Remittances and Poverty in Migrants' Home Areas: Evidence from the Philippines

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April 2005

Abstract

In many developing countries, remittance receipts from overseas are important supplements to household income. How do these remittance flows affect poverty and inequality in migrants' home areas? To answer this question, we take advantage of exogenous shocks to the remittance receipts of Philippine households. Filipino migrants work in a variety of foreign countries, and experienced sudden changes in exchange rates due to the 1997 Asian financial crisis. Appreciation of a migrant's currency against the Philippine peso leads to increases in household remittance receipts, and reductions in poverty in migrants' origin households. We find evidence of spillovers to households without migrant members, focusing on cross-regional variation in the mean exchange rate shock experienced by the region's migrants. In regions with more favorable mean exchange rate shocks, aggregate poverty rates decline even in households without migrant members. However, we find no strong evidence of effects on region-level inequality.

Keywords: migration, remittances, poverty, inequality, exchange rates, Philippines
JEL codes: D81, F22, F32, O12, O15

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1 Introduction

Between 1965 and 2000, individuals living outside their countries of birth grew from 2.2% to 2.9% of world population, reaching a total of 175 million people in the latter year.[1] The remittances that these migrants send to origin countries are an important but relatively poorly understood type of international financial flow. In 2002, remittance receipts of developing countries amounted to US$79 billion.[2] This figure exceeded total official development aid (US$51 billion), and amounted to roughly four-tenths of foreign direct investment inflows (US$189 billion) received by developing countries in that year.[3]

What effect do remittance flows have on poverty and inequality in migrants' origin households, and in their home areas more broadly? The answer to this question is central in any assessment of how international migration affects origin countries,[4] and in weighing the benefits to origin countries of developed-country policies liberalizing inward migration (as proposed in Rodrik (2002) and Bhagwati (2003), for example). Remittance flows obviously have their most direct effect on incomes in migrants' origin households. More generally, though, remittances may have broader effects on economic activity in migrants' home areas, leading to changes in poverty and inequality even in households without migrant members. In addition, remittance inflows to certain regions may reduce poverty more broadly if remittance-receiving households make direct transfers to non-recipient households.

A major obstacle to examining the causal impact of remittance flows on aggregate poverty and inequality is the fact that remittances are not generally randomly assigned across areas, so that any observed relationship between remittances and an aggregate outcome of interest may not reflect the causal impact of remittances. Reverse causation is a serious concern. For example, if remittances serve as insurance for recipient households, worsening economic conditions could lead to increases in remittance flows (as documented in Yang and Choi, 2005), leading to a positive relationship between poverty and remittances. Omitted variables could also be at work. For instance, sound macroeconomic policies could lead to reductions in poverty and simultaneously

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

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

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

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

attract remittances intended for investment in the local economy, so that poverty and remittances would be negatively correlated.

This paper exploits a unique natural experiment that helps identify the causal impact of remittances on poverty in migrants' origin households, and in remittance-receiving areas more broadly. In identifying the causal impact of remittances, it is very useful to have a source of random or arbitrary variation in remittance flows, so as to more readily put aside concerns about reverse causation and omitted variables. In June 1997, 6% of Philippine households had one or more members working overseas. These overseas members were working in dozens of foreign countries, many of which experienced sudden changes in exchange rates due to the 1997 Asian financial crisis. Crucially for the empirical analysis, there was substantial variation in the size of the exchange rate shock experienced by migrants. Between July 1997 and October 1998, the US dollar and currencies in the Middle Eastern destinations of Filipino workers rose 52% 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 against the peso.[5]

These sudden and heterogeneous changes in the exchange rates faced by migrants allow us to estimate the causal impact of the shocks on remittances, household income, and poverty in the migrants' origin households. Appreciation of a migrant's currency against the Philippine peso leads to increases in household remittance receipts and in total household income. In migrants' origin households, a 10% improvement in the exchange rate leads to a 0.6 percentage point decline in the poverty rate.

In addition, it turns out that different regions within the Philippines sent migrants to somewhat different overseas locations, so that the *mean* exchange rate shock experienced by a region's migrants also varied considerably across the country. For example, the mean exchange rate shock faced by migrants from Northern Mindanao was 34%, while the mean shock for migrants from the Cordillera Administrative Region was 46%, and the average across all migrants in the country was 41%. To understand the regional impact of aggregate remittance flows to certain regions, we ask how changes in the mean migrant exchange rate shock affect changes in region-level poverty and inequality. We find evidence of favorable spillovers to households without migrant members. In regions with more favorable mean exchange rate shocks, aggregate poverty rates decline. However, there is no strong evidence that the region-level mean exchange rate shock affects measures of aggregate inequality. This aggregate decline in poverty may be due to increases in economic

[5] We describe the exchange rate index in section 2.2 below.

activity driven by remittance flows, as well as by direct transfers from migrants' origin households to households that do not have migrant members.

This paper is related to an existing body of research on the impact of migration and remittances on aggregate economic outcomes (such as poverty and inequality) in migrants' origin areas. One approach used in previous research has been to compare the actual income distribution (including remittances) to the income distribution when remittances are subtracted from household income. The difference is then interpreted as the impact of remittances.[6] Such an approach assumes that domestic non-remittance income is invariant with respect to remittance receipts, and so is likely to yield biased estimates of the impact of remittances. With this concern in mind, other research constructs counterfactual measures of poverty and income distribution based on predicting remittance-recipients' income in the absence of remittances.[7] In contrast to existing work on the topic, to our knowledge ours is the first paper to examine the impact of remittances on poverty and inequality in migrants' home areas using exogenous variation in an important determinant of remittances (exchange rates in migrants' overseas locations).

This paper is organized as follows. Section 2 describes the dispersion of Filipino household members overseas, and discusses the nature of the exchange rate shocks at both the household and regional levels. Section 3 describes the data used and presents the empirical results. Section 4 concludes. Further details on the household datasets are provided in the Data Appendix.

2 Overseas Filipinos: characteristics and exposure to shocks

2.1 Characteristics of overseas Filipinos

To help ameliorate rising unemployment and aggregate balance of payments problems, in 1974 the Philippine government initiated an 'Overseas Employment Program' to facilitate the placement of Filipino workers in overseas jobs. At the outset, the government directly managed the placement of workers with employers overseas, but soon yielded the function to private recruitment agencies and assumed a more limited oversight role. The annual number of Filipinos going overseas on officially-processed work contracts rose six-fold from 36,035 to 214,590 between 1975 and 1980, and more than tripled again by 1997 to 701,272.[8] Today, the government authorizes some 1,300

[6] See, for example, Stark, Taylor, and Yitzhaki (1986), Taylor (1992), Ahlburg (1996), and Rodriguez (1998).

[7] Examples of this approach include Adams (1989), Barham and Boucher (1998), and Adams (2004).

[8] The source for these data is *Philippine Yearbook 2001*, Table 15.4. These figures do not include Filipinos who go overseas without the help of government-authorized recruitment agencies. By all accounts (e.g., Cariño (1998) and others), there was a dramatic rise in the number of Filipinos going overseas in this period, so the figures should

private recruitment agencies to place place Filipinos in overseas jobs (Diamond (2002)). Contracts for most overseas positions are typically of two years' initial duration, and are usually open to renewal. For the vast majority of positions, overseas workers cannot bring family members with them, and must go alone.

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.

In June 1997 (immediately prior to the Asian financial crisis), 5.9% of Philippine households had one or more household members overseas, in a wide variety of foreign countries. 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, and Hong Kong comes in second with 11.5%. But no other destination accounts for more than 10% of the total. The only other countries accounting for 6% or more are Taiwan, Japan, Singapore, and the United States. The top 20 destinations listed in the table account for 91.9% of overseas Filipino workers; the remaining 8.1% are distributed among 38 other identified countries or have an unspecified location.

Table 2 displays summary statistics on the characteristics of overseas Filipino workers in the same survey. 1,832 overseas workers were overseas in June 1997 in the households included in the empirical analysis (see the Data Appendix for details on the construction of the household sample). The overseas workers have a mean age of 34.5 years. 38% are single, and 53% are male. 'Production and related workers' and 'domestic servants' are the two largest occupational categories, each accounting for 31% of the total. 31% of overseas workers in the sample have achieved some college education, and a further 30% have a college degree. In terms of position in the household, the most common categories are male heads of household and daughters of the head, each accounting for 28% of overseas workers; sons of head account for 15%, female heads or spouses of heads 12%, and other relations 16% of overseas workers. As of June 1997, the bulk of overseas workers had been away for relatively short periods: 30% had been overseas for just 0-11 months, 24% for 12-23 months, and 16% for 24-35 months, 15% for 36-47 months, and 16%

not reflect merely the collection of new data on previously undocumented worker departures.

[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 Data Appendix for the procedure used to determine the locations of overseas Filipinos in the SOF.

for 48 months or more.

2.2 Shocks generated by the Asian financial crisis

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

Figure 1 displays monthly exchange rates for selected major locations of overseas Filipinos (expressed in Philippine pesos per unit of foreign currency, normalized to 1 in July 1996).[10] The sharp trend shift for nearly all countries after July 1997 is the most striking feature of this graph. An increase in a particular country's exchange rate should be considered a favorable shock to an overseas household member in that country: each unit of foreign currency earned would be convertible to more Philippine pesos once remitted.

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

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

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

2.2.1 Household-level exchange rate shock

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

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

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.[11] Because this variable is undefined for households without overseas migrants, when examining the impact of $ERSHOCK_i$ we restrict the sample to households with one or more members working overseas prior to the Asian financial crisis (in June 1997). 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).

2.2.2 Region-level exchange rate shock

For analysis of poverty in non-migrant households, and of inequality across all households, we calculate the mean exchange rate shock across migrants within 16 geographic regions of the Philippines.[12] This measure varies across regions because of regional differences in the locations of overseas workers.

For Philippine region k, the region-level migrant exchange rate shock is:

$$REGSHOCK_k = \frac{\sum_{j=1}^{J} N_{kj} ERCHANGE_j}{\sum_{j=1}^{J} N_{kj}} \quad (3)$$

As before, countries in the world where overseas Filipinos work are indexed by $j \in \{1, 2, ..., J\}$, and $ERCHANGE_j$ is the exchange rate shock for a migrant in country j as defined in equation (1) above. N_{kj} is the number of overseas workers a region k has in a particular country j in June

[11] 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.

[12] We use the National Statistics Office of the Philippines' region definitions as of July 1996 ('Version 4'). The regions are the National Capital Region (NCR), Ilocos, Cagayan Valley, Central Luzon, Southern Tagalog, Bicol, Western Visayas, Central Visayas, Eastern Visayas, Western Mindanao, Northern Mindanao, Southern Mindanao, Central Mindanao, Cordillera Administrative Region (CAR), Autonomous Region of Muslim Mindanao (ARMM), and Caraga.

1997 (so that $\sum_{j=1}^{J} N_{kj}$ is the total number of the region's workers overseas in that month). As with the household-level shock measure, it is important that $REGSHOCK_k$ is defined solely on the basis of migrants' locations prior to the crisis.

Across regions in the Philippines, $REGSHOCK_k$ has a mean of 0.40 and a standard deviation of 0.03. The lowest value of $REGSHOCK_k$ is 0.34 (Northern Mindanao), and the highest value is 0.46 (Cordillera Administrative Region).

3 Empirical analysis

In this section, we first describe the data and sample construction and the characteristics of sample households. We then discuss the regression specification and various empirical issues, and finally present estimates of the impact of exchange rate shocks on poverty and inequality.

3.1 Data

3.1.1 Household surveys

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

The LFS is administered quarterly to inhabitants of a rotating panel of dwellings in January, April, July, and October, and the other three surveys are administered with lower frequency as riders to the LFS. Usually, one-fourth of dwellings are rotated out of the sample in each quarter, but the rotation was postponed for five quarters starting in July 1997, so that three-quarters of dwellings included in the July 1997 round were still in the sample in October 1998 (one-fourth of the dwellings had just been rotated out of the sample). The analysis of this paper takes advantage of this fortuitous postponement of the rotation schedule to examine changes in households over the 15-month period from July 1997 to October 1998.

Survey enumerators note whether the household currently living in the dwelling is the same as the household surveyed in the previous round; only dwellings inhabited continuously by the same household from July 1997 to October 1998 are included in the sample for analysis. Because the exchange rate shocks are likely to have different effects on households depending on whether they have migrant members, we analyze separately households that reported having one or more

members overseas in June 1997, and households that did not report having migrant members in that month.

All variables denominated in currency terms are converted into real 1997 terms using the 1997-1998 change in the consumer price index, before being used as dependent variables. See the Data Appendix for other details regarding the contents of the household surveys and the construction of the sample for analysis.

3.1.2 Poverty statistics

Poverty variables take household per capita income as the basis, where overseas household members are not included in the per capita income calculations. However, remittances received from the overseas members are included in household income. This procedure acknowledges the lack of information on the earnings of overseas migrants, and is consistent with that used in constructing the Philippine government's poverty statistics (Virola et al, 2005). To construct poverty measures, we used poverty lines for 1997 and 1998 by locality, from the Philippine government's National Statistical Coordination Board (NSCB).[13]

The empirical analysis focuses on three poverty measures. First, a *poverty indicator* for household i in period t, POV_{it}:

$$POV_{it} = \begin{cases} 1 & \text{if } Y_{it} < \widetilde{Y}_{it} \\ 0 & \text{otherwise} \end{cases}$$

where Y_{it} is household per capita income, and $\widetilde{Y}_{it}$ is the per capita poverty line for household i and period t.

The second poverty measure is the *poverty gap*, expressed in pesos:

$$POVGAP_{it} = \begin{cases} \widetilde{Y}_{it} - Y_{it} & \text{if } Y_{it} < \widetilde{Y}_{it} \\ 0 & \text{otherwise} \end{cases}$$

The third poverty measure is the *poverty gap (as fraction of the poverty line)*, expressed in

[13] These data are available online at <http://www.nscb.gov.ph/poverty/2000/povertyprov.asp>. For 1997, the poverty lines were constructed separately for urban and rural areas within 83 disaggregated localities (provinces). In 1998, poverty lines were not constructed at this disaggregated level, and are only available at the level of 16 regions.

pesos:

$$POVGAPFR_{it} = \begin{cases} \frac{\widetilde{Y}_{it} - Y_{it}}{\widetilde{Y}_{it}} & \text{if } Y_{it} < \widetilde{Y}_{it} \\ 0 & \text{otherwise} \end{cases}$$

The poverty indicator provides information on the incidence of poverty in particular households. The poverty gap measures, on the other hand, provide information on the depth of poverty. Means of these three measures (across 16 Philippine regions) will also be used as outcome variables in analyses of the impact of region-level exchange rate shocks on region-level poverty.

3.1.3 Rainfall shocks

A number of the analyses of this paper examine the impact of region-level exchange rate shocks, and so it will be crucial to control for the impact of other types of region-level shocks on poverty and inequality that might be correlated (coincidentally) with the region-level exchange rate shocks. Reflecting the central role of agriculture in the Philippine economy, important regional economic fluctuations derive from rainfall variation (as documented in Yang and Choi, 2005).

To construct measures of rainfall shocks, we use rainfall data obtained from the Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA). Daily rainfall data are available for 47 weather stations, often as far back as 1951. Rainfall variables are constructed by station separately for the two distinct weather seasons in the Philippines: the dry season from December through May, and the wet season from June through November. Monthly rainfall was calculated by summing daily rainfall totals, with daily missing values replaced by the average among the non-missing daily totals in the given station-month, as long as the station had 20 or more daily rainfall records. When a particular station-month had less than 20 daily rainfall records, monthly rainfall for the station was taken to be the monthly rainfall recorded in the nearest other station with 20 or more daily rainfall records. Seasonal total rainfall for each station in each year is obtained by summing monthly rainfall for the respective months in each wet or dry season (December observations are considered to belong to the subsequent calendar year's dry season).

Households are assigned the rainfall data for the weather station geographically closest to their local area (specifically, the major city or town in their survey domain), using great circle distances calculated using latitude and longitude coordinates. Because some stations are never the closest station to a particular survey domain, the number of stations that end up being represented in the empirical analysis is 38.

Rainfall shock variables are then constructed as the change in rainfall between the two years relevant for household incomes in the survey reporting periods. The rainfall taken to be relevant for income in Jan-Jun 1997 (the first observation for each household) is in the wet and dry seasons of 1996, while the rainfall taken to matter for income in Apr-Sep 1998 (the second observation for each household) is in the wet and dry seasons of 1997. So the wet (dry) rainfall shock variables will be rainfall in the wet (dry) season of 1997 minus rainfall in the wet (dry) season of 1996. Yang and Choi (2005) document that these rainfall shock variables are strongly correlated with changes in income across localities in the Philippines during this same time period, and using these same household data.

3.2 Characteristics of sample households

Tables 3 and 4 present descriptive statistics for the households used in the empirical analysis, separately for migrant households (Table 3, N=1,646) and non-migrant households (Table 4, N=26,121). Migrant households are those with at least one member working overseas in June 1997 (immediately prior to the financial crisis), and non-migrant households are all others.

The top row of each table displays summary statistics for the relevant exchange rate shock. For migrant households, the shock is at the household level, and it has a mean of 0.41 and a standard deviation of 0.16. For non-migrant households, the shock is at the *regional* level, and it also has a mean of 0.41. The cross-regional variation in the size of the shock is substantially smaller than the overall variation, so the regional-level exchange rate shock has a standard deviation of only 0.03.

In migrant households, the mean number of overseas workers in June 1997 is 1.11, mean remittance receipts was 36,194 pesos (US$1,392) in Jan-Jun 1997, and the mean of remittances as a share of household income was 0.40. Non-migrant households by definition have no members overseas initially. As a result, they also have substantially smaller remittances, with a mean of 1,889 pesos ($73), amounting to 2 percent of household income on average in Jan-Jun 1997.

Migrant households tend to be wealthier than other Philippine households in terms of their initial (Jan-Jun 1997) income per capita. 51% of migrant households are in the top quartile of the national household income per capita distribution, and 28% are in the next-highest quartile. 9% of migrant households are below the poverty line, and the poverty gap (as fraction of the poverty line) has a mean of 0.02. Mean pre-crisis income per capita in migrant households is 20,235 pesos

($778).[14] By contrast, non-migrant households are fairly evenly split across income quartiles, and have mean per capita income of 11,857 ($456). They have higher poverty rates (31%), and a higher mean poverty gap (as fraction of the poverty line) of 0.10.

In terms of gift giving, on the other hand, migrant households do not appear to be dramatically different from other households: mean gifts to other households are 527 pesos ($20) and 406 pesos ($16), respectively, from Jan-Jun 1997. Gifts received, on the other hand, tend to be somewhat higher for migrant households, so that net gifts (gifts given minus gifts received) are more negative for migrant households.

Education levels and occupational groups of migrant household heads also indicate higher socioeconomic status. 30% of heads of migrant households have some college or more education, compared to just 20% of heads in non-migrant households. 23 percent of migrant household heads work in agriculture, compared to a figure of 38 percent in all other households. In addition, 68% of migrant households are urban, compared to 58% of non-migrant households.

3.3 Regression specification

We are interested in the impact of migrants' exchange rate shocks on poverty in migrant households and in other (non-migrant) households more broadly. For a migrant household, the shock in question is the household-level migrant exchange rate shock, $ERSHOCK_{it}$, as defined above in (2). For a non-migrant household, the shock is the region-level migrant exchange rate shock, $REGSHOCK_{kt}$, defined in (3).

The regression equation for migrant and non-migrant households will be similar, with the only difference being in the shock variable. Each household in the dataset is observed twice, so the analysis asks how changes in outcome variables between 1997 and 1998 are affected by intervening shocks. A first-differenced regression specification is therefore natural for a household i in region k and time period t:

$$\Delta Y_{ikt} = \beta_0 + \beta_1 SHOCK_{ik} + \varepsilon_{ikt} \tag{4}$$

For household i, ΔY_{ikt} is the change in an outcome of interest (such as the poverty indicator, or remittance receipts). $SHOCK_{ik}$ is the relevant exchange rate shock for household i in region k (either $ERSHOCK_i$ or $REGSHOCK_k$). First-differencing of household-level variables is equivalent to the inclusion of household fixed effects in a levels regression, so that estimates are purged

[14] Per capita figures exclude overseas members. US dollar figures are converted from Philippine pesos at the first-half 1997 exchange rate of roughly 26 pesos per US$1.

of time-invariant differences across households in the outcome variables. ε_{ikt} is a mean-zero error term.

The constant term, β_0, accounts for the average change in outcomes across all households. 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 (and any other change between 1997 and 1998 common to all households).[15]

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 (instead of varying in size), 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 favorable shocks were different along certain pre-crisis characteristics from households whose migrants had less favorable shocks, *and* if changes in outcomes would have varied according to these same characteristics even in the absence of the migrant shocks. In fact, households experiencing more favorable migrant shocks do differ along a number of pre-crisis characteristics from households experiencing less-favorable shocks. Yang (2004) documents that the household's exchange rate shock can be predicted by a number of pre-shock characteristics of households and their overseas workers.[16]

Any 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 4).

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

$$\Delta Y_{ikt} = \beta_0 + \beta_1 \left(SHOCK_{ik}\right) + \boldsymbol{\delta}' \left(\mathbf{X}_{it-1}\right) + \varepsilon_{ikt} \tag{5}$$

[15] After the onset of the crisis, annual real GDP contracted by 0.8% in 1998, as compared to growth of 5.2% in 1997 and 5.8% in 1996 (World Bank 2004). The urban unemployment rate (unemployed as a share of total labor force) rose from 9.5% to 10.8% between 1997 and 1998, while the rural unemployment rate went from 5.2% to 6.9% over the same period (Philippine Yearbook (2001), Table 15.1).

[16] See Appendix Table 1 in that paper.

$\mathbf{X}_{it-1}$ includes a range of pre-crisis household characteristics. Household-level controls are as follows: income variables as reported in Jan-Jun 1997 (log of per capita household income; indicators for being in 2nd, 3rd, and top quartile of the sample distribution of household per capita income); and an indicator for urban location. Other controls include 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).

It is possible to use more control variables for migrant households than for non-migrant households. First of all, the exchange rate shock varies within regions for migrant households, so for these households it is possible to include 16 indicators for regions within the Philippines and their interactions with the indicator for urban location as controls.[17]

In addition, for migrant households it is possible to control for characteristics of the household's migrants. The migrant controls are means of the following variables across a 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.

Inclusion of the vector $\mathbf{X}_{it-1}$ 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, we therefore present regression results without and with the vector of controls for pre-crisis household

[17] Inclusion of such controls for non-migrant households would absorb all variation in the $REGSHOCK_k$ variable, which only varies at the region level.

characteristics, $\mathbf{X}_{it-1}$ (equations 4 and 5). As it turns out, for many outcome variables, inclusion of this vector of pre-crisis characteristics controls makes the results stronger, by making coefficient estimates higher in absolute value, by reducing standard error estimates, or both.

A final identification worry might be that the coefficient β_1 is biased due to correlation between $SHOCK_{ik}$ and changes in other time-varying characteristics of regions. Of particular concern is variation in local-level rainfall driven by the El Nino weather phenomenon, that happened to begin in mid-1997 (nearly coincident with the onset of the Asian financial crisis). So we also present regression results that include controls for local-level rainfall shocks in both the wet and dry seasons.

Serial correlation among households sharing similar shocks is likely to bias OLS standard error estimates downward (Bertrand, Duflo and Mullainathan, 2004). The concern is correlation among error terms of households experiencing similar exchange rate shocks, so we allow for an arbitrary variance-covariance structure among observations experiencing similar shocks. So for the migrant household regressions, standard errors are clustered according to the June 1997 location of the household's overseas worker.[18] For the non-migrant household regressions, standard errors are clustered at the level of 16 regions (the variable $REGSHOCK_i$ varies at this level).

3.4 Regression results

We now turn to analysis of the impact of the migrant exchange rate shocks on migrant households and non-migrant households separately.

3.4.1 Impact on migrant households

It is first most natural to examine the impact of household-level migrant exchange rate shocks ($ERSHOCK_i$) on poverty and other outcomes within the migrant origin households. Table 5 presents descriptive statistics and regression results for migrant households.

The first two columns provide descriptive statistics for the initial (Jan-Jun 1997) values of the outcome variables and the change in these variables from 1997 to 1998. Regression column 1 provides coefficient estimates (standard errors in parentheses) on $ERSHOCK_i$ from estimation of equation (4) via ordinary least-squares. Regression column 2 estimates equation (5), including controls for household and migrant characteristics prior to the crisis. Regression column 3 aug-

[18] 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.

ments equation (5) with controls for the wet and dry season rainfall shocks, to help control for bias due to any correlation between local rainfall shocks and migrant exchange rate shocks.

Panel A of the table presents results for the three poverty measures. The initial (Jan-Jun 1997) mean of the poverty indicator represents the poverty rate among migrant households in the initial period, 0.09. Analogously, the mean change in the poverty indicator is the change in the poverty rate among these households: at 0.041, this a substantial increase in the poverty rate from its initial level.

The coefficient estimates on the exchange rate shock in regression columns 1-3 indicate that improvements in the exchange rates faced by a household's migrants lead to reductions in the incidence of household poverty: coefficient estimates in all three columns are negative. Inclusion of controls for initial household and migrant characteristics (column 2) and for local rainfall shocks (column 3) make have little impact on the estimates: the coefficient in column 3 is -0.060, while the coefficient estimate in column 1 is -0.061. The coefficient estimates in columns 1 and 3 are statistically significant at the 10% level.

The coefficient estimate in column 3 (-0.060) indicates that a one-standard-deviation increase in the size of the exchange rate shock (0.16, a favorable change) leads to a 1.0 percentage point decline in the likelihood a household is in poverty. This is a large effect, relative to the mean change in poverty incidence over the time period (4.1 percentage points), and the initial poverty rate at the start of the period (9%).

Consistent with the negative impact on the incidence of poverty, the exchange rate shocks are also associated with reductions in the two poverty gap measures (second and third rows of Panel A): coefficient estimates for those outcomes are all negative in sign, large in magnitude, and are stable in the face of inclusion of additional control variables. However, these coefficients are also imprecisely estimated, and so this should only be taken as suggestive evidence that exchange rate shocks also reduce the depth of poverty in migrant households.

How do these reductions in poverty come about? Panel B examines the impact of exchange rate shocks on two likely channels through which the shocks affect household poverty. The first row presents results where the outcome variable is the change in remittance receipts (expressed as a fraction of initial household income).[19] The initial (Jan-Jun 1997) mean of this outcome variable is 0.395. Remittance receipts increased on average over the time period: the mean

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

change is 0.099 (or 9.9 percent of initial household income). The coefficient estimates indicate that improvements in the exchange rate faced by migrant household members lead to substantial increases in household remittance receipts. Coefficient estimates become larger in magnitude and achieve statistical significance (at the 1% level) upon inclusion of the initial household and migrant characteristics control variables, and are robust to inclusion of the rainfall shock controls. The coefficient estimate in column 3 indicates that a one-standard-deviation increase in the size of the exchange rate shock (0.16) leads to an increase in remittances amounting to 3.5 percent of initial household income.

Coefficient estimates in regressions where the outcome variable is the change in household income (as a fraction of initial household income) are very similar in magnitude and statistical significance to the coefficient estimates for the change in remittances (second row of Panel B). This suggests that the increase in household income comes directly as a result of the increase in remittances, rather than via second-order effects on entrepreneurial income (at least over this 15-month time frame).[20]

We are also interested in examining spillovers to non-migrant households of the shocks experienced in migrant households. One potentially important channel through which migrant households might affect poverty in non-migrant households is via gifts (transfers). So Panel C examines the impact of the exchange rate shocks on gift giving, gift receipt, and net gifts (gifts given minus gifts received), all expressed as fractions of initial household expenditures. (The gifts variables do not include remittances.)

The strongest result is for changes in gifts to other households, in the first row of Panel C. The coefficient on the exchange rate shock is positive and statistically significantly different from zero in all specifications, and is highly robust to inclusion of control variables and the rainfall shocks. The coefficient in column 3 (0.01) indicates that one-standard-deviation increase in the size of the exchange rate shock (0.16) leads to an increase in gifts to other households amounting to 0.16 percent of initial household expenditures.

The coefficient estimates in regressions where gifts received and net gifts are the dependent variables are in the remaining two rows, and are consistent with the results for gifts given. Gifts received decline, and net gifts rise in households experiencing more favorable migrant exchange rate shocks. That said, for neither of these outcome variables are the coefficient estimates statis-

[20] Yang (2004) examines finds that favorable exchange rate shocks raise entrepreneurial activity and entrepreneurial investments in these same households, but does not have strong effects on entrepreneurial income. It may be that entrepreneurial investments need more than 15 months to yield income improvements.

tically significantly different from zero when initial household and migrant characteristics control variables are added to the regression (in columns 2 and 3). (However, the coefficient for net gifts in column 3 is marginally statistically significant, with a t-statistic of 1.39 and a p-value of 0.170.)

3.4.2 Impact on non-migrant households

Did the exchange rate shocks, which lead to increased remittances, higher incomes, and reductions in poverty in migrant households, also have effects on non-migrant households? Potential channels for any potential spillover effects to non-migrant households include general increases in economic activity (driven by increased expenditures by migrant households), as well as direct transfers from migrant households to non-migrant households.

Table 6 presents descriptive statistics and regression results for estimates of the impact of region-level migrant exchange rate shocks ($REGSHOCK_k$, as defined above in (3)) on non-migrant households. The format of the table is identical to the format of Table 5, except that the shock variable is now $REGSHOCK_k$ instead of $ERSHOCK_i$.

The three poverty measures (in Panel A) indicate increases in poverty in the period following the financial crisis. The initial (Jan-Jun 1997) poverty rate among non-migrant households is 0.307, and this figure increases by 0.102 (roughly a third) over the study period. Likewise, the measures of the depth of poverty also show substantial increases.

The coefficient estimates for the poverty measures indicate that increases (favorable changes) in the mean exchange rate shock across a region's migrants lead to declines in both the incidence and depth of poverty. In the first row of Panel A, the coefficient estimates on $REGSHOCK_k$ are all negative in sign, and become more negative and statistically significantly different from zero in the specifications that include initial household controls and the rainfall shocks.[21] In the third row of the panel (where poverty gap as a share of the poverty line is the outcome variable), coefficient estimates on $REGSHOCK_k$ are also negative in sign, and again are statistically significantly different from zero in columns 2 and 3. The results for the poverty gap in pesos (second row of panel) are consistent with the results for the other two poverty outcomes in terms of sign, but for this outcome the coefficient estimates are not statistically significantly different from zero.

It is also worth noting the robustness of the coefficient estimates to inclusion of the rainfall shocks controls (comparing results in columns 2 and 3). The similarity of coefficient estimates across the two columns suggests that the rainfall shocks and regional exchange rate shocks are

[21] Because none of these households have migrant members initially, columns 2 and 3 do not include controls for migrant characteristics, only household characteristics.

not highly correlated, providing little reason to be concerned that the coincidental timing of the El Nino weather phenomenon with the Asian financial crisis leads to substantial bias.

The size of the estimated impacts on poverty are not extremely large, but neither are they insignificant. The coefficient estimate in column 3 of Panel A indicates that a one-standard-deviation increase in the size of the region-level migrant exchange rate shock (0.03) leads to a 1.4 percentage point reduction in the incidence of poverty (compare this to an initial level of 30.7 percent, and an aggregate change between 1997 and 1998 of 10.2 percentage points). Such a shock also leads to a modest reduction in the depth of poverty, as measured by the poverty gap as fraction of the poverty line, of 0.7 percentage points (compared to an initial level of 9.8%, and a change over 1997-1998 of 5.2 percentage points).

The obvious question is how exchange rate shocks in migrant households translate into reductions in poverty in non-migrant households. Regression estimates in Panels B and C attempt to address this question, by examining the impact of the region-level migrant exchange rate shocks on changes in remittances, household income, and gifts in non-migrant households.

The first row of Panel B presents results where the outcome variable is the change in remittance receipts (expressed as a fraction of initial household income). As is not surprising in households without migrant members, the initial (Jan-Jun 1997) mean of this outcome variable is low, at 0.023. Remittance receipts actually declined on average over the time period, with a mean change of -0.006. The coefficient estimates indicate that improvements in $REGSHOCK_k$ do not have an important effect on remittance receipts in non-migrant households: the coefficient estimates are inconsistently signed, close to zero, and are not statistically significantly different from zero. Changes in remittance receipts from overseas do not help explain the reductions in poverty in non-migrant households.

Are reductions in poverty in non-migrant households explained by increases in household income, perhaps due to general increases in economic activity stemming from increases in remittances to the migrant households? The second row of Panel B explores this hypothesis, presenting results where the outcome variable is the change in household income (expressed as a fraction of initial household income). The coefficient on $REGSHOCK_k$ is positive in all three specifications, and becomes substantially larger in magnitude when control variables are added in columns 2 and 3. The coefficient in column 3 (0.992) suggests that a one-standard-deviation increase in the size of the region-level migrant exchange rate shock (0.03) leads to a 3.0 percentage point increase in household income (as a share of initial income). However, this coefficient is imprecisely estimated, with a standard error of 0.767 (the t-statistic is 1.29, p-value 0.216). This should therefore be

taken as merely suggestive evidence that household incomes increase between 1997 and 1998 in regions with more positive values of $REGSHOCK_k$.

In addition, there is evidence that gift receipts by non-migrant households rise in regions that experience more positive changes in the mean migrant exchange rate shock. $REGSHOCK_k$ has little relationship with gifts given to other households by non-migrant households, as evidenced by the small size and the lack of statistical significance of the coefficient estimates in the first row of Panel C. However, region-level migrant exchange rate shocks do lead to larger gift receipts: the coefficients in the second row of Panel C are all positive, and the coefficient in column 3 is statistically significantly different from zero. The impact of $REGSHOCK_k$ on net gifts is negative and also statistically significant in column 3.

The coefficient on gifts received in column 3 of Panel C indicates that a one-standard-deviation increase in the size of the region-level migrant exchange rate shock (0.03) leads to a 0.26 percentage point increase in gifts received (as a share of initial household expenditures).

In sum, more favorable region-level migrant exchange rate shocks lead to reductions in both the incidence and depth of poverty, increases in receipt of gifts, and (possibly) increases in household income levels. The magnitude of the response of gift receipts does not appear large enough to explain the reductions in poverty, so it is likely that general increases in economic activity (translating into higher incomes for the poor) also plays a role.

3.5 Region-level analysis

In order to examine region-level inequality measures, we collapse the data to the level of the Philippines' 16 regions. The outcome variables of interest are changes in three measures of inequality at the region level: the Gini index, the 90-10 percentile ratio, and the 75-25 percentile ratio. These measures are constructed on the basis of household per capita income (calculated excluding overseas members), making use of survey weights. To confirm the robustness of the the household-level results in Tables 5 and 6, we also examine poverty measures at the regional level that are analogous to the household-level poverty measures previously used: the regional poverty rate (the mean across households of POV_{it}), and the regional means of the two poverty gap measures ($POVGAP_{it}$ and $POVGAPFR_{it}$).

The regression equation is simply:

$$\Delta INEQ_{jt} = \alpha_0 + \alpha_1 REGSHOCK_j + \varepsilon_{jt} \tag{6}$$

where $\Delta INEQ_{jt}$ is the change between Jan-Jun 1997 and Apr-Sep 1998 in a measure of income inequality. $REGSHOCK_j$ is as defined above in equation (3). ε_{jt} is a mean-zero error term. Each region-level regression will therefore have just 16 observations.

The first two columns of Table 7 provide descriptive statistics for the initial (Jan-Jun 1997) values of the outcome variables and the change in these variables from 1997 to 1998. Regression column 1 provides coefficient estimates (standard errors in parentheses) on $REGSHOCK_j$ from estimation of equation (6) via ordinary least-squares. Regression column 2 augments equation (6) with controls for the mean of the wet and dry season rainfall shocks across households within the region, to help control for bias due to any correlation between the rainfall shocks and the regional exchange rate shocks.

Panel A of the table provides results where the poverty measures are the dependent variables. The mean poverty rate across regions is 0.349 in the initial period. Poverty rates increased over the study period, with a mean change across regions of 0.106. The coefficient estimate on $REGSHOCK_j$ for this outcome in column 1 is negative (-0.546) and statistically significant at the 10% level. Inclusion of the rainfall shock controls (column 2) makes the coefficient slightly more negative (-0.582), and it maintains its level of statistical significance.

How large is this effect on the poverty rate? A one-standard-deviation increase in the region-level migrant exchange rate shock (0.03) leads to a 1.8 percentage point reduction in the poverty rate. (Reassuringly, this estimate is quite similar to the 1.4 percentage point estimated effect of a 0.03 region-level exchange rate shock in the household regression of Table 6.)

The coefficient estimates on the region-level migrant exchange rate shock for the two poverty gap measures are both negative in sign in column 2 of Panel A (and so are consistent with the decline in the poverty rate), but are not precisely estimated. The results on the depth of poverty must therefore be taken as suggestive in this analysis.

Descriptive statistics and regression results for the impact of region-level migrant exchange rate shocks on region-level inequality are presented in Panel B of the table. All three measures of within-region income inequality rise modestly on average between 1997 and 1998: the Gini coefficient by 0.021 (from a base of 0.455), the 90-10 percentile ratio by 0.73 (from a base of 7.274), and the 75-25 percentile ratio by 0.102 (from a base of 2.806).

The coefficient estimates of the impact of $REGSHOCK_j$ on the inequality measures tell a somewhat inconclusive story. The coefficient estimates in regressions where the Gini coefficient is the outcome variable are positive in sign (indicating an increase in inequality). By contrast, the coefficient estimates in the regressions for the 90-10 and 75-25 percentile ratios are negative in sign

(indicating reductions in inequality). However, these coefficients are all quite small in magnitude; the coefficient in column 2 for the 90-10 percentile ratio indicates that a one-standard-deviation increase in $REGSHOCK_j$ would cause a mere 0.10 decline in this inequality measure (from a base of 7.274). What is more, none of the coefficients in the regressions for the inequality measures are statistically significantly different from zero.

In sum, this analysis confirms that region-level migrant exchange rate shocks lead to modest reductions in the region-level incidence of poverty. A 3% improvement in the mean exchange rate experienced by a region's migrants is associated with a 1.8 percentage point reduction in poverty (from a base of 0.349). However, there are no strong results regarding the impact of such shocks on the depth of poverty or on income inequality within regions.

4 Conclusion

Millions of migrants worldwide send remittances to families back home. The potential poverty-reducing impact of remittances has been widely discussed, but until now empirical evidence on the topic has been scarce. This paper helps fill this gap, by examining the impact of exogenous shocks to remittances on poverty rates in migrants' origin households, as well as in non-migrant households in the same geographic region.

Filipino migrants work in a variety of foreign countries, and experienced sudden changes in exchange rates due to the 1997 Asian financial crisis. Appreciation of a migrant's currency against the Philippine peso leads to increases in household remittance receipts. In migrants' origin households, a 10% improvement in the exchange rate leads to a 0.6 percentage point decline in the poverty rate.

We also find evidence of spillovers to households without migrant members. Because of geographic variation within the Philippines in migrants' overseas locations, there was also variation in the region-level mean migrant exchange rate shock across regions of the country. In regions with more favorable mean exchange rate shocks, poverty rates decline even in households without migrant members (but there is no strong evidence of effects on region-level inequality). This broader decline in poverty may be due to increases in economic activity driven by remittance flows, as well as by direct transfers from migrants' origin households to households that do not have migrant members.

It is important to note that the period studied in this paper (1997-1998) was also one of substantial economic fluctuation in the Philippines, due to both the Asian financial crisis as

well as drought due to the El Nino weather phenomenon. While there is no evidence that the estimates are confounded due to cross-regional correlation between the region-level exchange rate shocks and these other shocks, one might worry that the exchange rate shocks' effects on poverty reduction might appear primarily during a crisis period, and not during periods free from economic fluctuations. In other words, in a time of general increases in poverty, remittances flowing into one's region might help keep households from falling into poverty (or from falling deeper into poverty), but they may not have the same effect in times of economic growth. An important area of future research would be to examine the impact of migrants' exchange rate shocks (or other determinants of remittances) on poverty in home areas when the home areas in question are not suffering general declines in economic conditions.

5 Data appendix

Four linked household surveys were provided by the National Statistics Office of the Philippine government: the Labor Force Survey (LFS), the Survey on Overseas Filipinos (SOF), the Family Income and Expenditure Survey (FIES), and the Annual Poverty Indicators Survey (APIS).[22]

The Labor Force Survey (LFS) collects data on primary activity, 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.

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, we use the July 1997 and October 1998 rounds of the LFS and the October 1997 and October 1998 rounds of the SOF. We obtain household income, expenditures, and gifts from the FIES for Jan-Jun 1997 and from the APIS for Apr-Sep 1998 (because no FIES was conducted in 1998). Remittance data are from the FIES for Jan-Jun 1997 and from the SOF for Apr-Sep 1998.

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

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

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

criteria: (1) *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. (2) *The same household has occupied the dwelling between July 1997 and October 1998.* This criterion is necessary because the Labor Force Survey does not attempt to interview households that have changed dwellings. Usefully, the LFS dataset contains a field noting whether the household currently living in the dwelling is the same as the household surveyed in the previous round. (3) *The household has complete data on pre-crisis control and outcome variables (recorded July 1997).* (4) *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 1), 28,152 (91.6%) contained the same household continuously over that period (criterion 2). Of these households, 27,767 had complete data for all variables used in the empirical analysis (criteria 3 and 4).

5.1 Determining pre-crisis location of overseas household members

In this subsection we 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.

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

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

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

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

	Mean	Std. Dev.	10th pctile	Median	90th pctile
Age	34.49	9.00	24.00	33.00	47.00
Marital status is single (indicator)	0.38				
Gender is male (indicator)	0.53				
Occupation (indicators)					
Production and related workers	0.31				
Domestic servants	0.31				
Ship's officers and crew	0.12				
Professional and technical workers	0.11				
Clerical and related workers	0.04				
Other services	0.10				
Other	0.01				
Highest education level (indicators)					
Less than high school	0.15				
High school	0.25				
Some college	0.31				
College or more	0.30				
Position in household (indicators)					
Male head of household	0.28				
Female head or spouse of head	0.12				
Daughter of head	0.28				
Son of head	0.15				
Other relation to head	0.16				
Months overseas as of Jun 1997 (indicators)					
0-11 months	0.30				
12-23 months	0.24				
24-35 months	0.16				
36-47 months	0.15				
48 months or more	0.16				
Number of individuals:					
1,832					

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

Table 3 **Descriptive statistics for households *with* overseas migrants**

Num. of obs.: 1,646

	Mean	Std. Dev.	10th pctile	Median	90th pctile
Exchange rate shock	0.41	0.16	0.26	0.52	0.52
Household financial statistics (Jan-Jun 1997)					
Total expenditures	73,596	66,529	24,600	57,544	132,793
Total income	94,272	92,826	28,093	70,906	175,000
Income per capita in household	20,235	21,403	5,510	15,236	39,212
Gifts to other households (a)	527	1,673	0	100	1,100
Gifts received (b)	4,000	25,934	0	613	9,380
Net gifts (a - b)	-3,474	25,950	-9,080	-340	480
Remittance receipts	36,194	46,836	0	26,000	87,500
Remittance receipts (as share of hh income)	0.40	0.31	0.00	0.37	0.85
Number of HH members working overseas in Jun 1997	1.11	0.36	1	1	1
HH size (including overseas members, Jul 1997)	6.16	2.42	3	6	9
Located in urban area	0.68				
HH position in national income per capita distribution, Jan- Jun 1997 (indicators)					
Top quartile	0.51				
3rd quartile	0.28				
2nd quartile	0.14				
Bottom quartile	0.07				
Poverty (based in Jan-Jun 1997 HH per capita income)					
Poverty indicator	0.09				
Poverty gap (pesos)	1,671	7,152	0	0	0
Poverty gap (fraction of poverty line)	0.02	0.09	0.00	0.00	0.00
Household head characteristics (Jul 1997):					
Age	49.9	13.9	32	50	68
Highest education level (indicators)					
Less than elementary	0.17				
Elementary	0.20				
Some high school	0.10				
High school	0.22				
Some college	0.16				
College or more	0.14				
Occupation (indicators)					
Agriculture	0.23				
Professional job	0.08				
Clerical job	0.13				
Service job	0.05				
Production job	0.14				
Other	0.38				
Does not work	0.00				
Marital status is single (indicator)	0.03				

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

Table 4 **Descriptive statistics for households *without* overseas migrants**

Num. of obs.: 26,121

	Mean	Std. Dev.	10th pctile	Median	90th pctile
Region-level exchange rate shock	0.41	0.03	0.35	0.41	0.43
Household financial statistics (Jan-Jun 1997)					
Total expenditures	47,436	54,156	13,657	32,495	93,493
Total income	56,053	77,659	13,516	35,909	113,452
Income per capita in household	11,857	15,115	2,864	7,625	24,100
Gifts to other households (a)	406	3,471	0	25	680
Gifts received (b)	1,609	7,192	0	276	3,718
Net gifts (a - b)	-1,202	7,793	-3,364	-150	290
Remittance receipts	1,889	13,183	0	0	0
Remittance receipts (as share of hh income)	0.02	0.10	0.00	0.00	0.00
Number of HH members working overseas in Jun 1997	0.00	0.00	0	0	0
HH size (including overseas members, Jul 1997)	5.23	2.26	3	5	8
Located in urban area	0.58				
HH position in national income per capita distribution, Jan- Jun 1997 (indicators)					
Top quartile	0.23				
3rd quartile	0.25				
2nd quartile	0.26				
Bottom quartile	0.26				
Poverty (based in Jan-Jun 1997 HH per capita income)					
Poverty indicator	0.31				
Poverty gap (pesos)	6,188	13,054	0	0	24,082
Poverty gap (fraction of poverty line)	0.10	0.18	0.00	0.00	0.41
Household head characteristics (Jul 1997):					
Age	46.7	14.1	30	45	67
Highest education level (indicators)					
Less than elementary	0.28				
Elementary	0.22				
Some high school	0.11				
High school	0.18				
Some college	0.11				
College or more	0.09				
Occupation (indicators)					
Agriculture	0.38				
Professional job	0.06				
Clerical job	0.11				
Service job	0.07				
Production job	0.26				
Other	0.12				
Does not work	0.00				
Marital status is single (indicator)	0.03				

NOTES -- Data source: National Statistics Office, the Philippines. Surveys used: Labor Force Survey (Jul 1997 and Oct 1998), Survey on Overseas Filipinos (Oct 1997 and Oct 1998), 1997 Family Income and Expenditures Survey (for Jan-Jun 1997 income and expenditures), and 1998 Annual Poverty Indicators Survey (for Apr-Sep 1998 income and expenditures). Currency unit: Expenditure, income, and cash receipts from abroad are in Philippine pesos (26 per US$ in Jan-Jun 1997). Definition of region-level exchange rate shock: mean (within one of 16 regions) of migrant households' exchange rate shocks (see previous table). Sample: Households without a member working overseas in Jun 1997 (according to Oct 1997 Survey of Overseas Filipinos) and that also appear in 1998 Annual Poverty Indicators Survey, and excluding households with incomplete data (see Data Appendix for details).

Table 5 **Impact of migrant exchange rate shocks, 1997-1998**
(Sample: households with an overseas member in June 1997)
OLS regressions of change in outcome variable on exchange rate shock. Columns 1-3 report coefficients (standard errors) on exchange rate shock.

	Initial mean of outcome	Mean (std.dev.) of change in outcome	Regressions (1)	(2)	(3)
Panel A: Poverty measures					
Poverty indicator	0.09	0.041	-0.061	-0.054	-0.06
		(0.008)	(0.031)*	(0.035)	(0.034)*
Poverty gap (pesos)	1,671	1,594	-1,992	-1,611	-1,853
		(270)	(1,284)	(1,490)	(1,492)
Poverty gap (fraction of poverty line)	0.023	0.018	-0.02	-0.017	-0.02
		(0.004)	(0.017)	(0.018)	(0.018)
Panel B: Remittances, household income					
Remittance receipts	0.395	0.099	0.152	0.220	0.218
		(0.021)	(0.112)	(0.079)***	(0.081)***
Household income	1.000	0.131	0.232	0.238	0.236
		(0.027)	(0.144)	(0.114)**	(0.113)**
Panel C: Gifts					
Gifts to other households (a)	0.007	0.001	0.012	0.01	0.01
		(0.001)	(0.004)**	(0.004)**	(0.004)**
Gifts received (b)	0.046	-0.029	-0.023	-0.013	-0.012
		(0.002)	(0.010)**	(0.014)	(0.014)
Net gifts (a - b)	-0.039	0.03	0.034	0.023	0.022
		(0.003)	(0.012)***	(0.016)	(0.016)
Specification:					
*Region*Urban controls*			-	Y	Y
Controls for pre-crisis household and migrant characteristics			-	Y	Y
Rainfall shock controls			-	-	Y
Num. of obs. in all regressions:	1,646				

* significant at 10%; ** significant at 5%; *** significant at 1%
NOTES -- Each cell in regression columns 1-3 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 first-differenced variables. For remittance and income variables, change is between Jan-Jun 1997 and Apr-Sep 1998 reporting periods, expressed as fraction of initial (Jan-Jun 1997) household income. Poverty variables based on income per capita in household (excluding overseas members), using poverty lines specific to urban and rural areas by province. Gifts changes are between Jan-Jun 1997 and Apr-Sep 1998 reporting periods, expressed as fractions of initial (Jan-Jun 1997) expenditures. (Expenditures are only for current consumption, and do not include purchases of durable goods.) See Table 3 for notes on sample definition and definition of exchange rate shock.

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

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

Table 6 **Impact of region-level migrant exchange rate shocks on non-migrant households, 1997-1998**
(Sample: households without an overseas member in June 1997)

OLS regressions of change in outcome variable on *region-level* migrant exchange rate shock. Columns 1-3 report coefficients (standard errors) on region-level migrant exchange rate shock.

	Initial mean of outcome	Mean (std.dev.) of change in outcome	Regressions		
			(1)	(2)	(3)
Panel A: Poverty measures					
Poverty indicator	0.307	0.102	-0.412	-0.481	-0.475
		(0.009)	(0.358)	(0.241)*	(0.248)*
Poverty gap (pesos)	6,188	4,325	-4,587	-4,913	-3,483
		(444)	(15,674)	(12,128)	(10,923)
Poverty gap (fraction of poverty line)	0.098	0.052	-0.272	-0.244	-0.233
		(0.006)	(0.192)	(0.130)*	(0.120)*
Panel B: Remittances, household income					
Remittance receipts	0.023	-0.006	-0.026	0.029	0.024
		(0.002)	(0.038)	(0.055)	(0.054)
Household income	1.000	0.027	0.036	0.817	0.992
		(0.016)	(0.876)	(0.875)	(0.767)
Panel C: Gifts					
Gifts to other households (a)	0.007	-0.001	-0.008	-0.005	-0.005
		0.000	(0.014)	(0.013)	(0.013)
Gifts received (b)	0.037	-0.021	0.044	0.07	0.086
		(0.001)	(0.038)	(0.051)	(0.042)**
Net gifts (a - b)	-0.030	0.02	-0.052	-0.074	-0.091
		(0.002)	(0.044)	(0.054)	(0.045)**
Specification:					
Controls for pre-crisis characteristics			-	Y	Y
Rainfall shock controls			-	-	Y
Num. of obs. in all regressions:	26,121				

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

NOTES -- Each cell in regression columns 1-3 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 first-differenced variables. Controls for pre-crisis characteristics are: household characteristics as in previous table, indicator for urban location, and fraction of households in province with a migrant member. See previous table for other notes.

Table 7 **Impact of region-level migrant exchange rate shocks, 1997-1998**
(Units of analysis: 16 Philippine regions)

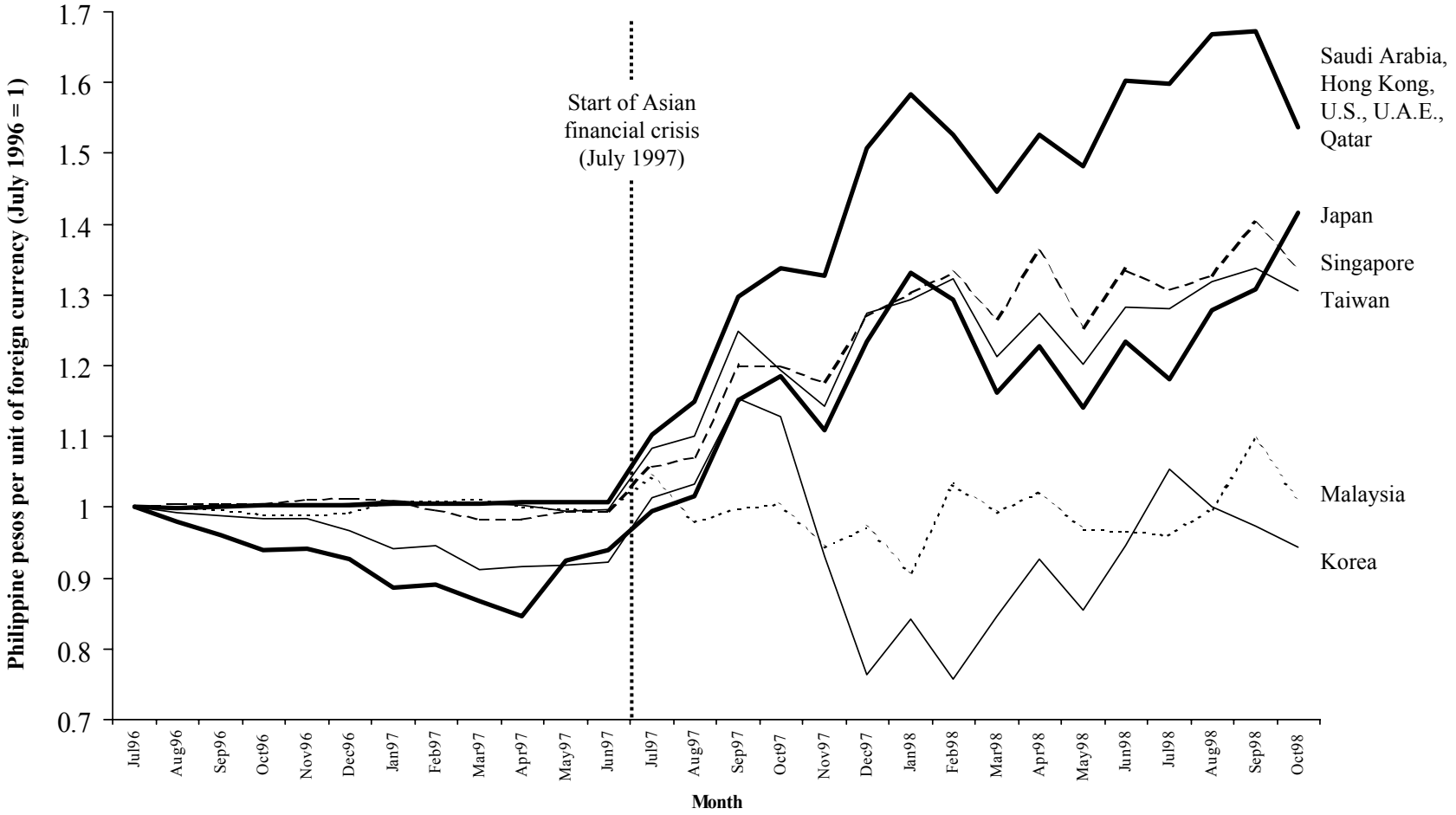
OLS regressions of change in outcome variable on region-level exchange rate shock. Columns 1-2 report coefficients (standard errors) on region-level exchange rate shock.

	Initial mean of outcome	Mean (std.dev.) of change in outcome	Regressions	
			(1)	(2)
Panel A: Regional poverty measures				
Poverty rate	0.349	0.106	-0.546	-0.582
		(0.010)	(0.287)*	(0.314)*
Mean poverty gap (pesos)	7,028	4,457	-4,508	-5,525
		(431)	(14,428)	(16,126)
Mean poverty gap (fraction of poverty line)	0.115	0.056	-0.256	-0.267
		(0.006)	(0.195)	(0.220)
Panel B: Regional inequality measures				
Gini coefficient	0.455	0.021	0.055	0.031
		(0.003)	(0.111)	(0.104)
90-10 percentile ratio	7.274	0.73	-2.499	-3.363
		(0.167)	(5.584)	(6.153)
75-25 percentile ratio	2.806	0.102	-2.584	-2.295
		(0.051)	(1.578)	(1.736)
Specification:				
Rainfall shock controls			-	Y
Num. of obs. in all regressions:	16			

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

NOTES -- Each cell in regression columns 1-2 presents coefficient estimate on region-level exchange rate shock in a separate OLS regression. Units of analysis are 16 Philippine regions. Standard errors in parentheses. All dependent variables are in first-differences. Independent variable (region-level exchange rate shock) is mean exchange rate shock across migrants within region (mean 0.40, std. dev. 0.03). Construction of poverty and inequality variables uses sample weights.

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



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