more-educated, better able to adjust their overseas destinations post-1997? I consider these questions important areas for future research.

Data Appendix

A.1. Data Sets

Four linked household surveys were provided by the National Statistics Office of the Philippine government: the Labour Force Survey (LFS), the Survey on Overseas Filipinos (SOF), the Family Income and Expenditure Survey (FIES), and the Annual Poverty Indicators Survey (APIS).³⁵

The Labour 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

³⁵ Use of the data requires a user fee and the datasets remain the property of the Philippine government.

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 (January–June 1997) remittances from the FIES.

Data on detailed income sources, consumption and other disbursements are available for the pre-crisis period (January–June 1997) from the July 1997 FIES. Data on detailed income sources, consumption, other disbursements and durable good ownership are available for the post-crisis period (April–September 1998) from the October 1998 Annual Poverty Indicators Survey (APIS). While educational expenditures are recorded in the consumption portion of the FIES and APIS, in this article I consider educational expenditures separately as an investment expense (and not as consumption). Data on durable good ownership and housing unit amenities in the pre-crisis period are unavailable in the July 1997 round of the FIES; these data were only recorded in the January 1998 survey. Therefore, 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 (April–September 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 April–September 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 LP.

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 Labour 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. An analysis presented in the Data Appendix of the NBER Working Paper version of this article (Yang 2006a) find no indication that attrition due to Criteria 3 or 5 is associated with the shocks, and so allowing these criteria to play a role in determining the sample for analysis should not threaten the internal validity of the estimates.

A.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.³⁶

³⁶ 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.

A.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 labour 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 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; see Appendix Table 4, Panels B and C, in Yang (2006a).

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