Abundance from Abroad: Migrant Earnings and Economic Development in the Philippines*

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Abstract

How do earnings by international migrants affect development in migrant origin areas? We examine the impacts of shocks to international migrant earnings on economic outcomes across Philippine provinces over two decades. We exploit exogenous variation in migrant earnings driven by persistent exchange rate shocks across Filipino migrant destinations due to the 1997 Asian Financial Crisis. These shocks have heterogeneous effects across provinces on migrant earnings per capita, depending on pre-shock migrant earnings and the distribution of migrants across overseas destinations. Positive province-level shocks to migrant earnings lead to increases in household assets and child schooling. These results are consistent with alleviation of credit constraints on household investment, as well as increased returns to education due to more attractive skill-selective migration opportunities.

Keywords: Migration, remittances, assets, entrepreneurship, schooling, labor force participation, Philippines

JEL classification: F22, J24, L26, O15, O16

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1 Introduction

International migration is a large and growing phenomenon. In 2015, 244 million people were living outside their country of birth, up from 153 million in 1990 (United Nations (2015)). Labor migration, particularly to the developed world, typically leads to large income gains (Gibson et al. (2010), Clemens et al. (2016)). Out of these earnings from international labor migration, migrants send substantial remittances to beneficiaries in their home countries. Migrant remittance flows are the second-largest type of international financial flow to developing countries (after foreign direct investment), amounting to $432 billion in 2015, a number that far exceeded official development assistance (World Bank (2016)).[1]

In this paper, we examine the impact of migrant earnings shocks on local-level economic development in the Philippines. Examining the impacts of migrant earnings shocks is important, because their effects can be difficult to predict. Consider incentives for human capital investment, for example. Positive shocks to migrant earnings could loosen financial constraints on investment in children's schooling in remittance-recipient households. Shocks to migrant earnings can also change the expected return to education in the population at large (even for households not currently connected to migrants), and here the likely impacts are unclear theoretically. Positive migrant earnings shocks could raise schooling investments overall if the return to education is perceived to rise (Chand and Clemens (2008), Shrestha (2017)), but it is also possible to find reductions in schooling if the return to education is perceived to have fallen (McKenzie and Rapoport (2011)). Impacts on employment rates are also ambiguous. Positive income shocks could alleviate financial constraints on household entrepreneurial investments, leading to higher household labor supply. On the other hand, however, labor supply could fall due to income effects, as households choose to consume more leisure.[2]

In the context of existing research on the economic impacts of migration, the

[1] In comparision, in 2015 foreign direct investment (FDI) flows to developing countries amounted to $752 billion (UNCTAD (2017)), while commitments of official development assistance (ODA) amounted to $118 billion (OECD (2018)). Yang (2011) reviews recent research on the economics of migrant remittances.

[2] We further discuss these and other theoretical possibilities further in the next section of the paper.

study has two key distinguishing features. First, it is the first study (to our knowledge) to quantify and examine the impact of shocks to migrant earnings, which is possible due to our access to unusual data. Second, we take advantage of a natural experiment that (we argue) allows us to provide a credible estimate of the *causal* impact of migrant earnings shocks.

The focus on the impact of migrant earnings is the first unique feature of this study. Previous work has taken the independent (right hand side) variable of interest to be migration (e.g., the local migration rate, or presence of a migrant in the household), or remittances (at the local or household levels). Migrant earnings is of independent interest as a right-hand-side variable in this context. Migrant earnings do not have to be collinear with migration; they can rise or fall, even if the migration rate remains stable. In addition, impacts of migrant earnings shocks are not necessarily mediated by subsequent changes in remittance flows, since migrant earnings shocks can also change household expectations regarding future migrant earnings prospects, returns to education, and the like. We are able to estimate migrant earnings at the locality level in the Philippines using an unusual dataset: the universe of work contracts registered by overseas Filipino workers (OFWs) with the Philippine government (the POEA/OWWA dataset).[3] These data provide the locality of origin of migrants on work contracts overseas, as well as their contractual wages. We aggregate data from these work contracts to calculate total migrant annual earnings at the province level, dividing by province population to obtain our independent variable of interest: migrant earnings per capita.

The second key feature of our study is that we exploit a natural experiment to provide plausible exogenous variation in province-level migrant earnings per capita. The 1997 Asian Financial Crisis caused large, persistent changes in exchange rates across the many overseas destinations of Filipino migrants. Crucially for the analysis, these exchange rate shocks were heterogeneous across migration destinations. Between 1997 and 1998, the US dollar and currencies in key Middle Eastern destinations of overseas Filipino workers rose 50% in value against the Philippine peso.

[3]To be specific, the data are from the administrative records of the Philippine Overseas Employment Administration (POEA) and the Overseas Worker Welfare Administration (OWWA), merged for the purposes of our research project. We provide further details below.

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.

How did these exchange rate shocks lead to heterogeneous shocks to migrant earnings per capita across Philippine localities? The variation we exploit derives from two dimensions of heterogeneity across 82 Philippine provinces that, in combination, we argue can be taken as plausibly exogenous. The first dimension of heterogeneity is in the pre-shock distribution of a province's migrant earnings across destination countries. This heterogeneity in earnings shares across destinations generated heterogeneity in the size of the *destination-weighted* exchange rate shock (exchange rate shocks weighted by earnings shares across overseas destinations) across provinces. A province with a high share of migrant earnings denominated in US dollars (or currencies pegged to it) experienced a much more positive exchange rate shock than one in which a relatively large fraction of earnings came from Malaysia or Korea (whose currencies depreciated substantially due to the crisis).[4] For example, Davao del Norte province experienced a positive exchange rate shock of 35.1% from 1997 to 1998, while over the same period Basilan province had a much larger exchange rate shock of 49.7%.[5]

The second dimension of heterogeneity is in migrant earnings per capita at baseline, prior to the shock. There is a wide variation in migration rates (the share of population migrating internationally) and average migrant wages across provinces, and therefore wide variation in baseline migrant earnings per capita. For example, Camarines Norte province had migrant earnings per capita in 1993 of just PhP 1,343, while in Bulacan province the corresponding figure was more than twice as large, PhP 3,157 (as it happens, these provinces experienced similar destination-

[4] It is crucial for the empirical approach that origin provinces not be able to completely flexibly adjust their migration destinations after the shock (in other words, that there be some "stickiness" in migration destinations), so that the destination-weighted exchange rate shocks have lasting effects. We empirically test and do find stickiness in migration destinations at the province level. This is consistent with the broader literature in the economics of migration that uses "shift-share" instruments, such as Theoharides (forthcoming), Card (2001), and many others.

[5] All the province-level shocks are positive, since most migration destination currencies appreciated against the Philippine peso. So our analysis exploits variation in the magnitude of positive destination-weighted exchange rate shocks.

weighted exchange rate shocks of 37.0% and 38.0%, respectively).[6]

A province's shock to migrant earnings per capita is the product of these two dimensions of heterogeneity: the province's destination-weighted exchange rate shock multiplied by the province's baseline (pre-shock) migrant earnings per capita. In our analysis, we take only the product of these two dimensions of heterogeneity as exogenous, not either dimension on its own.[7]

Taking advantage of this variation in migrant earnings shocks, we examine their impacts on aggregate provincial outcomes, as observed in Census data over two decades from before to after the shock. We examine impacts on province migration rates, first of all, and then on province-level averages of household asset ownership, years of schooling of children, employment rates, and entrepreneurship (the full set of outcomes available in the Census). We conduct difference-in-difference analyses with a continuous "treatment" variable (the post-1997 shock to migrant earnings per capita). Regression analyses control for province fixed effects, year fixed effects, and time trends related to key baseline province characteristics. It is important that we also control for the destination-weighted exchange rate and baseline migrant earnings per capita interacted with a post-shock indicator, so that identification comes only from the product of these two variables.

The first step in our analysis is to show that the initial shock to province-level migrant earnings per capita is highly persistent over time. A measure of the immediate migrant earnings shock (over 1997-1998), is predictive of the change in migrant earnings per capita over the subsequent decade (calculated using earnings reported in 2007-2009 work contracts). This persistence arises from the fact that the exchange rate shocks themselves were highly persistent, as are migration rates and the destination-country composition at the province level.[8]

[6]Calculation of the destination-weighted exchange rate shock as well as the baseline (pre-shock) migrant earnings per capita at the province level both take advantage of the abovementioned POEA/OWWA dataset. Data from that dataset on migrant origins in the Philippines, their locations overseas, and their overseas earnings are all necessary for exploiting the natural experiment as described.

[7]While the weighted exchange rate shock might be plausibly taken as exogenous on its own, baseline migrant earnings per capita at the province level is certainly endogenous, and is associated with a number of baseline province characteristics.

[8]This positive impact of the shock on provincial migrant earnings per capita occurs even as the provincial migration *rate* (migrants as a share of population) remains roughly stable among adults,

These positive shocks to migrant earnings lead to improvements in a set of key outcomes observable in Census data. First, the shock leads to higher household asset ownership, as measured by an index of household assets created from measures of durable goods, utilities access, housing quality, and property ownership. Second, we see increases in years of schooling completed by children aged 7-12 (primary school) and 13-15 (early secondary).

Overall, our results suggest that, on net, localities are better off on a variety of important dimensions when international migrant earnings improve. They help assuage concerns that international migrant earnings opportunities can have net negative consequences for home areas due, for example, to the departure of skilled individuals from the economy ("brain drain"), reductions in educational investments due to perceived lower returns, lower parental time investment in children, or by creating a culture of "dependency" or reliance on remittances. The increases we see in years of schooling, and assets are consistent with a loosening of credit constraints. The increase in schooling investments may also reflect higher perceived returns to schooling.

We examine impacts on aggregate economic development outcomes at the locality level, so our estimates incorporate general equilibrium effects, spillover effects, and changes in incentives for the entirety of local populations (not just households connected to current migrants). The focus on subnational-level outcomes is relatively rare in the migration literature, owing to substantial challenges in finding plausibly exogenous variation in migration-related right-hand-side variables of interest.[9] The central methodological concern in such an investigation is that migration-related outcomes are in general not randomly allocated across localities, so that any observed relationship with development outcomes may simply reflect

and declines among young adults (those aged 16-24). Remaining at home (rather than migrating) is likely to be a normal good, and so households appear to be responding to the gains from the positive income shock by reducing young adults' international migration.

[9]Previous work on the aggregate impacts of international migration on origin areas (either subnational or national) include Orrenius et al. (2010), Lopez-Cordoba (2005), Adams and Page (2005), Acosta et al. (2008), Dinkelman and Mariotti (2016), Barsbai et al. (2017), Abarcar and Theoharides (2017), and Theoharides (forthcoming). Barham and Boucher (1998) and McKenzie and Rapoport (2010) have investigated impacts on income distribution in migrant home areas. In the context of internal migration, Kinnan et al. (2017) examine impacts on origin areas in China.

the influence of unobserved omitted variables.[10] A key contribution of our work is to identify and exploit a natural experiment that provides plausibly exogenous variation in migrant earnings across localities, and estimate its effects on local outcomes.

This paper is organized as follows. In Section 2, we discuss relevant conceptual issues that have bearing on our analyses. Section 3 provides a brief overview of Philippine international migration over the last few decades. Section 4 describes the data used in the empirical analyses, and Section 6 reports empirical results. Section 7 concludes.

2 Conceptual Issues

We are interested in understanding the long-run impact at the locality level of a positive shock to international migrant labor earnings. What possible impacts might we expect? We first consider possible impacts on migrants' origin households themselves, and then discuss spillover or general equilibrium effects. The effects we estimate in our analysis will encompass both types of effects.

The shocks we examine were persistent, leading to increases in household and locality-level permanent income. A change in permanent income can have substantial effects on household investment and other behaviors even with perfect financial markets, due to income effects. Various household assets (e.g., durable goods) are normal goods, and it is plausible that households may also consider child human capital and small business ownership to be normal goods as well (Becker (1965), Hurst and Lusardi (2004)).

Once one allows for financial market (credit, savings, insurance) constraints, alleviation of such constraints could be another channel through which positive migrant earnings shocks could cause higherLipton (1980) investment (Lloyd-Ellis and Bernhardt (2000)). Poverty traps can emerge if there are credit constraints and the poor find investment to be too risky (Banerjee (2000), Galor and Zeira (1993), Banerjee and Newman (1993)). Improvements in capital access and insurance, both

[10]For example, areas with higher education levels could send more migrants, and also have better outcomes. Alternatively, areas that recently experienced an adverse economic shock might send migrants overseas to make up lost income (Bazzi (2017), Mahajan and Yang (2017)), so that migration and remittances might be negatively correlated with locality outcomes.

of which can be provided by international migrants,[11] leads to an improved ability to cope with risk from idiosyncratic shocks and facilitates allocation of capital to the highest-return investments (Gine and Townsend (2004), Greenwood and Jovanovic (1990), Kaboski and Townsend (2005), Townsend and Ueda (2006).) [12,13]

On the other hand, others have argued that resources received from overseas rarely fund investments, and mainly lead to higher consumption.[14] If households consider leisure to be a normal good, labor supply, including household entrepreneurial effort, could decline in response to a positive shock to migrant income (Cox-Edwards and Rodriguez-Oreggia (2009), Hanson (2007)).

A key way in which migrant earnings shocks differ from income shocks more generally is the presence of asymmetric information, arising from geographic separation of migrants from origin household members. Migrants often have greater preferences for investment than their origin households (Ashraf et al. (2015)), but may not be able to ensure such investments are made due to imperfect monitoring of and control over the origin household (de Laat (2014); Chen (2013); de Weerdt et al. (forthcoming)). Recent research provides evidence that asymmetric information affects remittance uses by recipients, migrants desire more control over remittance-recipient spending, and alleviating asymmetric information changes how households use remittances.[15] One may therefore call into question whether increases in

[11] Yang (2008a) and Yang and Choi (2007) show that migrant remittances serve an insurance role, rising when migrants' origin households or areas experience negative shocks.

[12] Such effects can occur whether shocks are transitory or permanent. Yang (2008b) finds that positive exchange rate shocks (also due to the 1997 Asian Financial Crisis) lead to short-run increases in educational and small enterprise investments in migrants' households in the Philippines over a 15-month post-shock period. Over this short run period, it is not clear whether households would have perceived the shock as transitory or permanent. In our current paper, looking up to 13 years after the shock, households should have recognized that the shock had a substantial persistent component.

[13] Many studies find migration and remittance receipts to be positively correlated with various types of household investments in developing countries (e.g., Brown (1994), Massey and Parrado (1998), McCormick and Wahba (2001), Dustmann and Kirchkamp (2002), Woodruff and Zenteno (2007), Mesnard (2004), Adams (1998), Cox-Edwards and Ureta (2003), Borraz (2005), Taylor et al. (2003), Mendola (2008), Gibson et al. (2011), Gibson et al. (2014)).

[14] Lipton (1980), Reichert (1981), Grindle (1988), Massey et al. (1987), Ahlburg (1991), Brown and Ahlburg (1999) and references cited in Durand et al. (1996).

[15] See, e.g., Ashraf et al. (2015), Ambler et al. (2015), Ambler (2015), DeArcangelis et al. (2015), Batista and Narciso (2016), Seshan and Zubrickas (2015), Viceisza and Torero (2015), and Wang et al. (forthcoming). Also relevant is evidence, among households more generally, that individuals

migrant earnings would necessarily translate into higher investment back home.

Another consideration specific to the migration context is effects due to absent labor or time of migrant household members. Positive migrant earnings shocks affect outmigration and return decisions (Yang (2006), McKenzie et al. (2014), Abarcar (forthcoming), Llull (2016), Groger (2017)). When parents migrate, children in the household lose parental time investments. This may be detrimental to child schooling and other outcomes (Antman (2011)). Absent migrants cannot contribute their own labor time to household enterprises, which is important in contexts with imperfect labor markets (Benjamin (1992)).

In addition to direct impacts on the origin households of international migrants, non-migrant households may also be affected by spillovers and general equilibrium effects. There may be pecuniary externalities, such as higher prices for local non-tradables due to higher demand in migrant households. Increases in outmigration or reductions in return may increase wages in skill-groups from which migrants differentially originate (Mishra (2007)).

Perhaps the most widely debated type of spillover is "brain drain", hypothesized negative impacts due to the departure of relatively highly-skilled individuals from the local economy (Docquier and Rapoport (2012) provide a review). Migration opportunities for skilled individuals need not have negative development impacts, however, if they stimulate general investment in education in the home economy (Stark et al. (1997), Mountford (1997), Gibson and McKenzie (2011)) to gain gain access to the international labor market. Empirical evidence of such "brain gain" has been provided by Batista et al. (2012), Shrestha (2017), Chand and Clemens (2008), and Abarcar and Theoharides (2017).[16] On the other hand, it is possible for migration to reduce educational investments in origin areas, if migration opportunities are less skill-selective (McKenzie and Rapoport (2011)).

All told, then, there are a number of possible channels through which an increase in migrant earnings could affect investment outcomes (assets, entrepreneurship, and schooling) in origin localities. Not all channels imply that investment in origin

often prefer to control the uses to which gifted resources are put (Batista et al. (2015), Eckel et al. (2017)).

[16] See also Gibson and McKenzie (2012), Ozden and Phillips (2015), Beine et al. (2008), and Docquier et al. (2008).

localities would increase as a result. Given the theoretical ambiguity, it is important to examine empirical evidence, to which we now turn.

3 Philippine Migration: Overview

3.1 Filipino Migration

As one of the world's largest senders of migrants and the first country to facilitate temporary overseas contract migration on a large scale, the Philippines provides an excellent setting to study the effect of migrant earnings on development in the migrant's location of origin. In 1974, the Philippine government began the Overseas Employment Program to aid Filipinos in finding work overseas due to poor economic conditions in the Philippines. Since the program's inception, international migration from the Philippines has increased dramatically, so that in recent decades substantial shares of the Philippine population have migrated, had a household member migrate, or received migrant remittances. Appendix Table 1 provides some basic statistics. The fraction of the population (reported by households in the Philippine Census) who are currently overseas has risen from 0.7% to 1.6%. Over the same period, the fraction of households reporting an overseas migrant member rose from 3.2% to 6.3%. Migrants send remittances to more than just their origin household, however: the share of housesholds receiving remittances rose over roughly the same period from 17.6% in 1991 to 26.0% in 2009.

Migration from the Philippines is largely temporary and legal, and occurs through licensed private recruitment agencies. Recruiting agencies legally can charge fees up to one month's wages, but migrants incur numerous other costs prior to migrating such as travel to Manila, health checks, and passport processing. Overseas temporary contract work is the primary channel through which Filipinos migrate, and most contracts are two years in duration with many Filipinos renewing existing contracts for multiple years. Between 1992 and 2000, 83% of Filipinos abroad were engaged in contract work,[17] with most of the rest being non-temporary migration via family reunification policies or other permanent migration channels. The Philippines now serves as a model for other countries like Indonesia, Sri Lanka,

[17] Authors' calculation from the Survey of Overseas Filipinos (SOF), a rider survey of the Labor Force Survey in the Philippines.

and Bangladesh, who have adopted or are in the process of adopting their own temporary contract migration programs (Agunias, 2012; Rajan and Misha, 2007; Ray, Sinah, and Chaudhuri, 2007; World Bank, 2011).

Crucial to our identification strategy, Filipinos migrate to a wide variety of destination countries. Table 1 shows the top twenty destination countries for all Filipino migrants prior to the Asian financial crisis. Approximately 42% of migrants work in Saudi Arabia, and 16% of migrants work in Japan. The other top destinations each account for less than 10% of the total. The top 20 countries account for 97.6% of all Filipino migrants, with the other 2.41% migrating to 142 other destinations. There is also substantial heterogeneity in the wages earned by migrants in different destinations. Average annual earnings for the top 20 destination countries are shown in Column 3 of Table 2. For instance, migrants in Saudi Arabia earn, on average, 114,000 Philippine pesos (Php) per year (approximately USD 2,651), while migrants to Japan earn Php 545,000. The lowest annual earnings are in Lebanon, while the highest are in the United States.

Within the Philippines, migration is more prevalent in certain provinces. Table 2 shows that the average province-level international migration rate is 2.1%. However, migration rates range from 0.1% to 7.3% of provincial population. Even amongst high migration provinces, the choice of destination varies substantially. This pattern is likely due to social networks and the locations of overseas recruiting agencies (Theoharides (forthcoming)). As a result, overseas destinations tend to be persistent: provinces sending migrants to a certain destination in one year also tend to do so in future years. Table 2 also shows summary statistics for per capita migrant earnings at the province level. The average is Php 1,594 (USD _____), and the range runs from Php 313 to Php 4,715.

3.2 Exchange Rate Shock

Because Filipino provinces differ in the destination composition of their international migrants (and their corresponding earnings), there was substantial heterogeneity in the destination-weighted exchange rate shocks experienced by different provinces following the Asian financial crisis. In July 1997, the Thai baht was devalued, setting off a series of speculative attacks on national currencies located

primarily in Southeast and East Asia. The crisis was unexpected on the part of the affected countries themselves as well as financial market analysts (Radelet and Sachs (1998)), and so migrants (and their provinces more broadly) should also have been surprised by the shock. The crisis led to the devaluation of numerous currencies throughout Southeast and East Asia, including the Philippines. As a result, the Philippine peso per foreign currency unit exchange rate changed dramatically in many of the key destinations of Filipino migrants. An increase in the exchange rate in a given destination country provides a positive income shock to Filipino migrants working in that destination. Each unit of foreign currency earned while abroad would be convertible to more Philippine pesos.

To create a measure of the exchange rate shock experienced by Philippine provinces, we follow Yang (2006). For each country j, we construct the following measure of the change in the exchange rate between the year preceding July 1997 and the year preceding October 1998:

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

A 1% improvement in the exchange rate would be expressed as 0.01, whereas a 1% decline in the exchange rate would be expressed as -0.01. Exchange rate changes for the 20 major destinations of Filipino migrants are listed in Table 1, Column 4. Migrants in Saudi Arabia, Hong Kong, and the United Arab Emirates experienced positive exchange rate shocks of approximately 50%. Migrants in Japan and Taiwan experienced positive shocks, but of a smaller magnitude. Migrants in Malaysia and South Korea actually experienced slightly negative shocks. Because of differences in migrant earnings across destinations (as shown in Column 3), even for countries with the same exchange rate shocks (Saudi Arabia and the United States, for instance), the effect of the shock on migrant earnings will vary substantially for provinces whose migrant earnings come from Saudi Arabia versus the United States.

We construct a province-level exchange rate shock as follows. Let the overseas locations where Filipino migrants work be indexed by $j \in \{1,2,\ldots,J\}$. Let y_{pj} in-

dicate the total annual earnings of migrants from province p who are overseas in country j prior to the Asian financial crisis. The weighted-average exchange rate shock measure for each province p is:

$$ERSHOCK_p = \frac{\sum_{j=1}^{J} y_{pj} ERCHANGE_j}{\sum_{j=1}^{J} y_{pj}} \tag{2}$$

In other words, the exchange rate shock for a province is the weighted average exchange rate change across those countries, with each country's exchange rate weighted by the fraction of a province's migrant earnings originating in that country.

3.2.1 Persistence of exchange rate shocks and migration patterns

A crucial aspect of this study is that there is persistence over time in both the exchange rate shocks and province-level overseas migration patterns. If there is no persistence of exchange rate shocks, we should expect limited longer-run effects of the shocks. If there were no persistence of destinations from particular origin provinces (if migrants could easily adjust their overseas destinations after the exchange rate shocks), the cross-province heterogeneity in the shock to migrant earnings might not persist, if migrants from all provinces readily shifted towards destinations experiencng better exchange rate shocks.

Figure 1 shows the exchange rates for the top ten destinations for Filipino migrants over time. The Asian financial crisis is denoted by the dashed line in 1997, after which there is substantial dispersion of the exchange rates. Notably, the exchange rate shock is persistent, with effects persisting through the year 2010. Table 1 also illustrates the persistence of exchange rate shocks in Columns 5 and 6. Column 5 shows the percent change in the exchange rate betweeen 1997 and 2000, while Column 6 shows the percent change between 1997 and 2010.

We provide statistical tests of this persistence in Appendix Table 2. In Columns 1 through 3, we regress the three-year (1997-2000) change in the exchange rate on the one-year (1997-1998) change in the exchange rate. The shocks are persistent across various subsamples (all countries, as well as only countries with large numbers of Filipino migrants). Columns 4 through 6 show the correlation of the 13-year (1997- 2010) and one-year exchange rates, showing that the exchange rate shocks

are just as persistent over this longer time window.

Also crucial to the analysis is that the destinations of migrants from particular provinces (and thus the locations of their overseas earnings) show some persistence or "stickiness" over time. We provide evidence of persistence in origin-province/overseas-destination in Appendix Table 3. In Appendix Table 3a, we first show that total province-level international migration rates themselves are highly persistent: when regressing post-shock (2000 or 2010) migration rates on the initial (1995, pre-shock) migration rate, the coefficient on the initial migration rate is highly statistically significant and the regression with this single RHS variable has a very high R-squared (close to 0.8). Appendix Table 3b then tests persistence of specific overseas destinations by province. We run one regression for each of the top 20 overseas destinations in 1993 (pre-shock), regressing the share of the province's population migrating to the destination in 2009 on the corresponding share in 1993. Each row presents the coefficient on the 1993 share. The positive and statistically significant coefficients indicate strong persisence in overseas destinations at the province level: knowing a province's pre-shock migrant destination pattern has strong predictive power for its post-shock destination pattern. While not very coefficient in this set of 20 is statistically significant at conventional levels (three are not), a test from estimation of a SUR model of joint significance of these 20 coefficients rejects the null of no statistical relationship at the 1% level (p-value<0.001).

4 Data

4.1 The POEA/OWWA Dataset

To calculate the share of earnings in each migration destination for migrants from each Philippine province, we obtained two unique administrative datasets from agencies of the the Philippine government.[18] The first dataset is from the Overseas Worker Welfare Administration (OWWA), the government agency tasked with ensuring the well-being of overseas migrants and their families. All Filipinos departing on overseas work contracts are required to obtain OWWA membership prior to

[18]These datasets have been used previously in McKenzie et al. (2014) and Theoharides (forthcoming).

departure, and OWWA keeps a detailed membership database that includes the migrant's home address in the Philippines (which includes municipality and province detail.).

A second administrative data set from the Philippine Overseas Employment Agency (POEA) provides data on migrant earnings. POEA is tasked with enforcing regulations related to work contracts of OFWs. In particular, POEA verifies that contracted wages meet minimum wage requirements (see McKenzie et al. (2014) for a detailed discussion) and keeps a detailed database of wages and other contractual details for departing OFWs.

Both the OWWA and POEA data include name, date of birth, destination, and gender, and so we match the two datasets using probabilistic matching in order to determine the province of origin for all migrants in the POEA database.[19] Having conducted this matching, we can calculate the each province's migrant earnings that are earned in each overseas location prior to the 1997 crisis (y_{pj}in equation 2), which allows us to calculate the destination-weighted exchange rate shock for each province, $ERSHOCK_p$.[20] The matched dataset also allows us to

calculate the sum total of migrant earnings from each province. We then divide by the province's population (from the 1995 Census) to obtain migrant earnings per capita in the province prior to the shock.

4.2 Census Data

We analyze a panel dataset of provinces, with outcomes derived from Philippine Census data in 1990, 1995, 2000, and 2010.[21] The exchange rate shocks occurred in 1997, so for each province observation we have two pre-shock years and two post-shock years. We show summary statistics for these outcome variables in Table 2, which include migration rates, employment rates, class of employment, and average years of schooling for various age and gender groupings. Males aged 25 to 64 migrate at a slighly higher rate (2.2%) than females (2.0%), but migration is higher for 16 to 24 year old females than males (1.2% versus 0.7%). 63.0% of 25 to 64 year

[19] See data appendix in Theoharides (forthcoming) for more details on this matching process.

[20] We use data from 1993 work contracts for this calculation. We use 1993 because it has the fewest missing values for migrant origin address in the OWWA data (86% non-missing) of all pre-crisis years (1992-1996).

[21] Data are from IPUMS-International and the Philippine Statistics Authority (PSA).

olds are employed. On average, children aged 7 to 18 have 4.88 years of education. We also create pre-shock control variables using the 1990 Census.

The Philippine Census does not contain data on wealth or poverty status of households, and so it is not possible to create an aggregated measure of province-level poverty using the Census micro data. However, the Census does contain data on ownership of a number of durable goods, access to utilities, housing quality, and land and home ownership. We construct an index of household assets by taking the first principal component of these binary variables (Filmer and Pritchett (2001)).[22]

5 Methodology

We seek to estimate the impact of province-level shocks to migrant earnings on province-level outcomes.

Our regression specification is as follows:

$$Y_{pt} = \beta_0 + \beta_1 ERshock_p * MigEarn_{p0} * Post_t + \beta_2 ERshock_p * Post_t + \beta_3 MigEarn_{p0} * Post_t + \alpha_p + \gamma_t + X_{p0} * Trend_t + \varepsilon_{pt} \quad (3)$$

where Y_{pt} is the outcome variable of interest for province p in year t. $ERshock_p$ is the exchange rate shock for province p (equation 2 above). $Post_t$ is a dummy variable equal to 1 in 2000 and 2010 and zero otherwise. α are province fixed effects, γ_t year fixed effects, and ε_{pt} is the error term. $MigEarn_{p0}$ is annual migrant earnings per capita in the province (based on pre-shock earnings and population). Standard errors are clustered at the level of the 82 provinces. Year and province fixed effects are crucial, so that estimates are purged of any association between the shocks and time-invariant locality characteristics or province-invariant year char-

[22] The loadings on the individual variables are obtained from the principal component analysis for the 1990 data, and the resulting loadings are then used to predict an asset index for 2000 and 2010. It is important to use the loadings in 1990, as the loadings themselves could be affected by the exchange rate shock and the resulting changes in migrant income. We create both an aggregate index, as well as disaggregated indices for subcategories of assets. Specifically, we create a durable goods index, a utilities index, a housing quality index, and a land ownership index. The principal component loadings are shown in Appendix Table 4 both for the overall index and for the subgroup indices.

acteristics. X_{p0} is a vector of pre-shock (1990) province-level control variables,[23] interacted with an annual time-trend $Trend_t$ (year of the observation minus 1990); this term captures long-running changes in outcomes that are related with baseline province characteristics.

The regression specification also includes $ERshock_p$ and $MigEarn_{p0}$ interacted with the indicator for $Post_t$. This is imporant, as we are not presuming $ERshock_p$ and $MigEarn_{p0}$ by themselves to be strictly exogenous; the interaction terms with $Post_t$ account for ongoing changes from before to after the shock that are related with provinces' exchange rate shocks and their pre-shock migrant earnings. In particular, pre-shock migrant earnings are correlated with some important pre-shock province characteristics.[24] While the $ERshock_p$ variable itself has a stronger claim to exogeneity, on its own the term $ERshock_p * Post_t$ is not likely to capture well the true impacts on provinces, because the shock needs to be interacted with (pre-shock) per capita migrant earnings to represent the actual financial impact on provinces.

Only the interaction between the province's destination-weighted exchange rate shock and its pre-shock per capita migrant earnings is taken to be exogenous. Therefore, our coefficient of interest is β_1 on the $ERshock_p * MigEarn_{p0} * Post_t$ term. To ease interpretation of coefficients, we divide the shock to migrant earnings per capita ($ERshock_p * MigEarn_{p0} * Post_t$) by its own standard deviation. The coefficient β_1 is therefore interpreted as the impact of a one-standard-deviation increase

[23] The variables in X_{p0} are all calculated using the 1990 Census, and are: school attendance rate (ages 7-18), female employment rate (ages 25-64), male employment rate (ages 25-64), share of population rural, overall asset index, share of individuals (ages 25-64) working in an enterprise, and population.

[24] We explore correlations between baseline (pre-shock) characteristics and the $ERshock_p$ and $ERshock_p * MigEarn_{p0}$ variables in Appendix Table 5. In Column 1, we see that the $ERshock_p$ variable is larger (exchange rate shocks are more positive) for provinces with high baseline migrant earnings per capita, lower baseline years of schooling, lower female employment rates, and higher rural share of population. Baseline migrant earnings per capita (column 2) are higher for provinces with more positive exchange rate shocks, higher share rural, and with higher asset indices. For $ERshock_p * MigEarn_{p0}$, when migrant earnings per capita and the exchange rate shock are not included as RHS variables, there is a statistically significant positive correlation with share rural and the overall asset index. When we control for the baseline level of migrant earnings per capita and the exchange rate shock, both these latter variables are highly statistically significant, while the coefficients on the baseline province characteristics all decline substantially in magnitude, with only average years of schooling being statistically signficantly different from zero (and positive in magnitude).

in the migrant earnings per capita shock.

Figure 2 displays the spatial distribution of the shock to migrant earnings per capita across Philippine provinces. The figure displays the residual of the shock variable after partialling out all right hand side variables included in equation 3. The shock appears to be evenly distributed across the country, with all regions containing provinces with different values of the shock variable.

The identifying assumption is that forprovinces with the same level of per capita migrant earnings, if the exchange rate shock experienced by provinces had all been the same in magnitude, then changes in outcomes would not have varied systematically across provinces based on the overseas location of migrants from each province. While the province fixed effects account for differences in pre-crisis characteristics across provinces, one potential violation of this identifying assumption might be that provinces with more favorable shocks to migrant earnings might be trending differentially in their outcomes along certain pre-crisis characteristics from provinces with less positive shocks to migrant earnings. Concerns of this sort about differential trends in outcomes by size of the migrant earnings shock motivates inclusion of the $X_{p0} * Trend_t$ term in the regression, in which baseline province characteristics are interacted with a linear time trend.[25]

We also conduct a test of pre-shock (1990-1995) trends for a subset of outcome variables that are available in the 1995 Census. Using observations only for 1990 and 1995, we estimate equation 3 where we pretend that the shock occurred between 1990 and 1995 (seting $Post_t = 1$ in 1995 and 0 in 1990). Results are in Appendix Table 6. We find no evidence of economically substantial or statistically significant pre-shock trends in outcome variables related to our key variables of interest.

6 Results

6.1 Earnings and migration ("first stage")

We first show that the shock variable we construct does have a lasting impact on key variables that would be the first to be affected by the shock. While we are not conducting instrumental variables (IV) analyses, these might be considered to "first stage" regressions in the IV context.

[25] Our results are robust to inclusion or exclusion of the $X_{p0} * Trend_t$ term from the regression.

First, we examine impacts on the migration rate (share of the population who are international migrants separately for those aged 25-64 and 16-24). Results from estimating regressions in the form of equation 3 are in Table 3, Panel A. The coefficient on $ERshock_m * MigEarn_{m0} * Post_t$ is small in magnitude and is not statistically significantly different from zero for total migration (pooling both genders) of 25-64 year olds, and is negative and statistically significant for total migration of 16-24 year olds. Looking separately at females and males, among those aged 25-64 there is a postive effect on male migration that is statistically significant at the 10% level while the point estimate for females is negative but not statistically significant. For migration of young adults (16-24 year olds), the point estimates are negative and statistically significant at conventional levels for both females and males with the point estimate being larger in absolute value for females.

These results suggest that the positive shock to migrant earnings led to an increase in migration for adult (age 25-64) males only, presumably to take advantage of the substantially higher migrant earnings prospects. The simultaneous decline in the migration rate for younger adults is likely to be an income effect. Remaining at home (rather than migrating) is may be a normal good for these younger individuals. Households appear to be responding to the gains from the positive income shock by having these younger individuals do slightly less international migration.

Given these heterogenous impacts on migration rates across different types of individuals, we now turn to examining the net impact on migrant earnings. We investigate this by running a regression equation 3 where the dependent variable is province-level migrant earnings per capita. Due to data limitations, this regression only has two observations, one prior to the shock (1993), and one post-shock (the average of 2007, 2008, and 2009 province-level migrant earnings).

Results are in Table 3, Panel B. In column 1, migrant earnings per capita is denominated in thousands of Philippine pesos. The coefficient on $ERshock_m * MigEarn_{m0} * Post_t$ is positive and statistically significant at the 5% level, indicating that the shock does lead migrant earnings per capita to increase overall. The magnitude of this effect is large: the coefficient indicates that each standard-deviation increase in the earnings shock leads to PhP 11,563 higher migrant earnings per capita a decade later.

In the next column, we also show the impact of a one-standard-deviation change in the migrant earnings shock in 1993 on standard deviations of migrant earnings in 2007-09. To do this, we divide migrant earnings in the post-shock period (2007-09) by the cross-province standard deviation in that period, and use that adjusted variable as the dependent variable in the regression. . With this adjustment, the regression coefficient is denominated in standard deviations of the dependent variable. .

The coefficient on $ERshock_m * MigEarn_{m0} * Post_t$ remains positive and statistically significant at the 5% level. Its magnitude indicates that the shock is very persistent over roughly a decade. Rather than attenuating (which would be indicated by a coefficient less than one), if anything the shock's impact rises in magnitude: a one-standard-deviation increase in the size of the initial shock leads to 2.8-standard-deviations higher migrant earnings in 2007-09.

In column 3 of Panel B we test whether any of this increase in migrant earnings per capita is due to increased earnings *per migrant*. In this regression the dependent variable is total migrant earnings divided by number of migrants (rather than population) in the province. The coefficient on $ERshock_m * MigEarn_{m0} * Post_t$ is positive and statistically significant at the 5% level. Part of the effect of the shock on migrant earnings per capita in the province derives from higher earnings per migrant.

6.2 Assets

Having established that the increases in migrant earnings persist for at least a decade after the initial 1997 shock, we now examine changes in household wealth. We run regressions where the dependent variable in equation 3 is the provincial average household asset index, using asset data from 1990, 2000, and 2010. This measure of assets is perhaps the best overall or summary measure of well-being to which we have access.

Results are in Table 4. The shock has a positive impact on the overall asset index (column 1) that incorporates information on all the asset types available. The coefficient on $ERshock_m * MigEarn_{m0} * Post_t$ is positive and statistically significant at the 5% level. The effect is large in magnitude: a one-standard-deviation increase in the size of the shock leads to a 1.84-unit increase in the asset index (about 2.3

standard deviations of the asset index).

We also estimate impacts on asset indices based on subset of assets (columns 2-5). The coefficient on $ERshock_m * MigEarn_{m0} * Post_t$ is positive in regressions for the sub-indices for durable goods, utilities access, and housing quality, but not for land and home ownership (for which the coefficient is small in magnitude and not statisically significantly different from zero). The coefficient in the regression for the utilities sub-index (comprised of indicators for running water, electricity, trash collection, using wood fuel to cook, using a high quality fuel to cook, and flush toilet) is statistically significantly different from zero at the 1% level. All told, then, there is clear evidence that the migrant earnings shock has a positive impact on household wealth.

We also present nonparametric regression plots of the relationship between the asset index and the shock. In Figure 3, we plot the pre-to-post change in assets (average of 2000 and 2010 minus 1990) against the migrant earnings shock. Both the y-axis and x-axis variables are residuals (partialled-out) from regressions on the other right-hand-side variables in equation 3 (province fixed effects, year fixed effects, and baseline variables interacted with a time trend). The nonparametric regression plot also shows a positive relationship between the change in assets and the migrant earnings shock. The relationship appears approximately linear.

6.3 Schooling

Another central household investment activity of general interest is in the education of children. In Table 6, we present results from estimating regression equation 3 where the dependent variables are average years of completed schooling, by age group, for all children and for girls and boys separately. These outcomes are available in each of the four Census years we work with, 1990, 1995, 2000, and 2010.

We find a positive effect for all children age 7-18 (column 1), which is statistically significantly different from zero at the 1% level. When we look at narrower age groups (columns 2-4), we find positive and statistically significant effects for primary-school-aged children (age 7-12) and for lower-secondary children (age 13-15); the coefficients on $ERshock_m * MigEarn_{m0} * Post_t$ are positive and statistically significant at the 1% and 10% levels for these age groups, respectively. The coef-

ficient in the regression for upper-secondary (age 16-18) children is also positive (and similar in magnitude to the coefficients for the other age groups), but is not statistically significantly different from zero at conventional levels. There is little indication of heterogeneity in impacts with respect to child gender: results are very similar when we examine impacts on years of schooling separately for girls (columns 5-7) and boys (columns 8-10).

Figure 4, Panel A displays a nonparametric regression plot of the relationship between years of schooling for 7-12 year-olds and the shock. We plot the pre-to-post change in assets (average of 2000 and 2010 minus average of 1995 and 1990) against the migrant earnings shock. As in Figure 3, both the y-axis and x-axis variables are residuals (partialled-out) from regressions on the other right-hand-side variables in equation 3. The nonparametric regression plot also shows a positive relationship between the change in years of schooling and the migrant earnings shock.

These positive impacts on the years of completed schooling for primary- and lower-secondary-aged children suggest that educational investments for children are a key priority for households in provinces experiencing positive shocks to migrant earnings.

We also show a "placebo" experiment, taking advantage of the fact that we have two pre-shock observations of years of schooling per province (1990 and 1995). Panel B of Figure 4 displays a nonparametric regression plot that is analogous in all ways to the plot of Panel A, except that the variable on the y-axis is the change in the pre-shock period (1995 minus 1990 value). This constitutes a partial test of the identification assumption that no differential pre-existing trends exist that are related to the shock. The plot supports this assumption: there does not appear to be a clear positive relationship between the pre-shock change in years of schooling and the shock; if anything, the relationship appears to be slightly negative.

6.4 Internal migration

Given all these positive impacts of the shock that we observe, an important question of interpretation arises: to what extent do these impacts reflect changes in the composition of the population, driven by selective migration into and out of the

shock-affected areas? This type of question is sometimes raised in the context of concerns about selection bias. However, it is also appropriate to view potential compositional changes in the population as a legitimate and interesting channel through which provinces are changed when shocks to migrant earnings occur. Either way, it is important to understand whether provinces receiving positive migrant earnings shocks are appear "better off" due to improvements on the part of people who never move, or due to selected in- or out-migration, or both.

As a first step in this inquiry, we examine internal migration rates. The Philippine Census includes a question on which province the individual lived in five years before. We use this question to construct province-level rates of inmigration, outmigration, and net migration (outmigration minus inmigration), in different age groups, and estimate regression equation 3 with these outcome variables.

Results are in Appendix Table 7. While coefficients on the migrant earnings shock in the regressions for inmigration rates (in various age groups) are positive, they are not statistically significantly different from zero at conventional levels. The coefficients in the outmigration rate regressions are very small in magnitude and also not significantly different from zero. All told, there is no strong evidence that internal migration flows were affected by the shock, and therefore no evidence to suggest that the impacts presented in previous tables are the result of compositional changes in the population due to internal migration.

7 Conclusion

How do earnings by international migrants affect development in migrant origin areas? We are interested, first, in the overall impact of migrant earnings on economic development in home areas. We focus primarily on outcomes related to investment – in household assets, entrepreneurship, and in the schooling of children. In addition, we seek to shed light on the extent to which any gains extend to non-migrant households (those that do not currently have migrants). Finally, we assess the extent to which any of the effects we find are due to endogenous internal migration (both in-migration to and out-migration from) affected areas. We find that positive province-level shocks to migrant earnings lead to increases in household assets and child schooling. These results are consistent with binding credit constraints on

household investment, which are loosened as international migrant earnings opportunities improve.

Our study is unique in the literature. It is rare in general to examine impacts of migration on locality (rather than household) measures of economic development. Due to data limitations, no previous study has been able to examine the impact of migrant earnings. Our work stands out as well for its strong concern with causal identification, and for the unique natural experiment that provides plausible exogenous variation in migrant earnings.

These findings also provide insights for policy-makers. There has been great interest in academic and policy circles in development policies related to migration.[26] As developing country policymakers seek to create migration policy that will foster economic development at home, it is important to determine the effects of migration not just on migrant households but on migrant sending regions more broadly. Policy-makers in migrant destination countries may also be interested understanding the impacts of policies that affect migrants' economic prospects on outcomes their origin areas.

Future work building on our findings would examine more deeply the mechanisms through which these positive effects on migrant-origin locations are occurring. To what extent are the impacts working via alleviation of liquidity or financing constraints, as opposed to increasing willingness to take on entrepreneurial risk due to improved informal insurance provided by international migrants? To what extent do pecuniary externalities such as demand-induced increases in nontradable (e.g., property, private schooling) prices offset the overall gains? Why are origin-destination patterns of migration so persistent, even in the face of very large changes in exchange rates? We believe exploring such questions would be profitable avenues for future research.

[26] Policy-oriented publications include Pew Hispanic Center (2002), Terry and Wilson (2005), Fajnzylber and Lopez (2007), World Bank (2006) and World Bank (2007).

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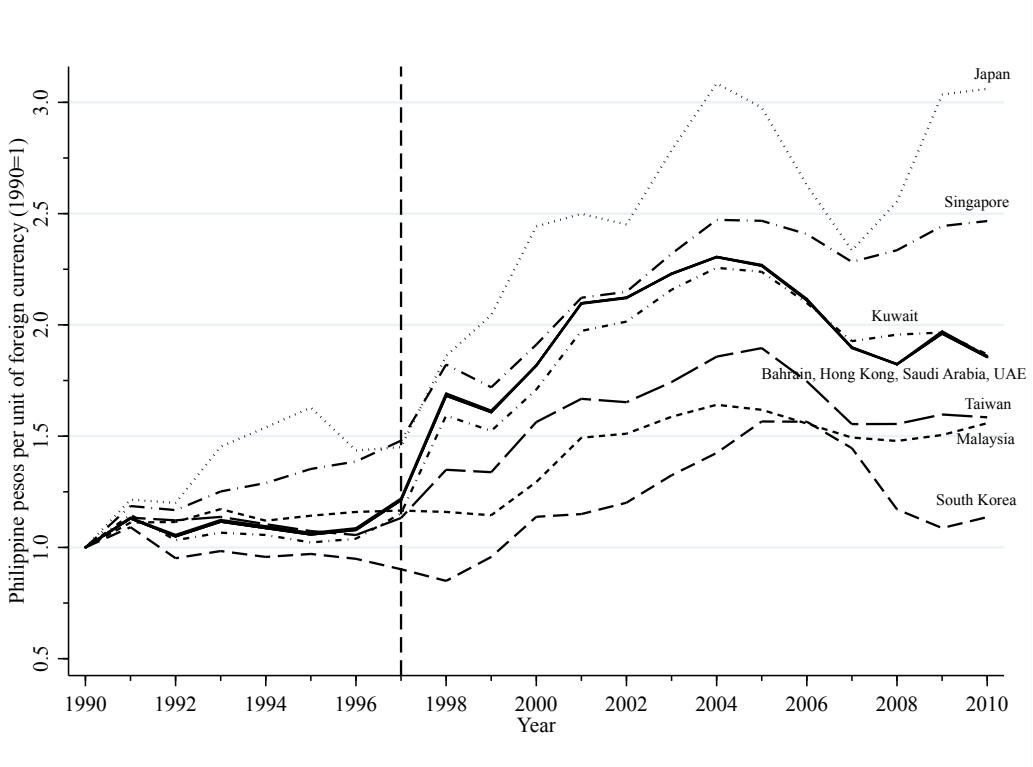
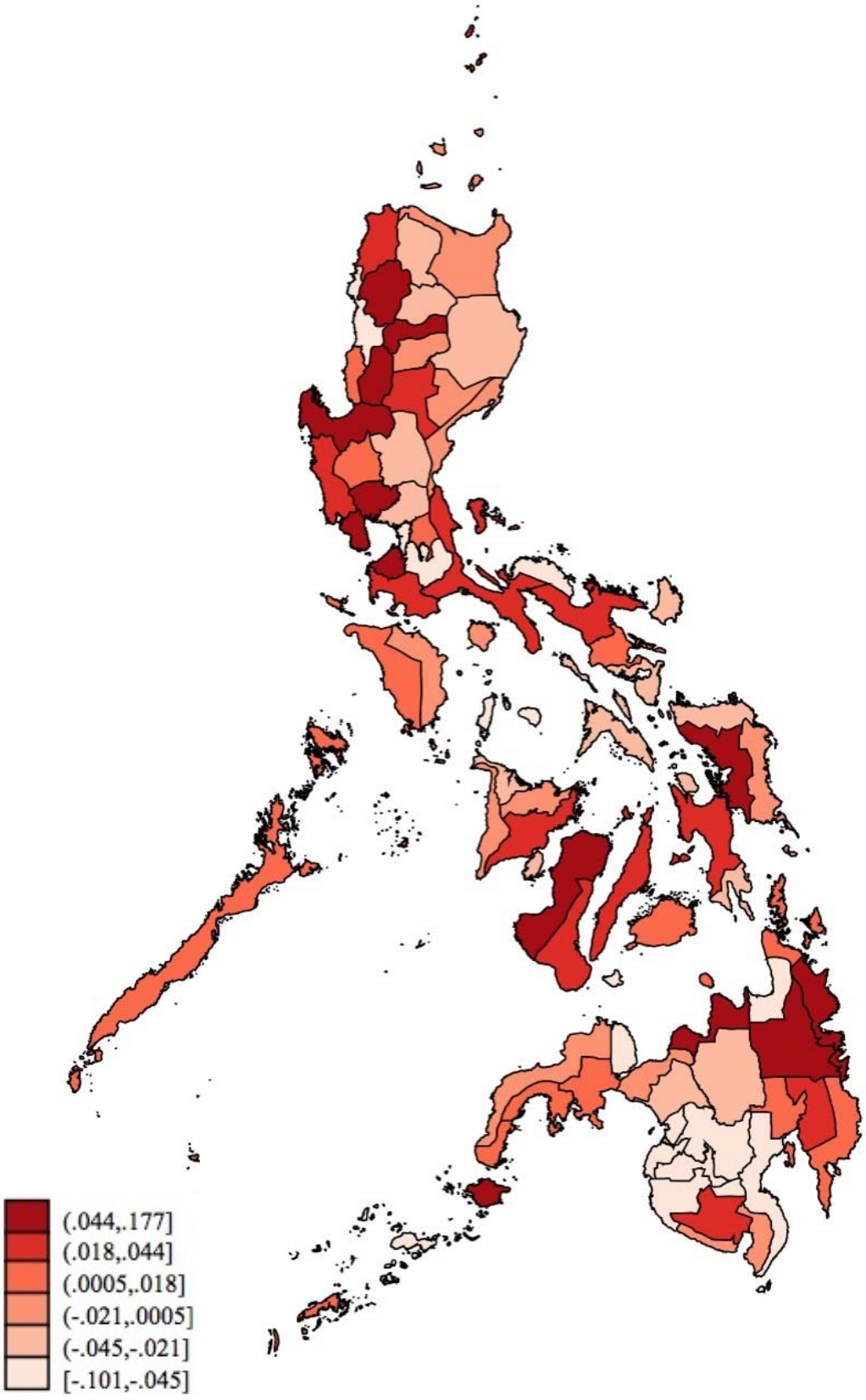
Figure 1: Exchange Rate Shocks Due to Asian Financial Crisis

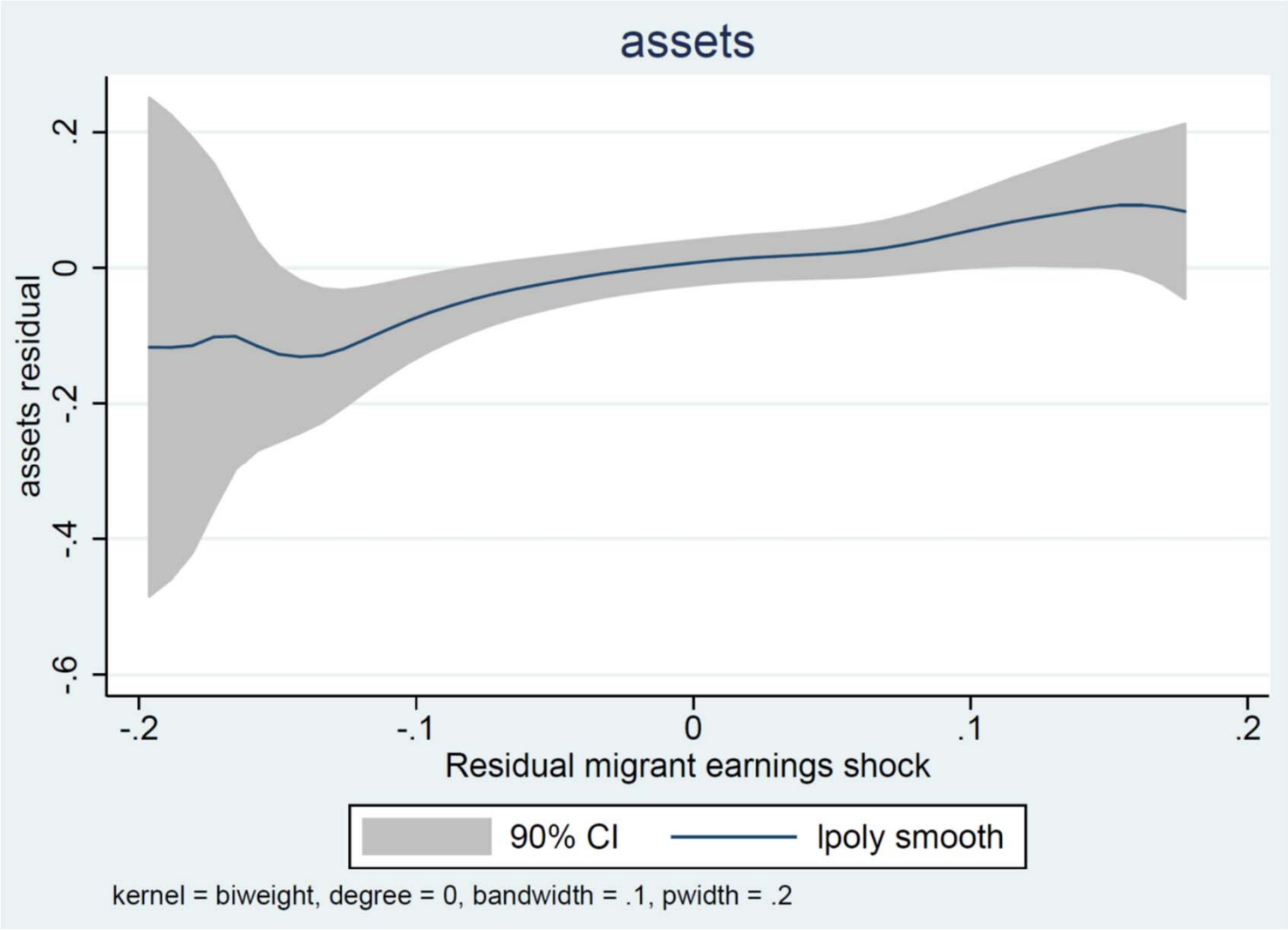


<u>Figure 2</u>: Spatial Distribution of Migrant Earnings Shock Across Philippine Provinces



Notes: Figure presents ranges of residual migrant earnings shock after partialling-out all RHS controls included in main regression specification (province fixed effects, year fixed effects, and time trend interacted with baseline province characteristics).

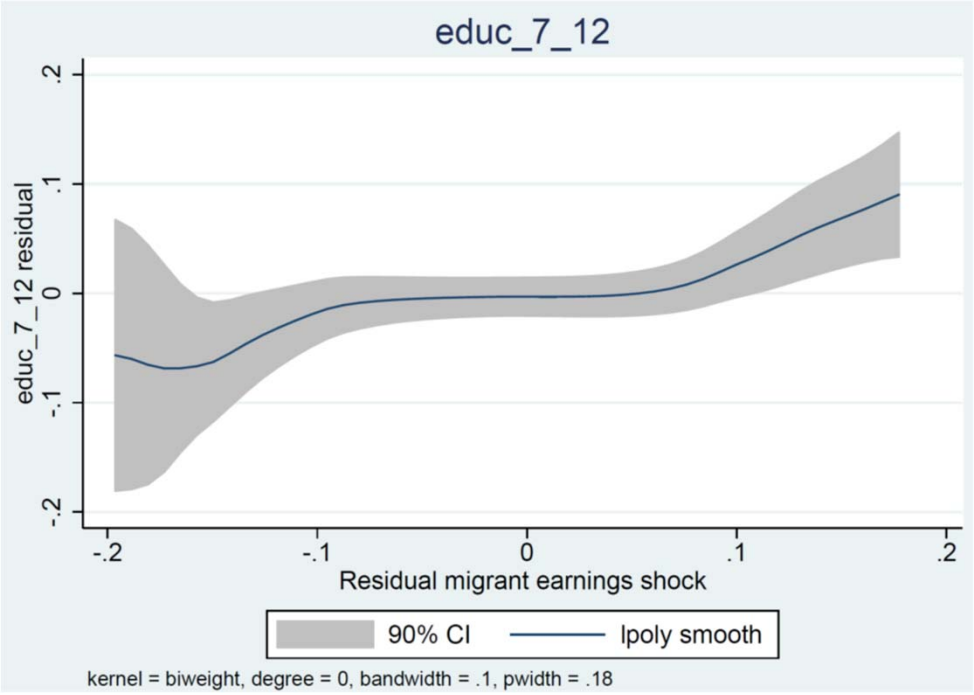
<u>Figure 3</u>: Change in Provincial Asset Index on Migrant Earnings Shock



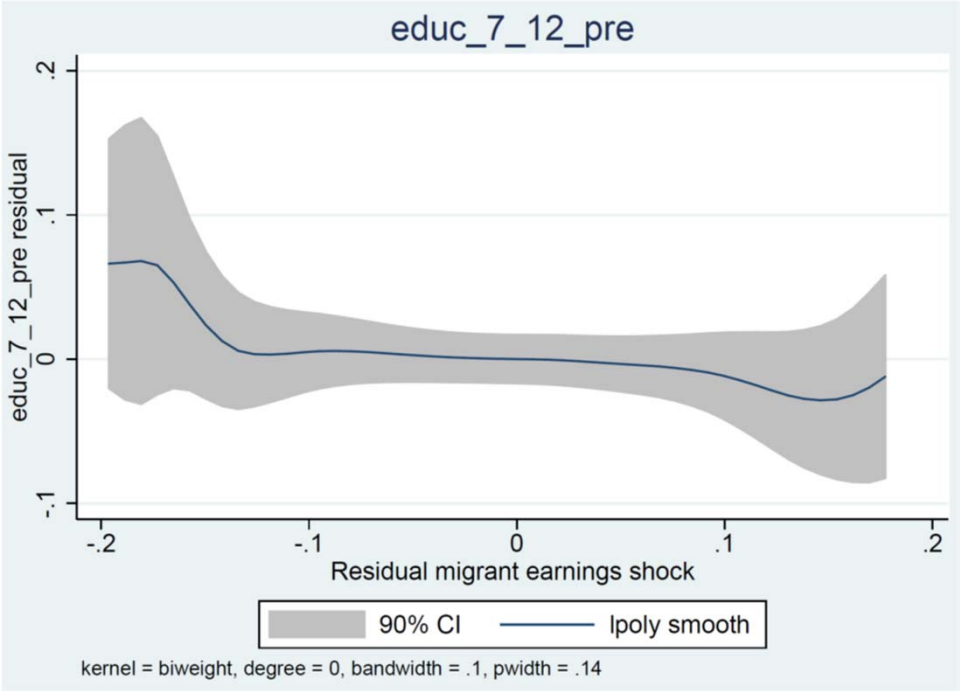
Notes: Nonparametric regressions (biweight kernel, bandwidth=0.1, degree=0, pwidth 0.2), conditional on province and year fixed effects, and linear time trends interacted with baseline province characteristics. Solid line is nonparametric regression estimate. Gray area is 90 percent confidence interval.

<u>Figure 4</u>: Change in Provincial Years of Schooling (of Children Aged 7-12) on Migrant Earnings Shock

A. True impact: change from pre-shock (average of 1990 and 1995) to post-shock (average of 2000 and 2010)



B. Placebo experiment: change in pre-shock period (1995 minus 1990)



Notes: Nonparametric regressions (biweight kernel, bandwidth=0.1, degree=0), conditional on province and year fixed effects, and linear time trends interacted with baseline province characteristics. Solid line is nonparametric regression estimate. Gray area is 90 percent confidence interval.

Table 1. Top 20 Locations of Filipino Migrants Prior to Asian Financial Crisis

Destination	Number of Migrants	% of Total	Average Annual Earnings (Thousands of Philippine Pesos)	Exchange Rate Shock (June 1997-Oct 1998)	Exchange Rate Shock: 2000	Exchange Rate Shock: 2010
Saudi Arabia	112,402	41.85	114.38	0.52	0.69	0.72
Japan	43,202	16.09	544.95	0.32	0.70	1.13
Taiwan	22,683	8.45	159.64	0.26	0.48	0.50
Hong Kong	19,641	7.31	142.06	0.52	0.67	0.71
United Arab Emirates	15,201	5.66	92.34	0.52	0.69	0.72
Malaysia	9,949	3.70	80.83	-0.01	0.12	0.34
Singapore	6,131	2.28	91.12	0.29	0.38	0.78
Italy	5,253	1.96	185.82	0.38	0.24	0.82
Qatar	4,980	1.85	81.40	0.52	0.69	0.72
Brunei Darussalam	4,595	1.71	101.68	0.30	0.38	0.78
Kuwait	3,329	1.24	137.06	0.50	0.65	0.80
United States	3,220	1.20	711.67	0.52	0.69	0.72
Bahrain	3,130	1.17	103.06	0.52	0.69	0.72
Northern Mariana Islands	2,985	1.11	111.71	0.52	0.69	0.72
Libya	2,916	1.09	197.34	0.57	0.44	-0.41
Oman	1,325	0.49	99.86	0.52	0.69	0.72
Lebanon	921	0.34	66.45	0.55	0.76	0.79
Guam	860	0.32	489.50	0.52	0.69	0.72
South Korea	477	0.26	204.40	-0.04	0.20	0.20
India	296	0.11	142.14	0.35	0.33	0.33
Other	6,494	2.41	181.12	0.34	0.16	0.25
Total	269,990	100.00				

Notes: Number of migrants and average annual salary are calculated using data from POEA and OWWA in 1993. Other includes all migrant destinations outside the top 20, or 142 destinations.The exchange rate shock is the change in Philippine pesos per local currency unit prior to the Asian Financial Crisis. The change is defined as the percent change between July 1996 to July 1997 and October 1997 and September 1998. A 10% increase is 0.1. The exchange rate shock in 2000 and 2010 are defined as the percent change in the exchange rate between 2000 and 1997 and 2010 and 1997 respectively.
Sources: POEA, OWWA, WDI

Table 2. Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
ERshock*MigEarn	0.648	0.489	0.118	1.758
Ershock	0.410	0.045	0.204	0.511
MigEarn	1.594	1.224	0.313	4.715
Migration Variables				
Total Migration Rate, age 25-64	0.021	0.015	0.001	0.073
Total Migration Rate, age 16-24	0.009	0.007	0.000	0.042
Female Migration Rate, age 25-64	0.020	0.018	0.000	0.096
Female Migration Rate, age 16-24	0.012	0.010	0.000	0.062
Male Migration Rate, age 25-64	0.022	0.017	0.001	0.101
Male Migration Rate, age 16-24	0.007	0.005	0.000	0.040
Years of Schooling				
Years of Schooling, age 7-18	4.880	0.573	3.132	6.123
Years of Schooling, age 7-12	2.776	0.332	1.758	3.508
Years of Schooling, age 13-15	6.401	0.619	4.337	7.706
Years of Schoolng, age 16-18	8.196	0.951	4.804	10.355
Years of Schooling, Female, age 7-12	2.874	0.331	1.809	3.532
Years of Schooling, Female, age 13-15	6.656	0.601	4.437	7.857
Years of Schooling, Female, age 16-18	8.621	0.977	4.908	10.812
Years of Schooling, Male, age 7-12	2.684	0.337	1.710	3.490
Years of Schooling, Male, age 13-15	6.157	0.649	4.213	7.575
Years of Schooling, Male, age 16-18	7.795	0.943	4.699	9.950
Asset Indices				
Overall	-0.316	0.811	-1.985	3.164
Durables	-0.283	0.539	-1.207	1.533
Utilities	-0.433	0.922	-2.269	2.694
Housing Quality	-0.191	0.527	-1.229	1.174
Land Ownership	0.112	0.282	-0.995	0.749
Internal Migration				
Inmigration Rate	0.027	0.021	0.001	0.141
Outmigration Rate	0.029	0.023	0.005	0.251
Net Migration Rate	0.002	0.025	-0.100	0.222
Controls (1990)				
Years of Schooling, age 7-18	4.584	0.535	3.132	5.914
Female Employment Rate, age 25-64	0.352	0.110	0.204	0.807
Male Employment Rate, age 25-64	0.831	0.099	0.409	0.969
Share Rural	0.626	0.225	0.000	0.916
Overall Asset Index	-0.580	1.206	-1.985	3.164
Enterprise Employment	0.433	0.143	0.120	0.785
Population (in 1000s)	735.869	606.314	14.973	2741.496

Notes: All observations are at the province-year level. There are 82 provinces in the sample. Age specific variables are out of the province population in that age group. For example, the "total migration rate, age 25-64" is defined as the number of migrants age 25-64 divided by the province population age 25-64.
Source: POEA, OWWA, and Census.

Table 3. Effect of Migrant Earnings Shock on Migration and Earnings

Panel A. Migration Rate	Total		Female		Male	
	Age 25-64	Age 16-24	Age 25-64	Age 16-24	Age 25-64	Age 16-24
	(1)	(2)	(3)	(4)	(5)	(6)
ERshock*MigEarn*Post	0.005	-0.027***	-0.010	-0.045***	0.022*	-0.009*
	(0.009)	(0.008)	(0.009)	(0.013)	(0.012)	(0.005)
ERshock*Post	0.000	0.003***	0.002	0.004***	-0.001	0.001*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
MigEarn*Post	-0.009	0.024***	0.008	0.042***	-0.027**	0.007
	(0.009)	(0.008)	(0.009)	(0.013)	(0.012)	(0.005)
N	328	328	328	328	328	328
R2	0.941	0.860	0.942	0.863	0.943	0.842
Mean Dependent Variable	0.021	0.009	0.020	0.012	0.022	0.007

Panel B. Earnings	Migrant Earnings Per Capita	Earnings Per Capita	Average Migrant Earnings
	(1)	(2)	(3)
ERshock*MigEarn*Post	11.563**	2.845**	689.871**
	(4.962)	(1.164)	(320.040)
ERshock*Post	-0.863*	-0.172	-64.333
	(0.478)	(0.112)	(58.773)
MigEarn*Post	-10.284**	-3.348***	-706.625**
	(4.923)	(1.173)	(332.920)
N	328	328	328
R2	0.723	0.774	0.352
Mean Dependent Variable	4.216	-0.000	307.208

Notes: All regressions include province and year fixed effects, as well as baseline controls interacted with a linear time trend. Baseline controls include the school attendance rate (ages 7-18), female employment rate (ages 25-64), male employment rate (ages 25-64), share rural, overall asset index, share of individuals working in an enterprise and province population (in 1000s), and are calculated using the 1990 Census. Post equals 1 in 2000 and 2010, and 0 in 1990 and 1995. Rates are calculated as the share of migrants within a given age group out of the total population within the same age group. Robust standard errors are clustered at the province level. *** indicates significance at the 1% level. ** indicates significance at the 5% level * indicates significance at the 10% level.

Source: POEA, OWWA, and Census.

Table 4. Effect of Migrant Earnings Shock on Asset Ownership

	Overall	Durables	Utilities	Housing Quality	Land/Home Ownership
	(1)	(2)	(3)	(4)	(5)
ERshock*MigEarn*Post	1.838**	0.668	1.486***	0.027	-0.087
	(0.836)	(0.412)	(0.509)	(0.272)	(0.232)
ERshock*Post	-0.056	-0.104**	-0.156**	0.023	-0.008
	(0.068)	(0.050)	(0.062)	(0.053)	(0.032)
MigEarn*Post	-2.266**	-0.651	-1.399***	-0.033	0.105
	(0.884)	(0.423)	(0.514)	(0.282)	(0.227)
N	246	246	246	246	246
R2	0.965	0.974	0.981	0.973	0.944
Mean Dependent Variable	-0.316	-0.283	-0.433	-0.191	0.112

Notes: All regressions include province and year fixed effects. All baseline controls interacted with a linear time trend included in Table 3 are included. Post equals 1 in 2000 and 2010, and 0 in 1990. Robust standard errors are clustered at the province level. Asset indices are calculated using a principal component analysis. The durables index includes the following assets: radio, tv, refrigerator, and phone. The utilities index includes: running water, electricity, trash collection, uses wood fuel to cook, uses a high quality fuel to cook, and flush toilet. The housing quality index includes whether the house has a metal roof and whether the house has brick walls. The land/homeownership index includes if the household owns land and if the household owns their home. The overall index includes all assets included in the four subindices. *** indicates significance at the 1% level. ** indicates significance at the 5% level * indicates significance at the 10% level.
Source: POEA, OWWA, and Census.

Table 5. Effect of Migrant Earnings Shock on Years of Schooling, By Age

		Total			**Female**			**Male**		
	Age 7-18	Age 7-12	Age 13-15	Age 16-18	Age 7-12	Age 13-15	Age 16-18	Age 7-12	Age 13-15	Age 16-18
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ERshock*MigEarn*Post	0.652***	0.493***	0.321*	0.302	0.512***	0.316*	0.356	0.474***	0.338*	0.311
	(0.212)	(0.141)	(0.167)	(0.380)	(0.140)	(0.175)	(0.420)	(0.147)	(0.171)	(0.377)
ERshock*Post	-0.087***	-0.066***	-0.054**	-0.080	-0.072***	-0.052*	-0.084	-0.061***	-0.059**	-0.084
	(0.028)	(0.021)	(0.027)	(0.068)	(0.021)	(0.029)	(0.072)	(0.022)	(0.027)	(0.065)
MigEarn*Post	-0.628***	-0.454***	-0.281*	-0.295	-0.475***	-0.274	-0.336	-0.432***	-0.302*	-0.319
	(0.211)	(0.136)	(0.161)	(0.363)	(0.135)	(0.168)	(0.405)	(0.143)	(0.168)	(0.361)
N	328	328	328	328	328	328	328	328	328	328
R2	0.975	0.960	0.985	0.979	0.959	0.984	0.978	0.960	0.984	0.976
Mean Dependent Variable	4.880	2.776	6.401	8.196	2.874	6.656	8.621	2.684	6.157	7.795

Panel B. 2000 vs 2010		**Total**			**Female**			**Male**		
	Age 7-18	Age 7-12	Age 13-15	Age 16-18	Age 7-12	Age 13-15	Age 16-18	Age 7-12	Age 13-15	Age 16-18
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ERshock*MigEarn*Post 2000	0.668***	0.464***	0.248	0.562	0.486***	0.249	0.678	0.441***	0.259	0.512
	(0.175)	(0.142)	(0.179)	(0.515)	(0.130)	(0.181)	(0.542)	(0.158)	(0.188)	(0.520)
ERshock*MigEarn*Post 2010	0.641**	0.490**	0.378	-0.189	0.500**	0.392	-0.195	0.479**	0.384	-0.119
	(0.322)	(0.190)	(0.247)	(0.340)	(0.194)	(0.247)	(0.373)	(0.190)	(0.262)	(0.363)
p-value on test of equality	0.905	0.875	0.567	0.209	0.932	0.523	0.136	0.831	0.599	0.312
N	328	328	328	328	328	328	328	328	328	328
R2	0.976	0.961	0.985	0.980	0.960	0.984	0.978	0.961	0.985	0.977
Mean Dependent Variable	4.880	2.776	6.401	8.196	2.874	6.656	8.621	2.684	6.157	7.795

Notes: All regressions include province and year fixed effects. All baseline controls interacted with a linear time trend included in Table 3 are included. Post equals 1 in 2000 and 2010, and 0 in 1990. Robust standard errors are clustered at the province level. *** indicates significance at the 1% level. ** indicates significance at the 5% level * indicates significance at the 10% level.

Appendix Table 1. Share of Households with Migrant Connections

Year	Migrants as % of population	% of households with a migrant member	% of households receiving remittances
1990	0.7%	3.2%	
1991			17.6%
1994			19.8%
1995	1.1%	5.0%	
1997			17.3%
2000	1.3%	5.2%	18.1%
2003			20.7%
2006			23.3%
2009			26.0%
2010	1.6%	6.3%	

Source: Authors' calculations from 2010 the Philippine Census (1990, 1995, 2000, and 2010) and the triennial Family Income and Expenditure Survey (FIES) from 1991-2009 inclusive. Migrants as % of population is number of individuals reported as migrants divided by total population in Census. % of households with a migrant member is fraction of all households reporting a migrant member in Census. % of households receiving remittances is share of households receiving remittances from overseas (not necessarily from a household member), from FIES (nationally representative survey of households).

Appendix Table 2. Persistence of Exchange Rate Shock

	2000 Exchange Rate Shock			2010 Exchange Rate Shock		
	All destinations	Destinations with >1000 migrants	Destinations with >5000 migrants	All destinations	Destinations with >1000 migrants	Destinations with >5000 migrants
	(1)	(2)	(3)	(4)	(5)	(6)
1998 Ershock	1.194***	1.310***	0.840***	1.191***	1.034***	0.511***
	(0.068)	(0.169)	(0.117)	(0.103)	(0.316)	(0.179)
N	163	41	25	163	41	25
R2	0.746	0.642	0.593	0.319	0.192	0.088

Notes: This table reports results from regressions of the exchange rate shock in 2000 or 2010 on the 1998 exchange rate shock, to measure persistence of the shocks. Reported coefficients are the coefficient on the 1998 exchange rate shock variable. Exchange rate shocks are defined as Philippine pesos per local currency unit exchange rate in a given year, divided by the 1997 exchange rate minus 1. Robust standard errors are in parentheses. *** indicates significance at the 1% level. ** indicates significance at the 5% level * indicates significance at the 10% level.

Source: POEA, OWWA, and Census.

Appendix Table 3a. Persistence of Total OFW Rate

	2000 Migration Rate	2010 Migration Rate
	(1)	(2)
1995 Migration Rate	0.740***	0.977***
	(0.034)	(0.055)
N	82	82
R2	0.779	0.797

Notes: The unit of observation is the province. Migration rates are the number of migrants in province j out of the total population in province j. Outcome variables are reported in the column headings. Robust standard errors are in parentheses. *** indicates significance at the 1% level. ** indicates significance at the 5% level * indicates significance at the 10% level

Source: POEA, OWWA, and Census.

Appendix Table 3b. Persistence of Migrant Shares Over Time

Bahrain	0.796***
	(0.161)
Brunei Darusssalam	0.209**
	(0.095)
Guam	1.149***
	(0.157)
Hong Kong	0.885***
	(0.072)
India	0.453
	(0.584)
Italy	0.466***
	(0.031)
Japan	0.027***
	(0.005)
Kuwait	0.642
	(0.581)
Lebanon	-0.000
	(0.000)
Libya	1.009***
	(0.184)
Malaysia	0.046***
	(0.013)
Northern Mariana Islands	0.022***
	(0.004)
Oman	0.725***
	(0.271)
Qatar	2.573***
	(0.442)
Saudi Arabia	0.698***
	(0.128)
Singapore	0.856***
	(0.311)
South Korea	0.034**
	(0.013)
Taiwan	0.419***
	(0.107)
United Arab Emirates	1.521***
	(0.308)
United States	0.212***
	(0.029)
p-value from SUR	0.000

Notes: The unit of observation is the province. N=82. Reported coefficients are from regressions of the number of migrants from province j going to a given destination in 2009 divided by the population in province j regressed on the the number of migrants from province j going to a given destination in 1995 divided by the population in province j. Results are reported for the 20 top migrant destinations in 1993. Robust standard errors are in parentheses. The bottom row of the table reports the p-value on a test of joint significance of the migrant shares in 1995 from a seemingly unrelated regression (SUR) model. *** indicates significance at the 1% level. ** indicates significance at the 5% level * indicates significance at the 10% level

Source: POEA, OWWA, and Census.

Appendix Table 4. First Principal Component Loadings

	Overall Asset Index
Refrigerator	0.322
Television	0.3521
Radio	0.175
Water	0.2271
Phone	0.1736
Electricity	0.3305
Metal Roof	0.2944
Brick Walls	0.2339
Trash collection	0.2678
Wood Fuel	0.3414
High Quality Fuel	0.3476
Flush Toilet	0.2945
Home Ownership	0.1123
Land Ownership	0.0278

Notes: This table shows the principal component loadings for each asset in the the overall asset index.

Appendix Table 5. Correlates of shock variables

	Exchange Rate Shock	Migrant Earnings Per Capita	Exchange Rate Shock times Migrant Earnings Per Capita	Exchange Rate Shock times Migrant Earnings Per Capita
	(1)	(2)	(3)	(4)
Migrant Earnings Per Capita	0.593***			1.019***
	(0.224)			(0.020)
Exchange Rate Shock		0.163***		0.087***
		(0.062)		(0.011)
Average Years of Schooling (ages 7-18)	-1.413***	0.288	0.029	0.084***
	(0.336)	(0.177)	(0.244)	(0.029)
Female employment rate (ages 25-64)	-2.542***	0.206	-0.432	0.037
	(0.870)	(0.617)	(0.890)	(0.071)
Male employment rate (ages 25-64)	-0.367	-0.451	-0.648	-0.010
	(0.789)	(0.463)	(0.572)	(0.061)
Share rural	1.684*	1.753***	2.644***	0.093
	(0.952)	(0.592)	(0.574)	(0.070)
Overall asset index	0.142	0.944***	1.132***	-0.027
	(0.308)	(0.142)	(0.165)	(0.022)
Rate of employment in enterprises	-0.729	0.326	0.276	0.094
	(1.359)	(0.635)	(0.709)	(0.092)
Population (1000's)	-0.000	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
N	82	82	82	82
R2	0.427	0.842	0.792	0.997
p-value on test of joint significance				
Mean Dependent Variable	9.018	1.295	1.320	1.320

Notes: The outcome variables are indicated in the column headers, and are regressed on control variables in 1990. Robust standard errors are clustered at the province level. *** indicates significance at the 1% level. ** indicates significance at the 5% level * indicates significance at the 10% level.

Source: POEA, OWWA, and Census.

Appendix Table 6. False or Placebo Experiment (check for pre-trends)

	Total		Female		Male	
Panel A. OFW Rate	Age 25-64	Age 16-24	Age 25-64	Age 16-24	Age 25-64	Age 16-24
ERshock*MigEarn*Post	0.016	0.006	0.023*	0.011	0.008	-0.000
	(0.009)	(0.004)	(0.013)	(0.008)	(0.011)	(0.003)
ERshock*Post	0.000	0.000	-0.000	-0.000	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
MigEarn*Post	-0.009	-0.003	-0.016	-0.008	-0.002	0.003
	(0.010)	(0.004)	(0.014)	(0.008)	(0.011)	(0.004)
N	164	164	164	164	164	164
R2	0.991	0.989	0.986	0.985	0.986	0.981
Mean Dependent Variable	0.016	0.008	0.016	0.011	0.017	0.005

	Total			Female			Male		
Panel B. Years of Schooling	Age 7-12	Age 13-15	Age 16-18	Age 7-12	Age 13-15	Age 16-18	Age 7-12	Age 13-15	Age 16-18
ERshock*MigEarn*Post	-0.068	-0.054	-0.362	-0.049	-0.089	-0.344	-0.086	-0.007	-0.367
	(0.237)	(0.240)	(0.449)	(0.230)	(0.244)	(0.408)	-0.248	-0.254	-0.527
ERshock*Post	0.006	0.006	0.072	0.008	0.012	0.080	0.005	-0.003	0.058
	(0.030)	(0.033)	(0.056)	(0.029)	(0.035)	(0.062)	-0.03	-0.033	-0.059
MigEarn*Post	0.069	0.017	0.434	0.052	0.049	0.393	0.086	-0.031	0.461
	(0.246)	(0.243)	(0.461)	(0.238)	(0.247)	(0.421)	-0.258	-0.259	-0.542
N	164	164	164	164	164	164	164	164	164
R2	0.973	0.994	0.993	0.972	0.993	0.991	0.974	0.994	0.992
Mean Dependent Variable	2.576	6.155	7.853	2.666	6.399	8.244	2.49	5.921	7.484

Notes: All regressions include province and year fixed effects. All baseline controls interacted with a linear time trend included in Table 3 are included. To conduct the check for pre-trends, post equals 1 in 1995 and 0 in 1990. Robust standard errors are clustered at the province level. *** indicates significance at the 1% level. ** indicates significance at the 5% level * indicates significance at the 10% level.

Source: POEA, OWWA, and Census.

Appendix Table 7. Effect of Migrant Earnings Shock on Internal Migration

	Inmigration rate				Outmigration rate			
	Age 25-64	Age 16-24	Age 7-12	Age 13-15	Age 25-64	Age 16-24	Age 7-12	Age 13-15
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ERshock*MigEarn*Post	0.056	0.073	0.047	0.060	0.001	0.018	-0.001	0.005
	(0.047)	(0.048)	(0.044)	(0.040)	(0.033)	(0.044)	(0.026)	(0.024)
ERshock*Post	-0.002	-0.005	-0.001	-0.002	-0.000	-0.003	0.001	0.000
	(0.007)	(0.007)	(0.005)	(0.005)	(0.004)	(0.006)	(0.003)	(0.003)
MigEarn*Post	-0.056	-0.074	-0.048	-0.062	0.001	-0.022	0.005	-0.003
	(0.049)	(0.051)	(0.046)	(0.042)	(0.036)	(0.049)	(0.027)	(0.027)
N	231	231	231	231	231	231	231	231
R2	0.868	0.918	0.850	0.871	0.711	0.574	0.823	0.676
Mean Dependent Variable	0.029	0.035	0.022	0.021	0.030	0.046	0.021	0.022

Notes: All regressions include province and year fixed effects. All baseline controls interacted with a linear time trend included in Table 3 are included. Post equals 1 in 2000 and 2010, and 0 in 1990. Robust standard errors are clustered at the province level. *** indicates significance at the 1% level. ** indicates significance at the 5% level * indicates significance at the 10% level.

Source: POEA, OWWA, and Census.