International Migration, Exchange Rate Shocks, and Education Investment

Masyhur A. Hilmy
University of New South Wales*

April 2025

Abstract

International migrants channel resources from abroad, but if they cause the state to reduce public investments back home, they may lead to negative development outcomes. I use Indonesian migrant returnees data and district variations in migration destinations and exchange rate shocks to estimate the effects of foreign income shocks on education investments. Households in higher-shock districts send more children to school, prompting the government to increase public schools. The state also provides other public goods complementing household investments. These responses to shocks are not driven by election or taxation, but rather by policy commitments and interactions with district splitting.

JEL Classifications: F22, F24, H41, I25, O15
Keywords: International Migration, Remittances, Public Goods, Education

*School of Economics, Sydney NSW 2052 Australia. I am very grateful to my advisor, Samuel Bazzi for his feedback and support throughout this project. This paper also benefited from feedback and suggestions from Joshua Goodman, David Lagakos, Ben Marx, David McKenzie, Dilip Mookherjee, Daniele Paserman, Dean Yang, Cesar Garro-Marin, Nils Lehr, Nurul Wakhidah, as well as seminar audiences at the BU Development Reading Group, Georg-August-Universität Göttingen, INSEAD, LKY SPP NUS, Macquarie University, Monash University, NUS Economics, UNSW Sydney, the AIFIS conference at MSU, the 2022 NEUDC conference, and the 2024 BREAD in Asia conference. Any errors are my own. Email: m.hilmy@unsw.edu.au.

1 Introduction

International migrants use their income from work abroad to help their families back home, and these are an important resource for many developing countries. A portion of these are often sent home as remittances, and the overall flow to low and middle-income countries can be sizable. At an estimated total of US$554 billion in 2019, the flow of foreign migrant incomes sent back to migrants' origin surpassed the flow of foreign aid to developing countries (Ratha et al., 2020). In fact, remittances bring in more resources than oil in Nigeria (The Economist, 2019), revenues from the Suez Canal in Egypt, and IT services exported from India (Ratha et al., 2016). For many small nations, they comprise significant portions of their GDP. This is the case for countries as diverse as Tonga (39%), Tajikistan (27%), and El Salvador (24%) (World Bank, 2019). As recipient households use them for consumption and investments, migrant incomes hold great potential to boost development in developing countries (World Bank, 2006, 2017).

However, the state's reactions to incoming resources from abroad could create negative consequences. If the migrant origin households use these foreign income to invest in substitutes for public goods and services, the state may respond by reducing public investments–a phenomenon often referred to as a "remittance curse." On the other hand, if the households instead increase their demand for public services, the state may make complementary investments that avert the curse. Thus, the state's provision of public goods can indicate how it responds to the foreign income windfall. Presently, the link between migrant income and the state's responses is still not well understood.

Empirically, it is challenging to analyze the impact of foreign migrant incomes on public goods and local development for several reasons. First, a positive correlation between local development and foreign migrant incomes could result from the fact that places with good outcomes facilitate migrants to send more of their abroad income as remittances. Second, when migrants only earn their incomes after they are abroad, changes in migration policies potentially impact migration and the foreign income flow simultaneously. The foreign income flow may influence the area of origin independent of migration, but the inextricable link between them makes it difficult to study both independently. Third, comprehensive data is rare. Migration or remittance data are often only available as country-level estimates, limiting analysis of foreign migrant incomes to approaches using cross-country regressions. The cross-country analyses typically rely on instrumental variables that lack validity or have low statistical power (Clemens and McKenzie, 2018).

In this paper, I overcome the above challenges by exploiting variations in international migrations and currency exchange rates to investigate the effect of migrant income shock in Indonesia. I identify the effects of migrant income shock on both households and districts by combining three sources of variation: the intensity of migration in different regions, a plausibly exogenous variation in the share of migrants going to different destination countries, and shifts in currency exchange rates over time. The latter provide unanticipated changes to the size of foreign income that households receive from abroad, and its magnitude depends on the migration destination. Since the share of destinations and the migration intensity differs by districts, this difference induces variation in the shocks at the district level. Using this approach, I estimate the reduced form effects on household indicators and public goods outcomes across Indonesian districts that are due to the exchange rate shocks.[1]

Indonesia provides an excellent setting to study the impact of foreign migrant income on public goods provision because nearly one million Indonesians migrate abroad annually. These migrants typically send portions of their earning home, making Indonesia the 14th

[1]This strategy builds on studies by Yang (2008) and Khanna et al. (2022), who estimated the effect of exchange rate shocks to the Philippines Peso on migrant household outcomes and domestic incomes, but did not analyze the provision of public goods.

largest remittance receiver in the world (World Bank, 2019). Indonesia also provides reliable subnational data, making it possible to exploit variations in destination and the scale of migration across hundreds of districts to overcome endogeneity challenges. The districts across Indonesia operate similarly under the same code of law, providing the opportunity to overcome the limitations of cross-country regressions, where unobserved variables may correlate with public goods provision and foreign migrant income.

I begin my analyses by showing that positive exchange rate changes increase the size of foreign income received by migrants' households of origin as remittances. Using a small panel data of migrant households from Doi et al. (2014), I find that origin households reports higher remittances when the Indonesian rupiah (IDR) depreciates against the migrants' host country's currency. The panel survey allows me to demonstrate the link between variations in exchange rates with changes in the flow of foreign migrant incomes at the household level.[2]

Next, I leverage a unique dataset to construct a foreign migrant income shock at the district level. I obtained an administrative record of more than one million migrant returnees and use their destination and origin addresses to measure the district-level exposure to foreign currency shocks before and after the global financial crisis (GFC). During this period, the crisis led to fluctuations in currency exchange rates against the Indonesian rupiah (IDR) at varying magnitudes. For example, the Singaporean dollar (SGD) rose by 18% between 2007–2008. In the same period, the US dollar (USD) and Saudi riyal (SAR) exchange rates both only changed by 5%, but the changes in their exchange rate to the IDR caught up with the SGD eight months later at 33% higher relative to 2007.[3] I construct foreign migrant income shocks using the interaction of migration intensity and currency fluctuations. I subsequently combine this measure with rich data from household surveys, school registries, and regional budget reports to estimate the effect of foreign migrant income shocks.

To address threats to causal identification, I provide diagnostics following the recent literature of shift-share identification based on exogenous shares from Goldsmith-Pinkham et al. (2020).[4] I find that there were no differential changes in the outcomes based on the share of migration prior to the GFC-induced exchange rate shocks, bolstering the parallel trend assumption. The districts' migration destinations in the pre-period are also generally uncorrelated with districts' baseline characteristics, while concerns about districts' time-invariant characteristics are alleviated with the inclusion of district fixed effects. I also test the relationship between pre-period outcomes with subsequent foreign migrant income shocks, and I find that future migrant income shocks do not predict past outcomes.

I find that migrant exchange rate shocks improve household-level development indicators. Specifically, they increase per capita expenditures for households at the bottom quintile of the expenditure distribution. An increase in the migrant exchange rate shocks by one standard deviation (SD), which corresponds to a back-of-the-envelope windfall of USD 260,000 to the economy in the given district, raises poor households' consumption by USD 2 per month (a 10 percent increase). Households also report a higher rate of ownerships for durable assets such as motorcycles, refrigerators, and cooking gas canisters.

Households invest more in education, and the migrant exchange rate shocks enable households to send more of their children to school. A one SD shock raises the enrollment

[2]Because respondents in the panel are recruited from only 400 migrant households in two districts, this validation exercise is akin to an out-of-sample analysis on a dataset with limited coverage.

[3]The monthly average exchange rates changed from IDR 5,772 (June 2007) to IDR 6,832 (June 2008) per SGD. Within the same period, the USD exchange rate changed from IDR 8,827 to IDR 9,305 per USD. The SAR is pegged to the USD at a rate of SAR 3.75 per USD. The rates in February 2009 are IDR 7,718 per SGD and IDR 11,775 per USD (Refinitiv, 2022). The changes to the exchange rate to the Malaysian ringgit (MYR) were 11% and 24% for June 2008 and February 2009, respectively (Refinitiv, 2022).

[4]Another approach of shift-share analysis in Borusyak et al. (2022) follows a different set of assumptions.

rate by 3 p.p., 4 p.p., and 7 p.p. for primary (grades 1-6), junior secondary (grades 7-9), and senior secondary (grades 10-12) levels, respectively. Cohort-specific analysis shows children aged 6, 13, and 16 drive increased enrollment; each of these are the crucial ages when children begin each level. These effects represent a meaningful improvement in achieving universal basic education, particularly in a context where secondary level enrollments have lagged behind the near-universal primary enrollment.

As households invest in education, the state responds accordingly. District governments in Indonesia bear the responsibility to provide public goods and services, which include public schools. In response to a one SD shock in migrant exchange rate shocks and subsequent increased enrollment, districts opened 0.78 more public primary schools and 0.25 more public junior high schools per 10,000 population one year after the shock. To provide junior secondary schools, district governments expand existing primary schools, which allows new schools to be established rapidly with fewer classrooms and teachers. Because of the expansion, the increased enrollment reported by households may include the effect of relaxing the constraint on the school supply. Like the provision of education, the provision of other public goods under district governments' purview demonstrates a consistent pattern: the state expands access to services that complement household investments.

The migrant exchange rate shocks may lead to the observed effects through migrant remittances and other channels that connect the migrants with their origin areas. I provide robustness checks to show that these are the relevant channels, and not alternative explanations such as commodity trade and differential trends. I construct a proxy for trade windfall from oil and gas and palm oil, Indonesia's primary export commodities. The coefficients for migrant exchange rate shocks do not change meaningfully with the inclusion of trade variables, indicating that commodity trade is unlikely to be the main driver of the observed results. My regressions also include an array of baseline controls, which provide further evidence of robustness. Separately, I account for differential trends by interacting year fixed effects with a set of indicators for island groups and I also test for alternative clustering that accounts for correlated shocks across districts. The relationship between migrant exchange rate shocks and outcomes is robust to these checks.

What drives this supply-side response to migrant exchange rate shocks? I consider four possible drivers of local governments' actions: policy commitments, local accountability, redistribution of tax windfalls, and electoral concern. For the first two, institutional contexts matter. First, districts are mandated by the constitution to commit at least 20% of their budget for education expenditures. Education expenditure rose from 27% on average in 2006 to 41% in 2012. Second, the push to make local government more accountable led to the creation of smaller districts ("splitting"). This process increased the number of districts from 440 to 514 in my study period due to the redistricting of existing boundaries. With smaller districts, the government could be more accountable in providing public service. Split districts also receive a significant increase in annual transfers following the fiscal allocation rules (Bazzi and Gudgeon, 2021). I analyze the districts' heterogeneous responses by their education budget and redistricting status.

I find that migrant exchange rate shocks influence the provision of local public goods in two ways: by complementing the state's existing policy commitments and strengthening its accountability. When the migrant exchange rate shocks occur after the district government allocates a higher share of its budget for education expenditures, I observe increased expansion of public schools. In this way, migrant exchange rate shocks complement commitments toward education, leading to increases in education investments. I also observe a positive interaction between migrant exchange rate shocks and an indicator for district split. This result suggests that migrant incomes can play an important role when accountability channels have strengthened and the local governments have ample fiscal space.

On the other hand, my findings support neither taxation nor election-driven responses. Suppose that the state captures part of the economic boom through taxes; it could use these funds to finance more public goods. Migrant remittances are not taxed, but the government collects income and property taxes. Using budget reports from the Ministry of Finance, I find migrant exchange rate shocks do not lead to increased tax revenues for the district. It also appears that electoral concerns do not drive the response. There are no systematic differences in the provision of public goods during district election years when local politicians might build schools to win votes.

At the aggregate level, I find migrant exchange rate shocks also improve development indicators such as regional GDP per capita and poverty indicators. I find a one SD shock is associated with 0.08 log points higher total GDP per capita. This magnitude corresponds to a ∼USD 48 increase at the mean. Migrant exchange rate shocks also reduce the share of households living below the poverty line, the poverty gap, and inequality as measured by the Gini coefficient.

Literature. I contribute to the literature on the impact of international migration and remittances. Research on these topics has continued to grow, reflecting increased interest among policymakers. While the existing literature has established the positive effect of remittances on household consumption using cross-country analysis, it has come to diverging conclusions on economic growth.[5] Yang (2008) and Khanna et al. (2022) take advantage of a natural experiment based on the 1997 exchange rate shock in the Philippines to provide evidence on the short- and long-term effects of foreign migrant income on households and their origin areas. I use a similar strategy in Indonesia, a new setting, to show that migrant exchange rate shocks increase household consumption and investment in education.

My paper provides two distinct contributions to the existing studies. First, I estimate the effects of migrant exchange rate shocks on public goods. Researchers have used cross-country data to link foreign incomes and remittances to various governance outcomes. Abdih et al. (2012) and Ahmed (2012, 2013) proposed theoretical models arguing for the existence of a remittance curse, where remittances increase corruption and reduce political turnover. Others, however, have argued that the remittance curse model does not hold for political competition and that remittances are more likely to increase government spending on education in democracies (Desierto, 2018; Easton and Montinola, 2017). These conflicting results may be due to the difficulty of disentangling the endogenous link between state failure as indicated by corruption, the outmovement of migrants, and its subsequent remittance flow (Mosley and Singer, 2015). Variations in governance structure across countries may also further hinder analysis of how governments provide public goods. To overcome these obstacles, I study a setting where local governments provide public goods according to a common governance structure.

Second, my rich data enables me to investigate how the state responds to foreign income shocks. By analyzing the heterogeneity in district responses, I can examine the roles of taxation, policy commitments, proliferation of government units, and elections in shaping the state's response to foreign migrant income and the patterns of public goods provision. Asatryan et al. (2017) find that remittances increase the likelihood of introducing the VAT. Decentralization-led district splitting could also influence public goods provision (Lewis, 2017; Cassidy and Velayudhan, 2022). Banerjee et al. (2007) highlight cases in India and elsewhere where top-down interventions financed by public budgets have been

[5]The cross-country regression literature has shown evidence for opposing views of the effects of remittances on growth. Giuliano and Ruiz-Arranz (2009) and Catrinescu et al. (2009) show positive effects, while Chami et al. (2008) and Le (2009) demonstrate negative effects. The cross-country analyses concur more with regard to the effects of remittances on poverty (Adams and Page, 2005; Gupta et al., 2009). For reviews of recent empirical evidence, see Yang (2011), Brown and Jimenez-Soto (2015) and Alpaslan et al. (2021).

central to public goods expansion. Pierskalla and Sacks (2018, 2020) have documented that government spending and hiring in Indonesia are influenced by election cycles. Marx (2018) shows that elections incentivized African leaders to complete visible development projects. My findings suggest that the state responds to migrant income flows not through taxation or election but through policy commitments and interactions with district splitting.

My work also contributes to the literature on human capital and migration. Recent studies have evaluated interventions designed to stimulate remittances for investment in education among Salvadoran and Philippine migrants (Ambler et al., 2015; De Arcangelis et al., 2015). These studies build on the literature that points to the positive effect of remittances on school enrollment (Edwards and Ureta, 2003; Yang, 2008; Amuedo-Dorantes and Pozo, 2010; Salas, 2014). Other studies have also linked migration opportunities to human capital investment (Dinkelman and Mariotti, 2016; Theoharides, 2018; Abarcar and Theoharides, 2021; Khanna and Morales, 2021). These studies focus on the response to education demand. Abarcar and Theoharides (2021) is a notable exception that also measures effects on the supply side and shows that expanding US visas for nurses led to the creation of new nursing programs at existing private tertiary institutions. Similarly, I measure changes in both the demand for and supply of education while focusing on the effects of migrant income shocks from low-skill migrants. My results contribute to the brain drain debate by providing evidence that low-skilled migration can induce brain gain.

2 Context: Indonesian Migrants and Local Public Administration

2.1 International Migration

According to the Indonesian Central Bank, approximately four million Indonesians worked abroad between 2005-2012 (BI, 2022). The international migrants, known locally as TKI (*Tenaga Kerja Indonesia*), are mainly women with low education. Placement statistics from the national agency for the placement and protection of Indonesian workers (BNP2TKI) indicate that about half of these women only completed basic education, and even fewer have completed upper secondary or post-secondary education (BNP2TKI, 2014).

Most of Indonesian migrants work in low-skilled jobs as housekeepers and operators (61 percent), plantation workers (10 percent), or fisherman (5 percent, BNP2TKI (2014)). Prospective migrants need to only show that they have completed six years of education in primary schools before they can apply for a placement abroad. To improve overseas migrant protection, the Indonesian government had intended to raise the educational requirement to work abroad (Law 39/2004 on Migrant Placement). However, the Constitutional Court deemed the requirement unconstitutional and ruled that primary education remains sufficient for work placement abroad.

The main countries to which Indonesians migrate include: Saudi Arabia and other Gulf countries, Malaysia, Taiwan, and Singapore (Appendix Table A.2, see also Bank Indonesia (2018)). It is not uncommon for migrants from the same area to work in different destination countries. A key factor that influences a migrant worker's destination is the interaction with recruiters/"sponsors" in the village. These recruiters connect prospective migrants with a placement agency, and they are frequently the prospective migrant's first point of contact in starting their migration journey (Bazzi et al., 2021).

With their low education backgrounds and foreign working environment, Indonesian workers are especially vulnerable to exploitation. The Indonesian government recognized this vulnerability and established an agency for the placement and protection of Indonesian workers (BNP2TKI, Law 39/2004). The agency's responsibilities included the cre-

ation of a service post for migrants at debarkation points–commonly referred to as the "migrant terminal" in Indonesian airports–where they recorded returning migrants' details and provided other relevant services. The administrative record from this terminal is a key component in the empirical analysis (subsection 4.2).

Indonesian migrants typically work under a fixed-term contract of 2-3 years (Bazzi, 2012). Prior to their departure, the migrants sign a contract with an agency that is then responsible for their training and preparation (Bazzi et al., 2021). The contract stipulates the worker's salary in the destination country's currency, and the salary remains fixed for the duration of the contract (Bazzi et al., 2021). Nevertheless, because the Indonesian rupiah (IDR) uses a floating rate, the migrant's salary in IDR fluctuates based on the exchange rate between the destination country's currency to IDR.

Indonesian migrant workers remitted more than USD 11 billion in 2018, making Indonesia the 7th largest remittance receiver in Asia and the 14th largest in the world (World Bank, 2019). A survey of migrants in four Asian countries documented that Indonesian workers send remittances multiple times a year: workers in Hong Kong on average remit monthly, while workers in Singapore send money on average every four months (ADB, 2006). Former female migrants surveyed in Bazzi et al. (2021) report remitting, on average, USD 183 to their families per month. A summary of survey-based remittance estimates in the literature is listed in Appendix Table A.4. Remittance recipients rank education expenses as one of the top three expenditures to which they allocate the funds that they receive (ADB, 2006). This suggests that remittances may influence education-seeking behavior at home.

Nearly all remittance recipients in the ADB study reported receiving remittances money through banking institutions (ADB, 2006). Banks and Money Transfer Operators (MTOs) report transaction statistics to the Central Bank, which publishes national aggregate remittance data. While disaggregated data by region are not publicly available, news reports covering important milestones in remittance transactions exist. For example, a post office in West Java reported that remittances within the district had reached USD 40 million in 2013 (Tribun News, 2013).

Although the Indonesian government is aware of remittance flow into the country, the government does not tax remittances. Government officials have observed that the remittance flow into Indonesia exceeds the revenues from the 2016 overseas tax repatriation program (Media Indonesia, 2017). At the same time, the state's capacity to enforce taxation is weak: out of a population of 255 million, fewer than one million people pay their taxes (Bloomberg, 2016). Furthermore, Government officials have also spoken of international migrant workers as "foreign currency heroes," as their remittances become a large source of foreign currencies (Media Indonesia, 2017).

2.2 Local Public Administration

After the Soeharto regime fell in 1998, the Indonesian central government devolved its responsibility for frontline service provision to district-level governments. Bypassing the first level administrative division (provinces), the districts at the second-level administrative division became responsible for many public services for its population. This policy environment underlies the selection of my outcomes of interest to analyze the state's responses to remittances and focus on key services managed by district governments.

In Indonesia, education is a key service that district governments are responsible for providing. Public schools comprise 76 percent of all schools under the purview of the Ministry of Education, and 83 percent of students are enrolled in public schools (Bazzi et al., 2023). Students progress through three levels of education: primary (grades 1-6, for children ages 6-12 years), junior secondary (grades 7-9, for children ages 13-15 years), and

senior secondary (grades 10-12, for children ages 16-18 years). The primary and junior secondary levels are compulsory. Although enrollment has reached more than 90 percent at the primary level, this number drops to 67 percent at the junior secondary level and 42 percent at senior secondary level. In this way, the junior secondary levels present the next bottleneck in ensuring universal education.

District governments must also provide other types of public goods, including piped water, electricity, and roads. Piped water is a public investment in clean water managed by district government-owned enterprises. Piped water stands in contrast to other safe drinking water sources such as bottled water, protected wells, or boreholes, which households access through private investments. Districts also provide electricity through a state-owned enterprise, and grid capacity commonly constrains households from accessing this service. Residents are required to pay a complementary private fee to connect to both electricity and piped water. The local government also manages roads. High quality roads in Indonesia are paved with asphalt, but roads in some villages may be paved only with gravel or dirt. In some cases, improvements in village roads are often funded partly by informal taxes that the villagers pay in form of labor or goods (Olken and Singhal, 2011).

District mayors play an important role in the local delivery of public services. Since 2005, mayors in Indonesian districts have been elected by popular vote every five years. Citizens directly vote for mayoral candidates in district elections, which are held at a different time than the presidential and legislative elections. Election timing varies across districts for two reasons: (1) the terms of mayors who were appointed by Soeharto began at different times, a practice which carried over even after the direct election system was introduced, and (2) massive decentralization reform that has taken place since 2000 has led to the creation of new districts (splitting), which require the election of new mayors; needless to say, these elections occurred as needed, thereby perpetuating the already idiosyncratic election cycle (Martinez-Bravo et al., 2017; Pierskalla and Sacks, 2018, 2020).

The reform process has led to decentralization and the creation of new, smaller districts within existing district boundaries through "district splits" (Bazzi and Gudgeon, 2021; Cassidy and Velayudhan, 2022). Between 2004-2012, 57 districts were split into 131 smaller districts, which make up roughly a quarter of the total districts in my sample. Overall, the division of existing districts increased the number of districts from 440 to 514. Most splits occurred outside Java, where the average district area is greater, and the land is less densely populated. Nevertheless, eight new smaller districts were also created in Java during the same period. Proponents of district splits argue that the closer proximity between district centers and citizens can improve governance. Bazzi and Gudgeon (2021) noted that the splitting process entailed an increase in annual transfer to the district from the central government, roughly 20% on average.

To provide services, district governments follow a budget proposed by mayors and approved by the district parliament. The operations are financed through several sources of revenue: general grants (DAU, 61 percent), central tax revenue share (8 percent), special allocation grants (DAK, 7 percent), local taxes (6.5 percent), and natural resource revenue share (6 percent). The DAU grants are formulaic transfers that depend on the district's mostly fixed characteristics, e.g., its land area and population size (Brodjonegoro and Martinez-Vazquez, 2005).

The central government collects income taxes, property taxes, and tobacco excise and then returns a portion of the revenue to district governments based on the following predetermined formula: 12 percent of total collected income tax and 9 percent of total collected property tax. This revenue is reported as a Tax Revenue Share (DBH). The DAK grants are conditional, matching transfers provided by the central government on a

discretionary basis. Districts need to match at least 10 percent of the funds provided by the central government. Funds are earmarked for the construction of education facilities and other types of infrastructure (see Cassidy (2022)). Revenues from local taxes are classified as Own Source Revenue (PAD) and based on local taxes and fees imposed by the district governments (i.e., vehicle and hotel taxes).

Districts are mandated by the constitution to spend 20 percent of their budgets on education. Government regulations require that district expenditures on education cover teachers' salaries and benefits, asset purchases for education facilities, and social assistance/education scholarships (PMK 84/2009). Despite the mandate, the share for expenditures varies between districts, and the average district spends 35 percent of its budget on education.

3 Data

To analyze the effects of migrant exchange rate shocks, I combine district-level data from official statistics, household surveys, and administrative records. I also use several household-level panels as auxiliary datasets to perform out-of-sample analysis and investigate the channels by which migrant exchange rate shocks affect the outcomes of interest.

Migration datasets. My analysis draws on two main migration data sources: village survey data and administrative records of migrant arrivals. The Village Potential (*Podes*) surveys collect data from village heads every 2–3 years on the number of migrants from the universe of Indonesian villages. I aggregate the village-level information to the district level.

I use administrative records of migrant departures and arrivals to obtain information on migration destinations. These records come from the "migrant terminal" at the Soekarno-Hatta International Airport. Located about 20 km from Jakarta, it is the primary point of departure for migrants leaving the country to work abroad. For returning migrants, officials at the migrant terminal record the migrant's gender, date of departure, date of return, country of work, and origin district. From March 2008-2011, the terminal recorded 1,006,241 migrants returning from work abroad. Table A.2 listed the distribution of migrants in the most common destinations. I use the departure and arrival dates to measure the monthly destination mix for each district and create a district-month-country level dataset.

I merge the aforementioned administrative records with exchange rates of various currencies to the Indonesian rupiah (IDR) using Refinitiv (2022). I also utilized supplementary sources described in the Appendix for currencies without direct information on exchange rate to IDR. Exchange rate observations are recorded monthly and expressed as relative changes to the exchange rates in June 2007, one year before the exchange rate upheaval of the Global Financial Crisis of 2008 (see Figure 1).

Outcomes. Indicators on district development come from the Indo-Dapoer database compiled by the World Bank. Indo-Dapoer compiles regional gross domestic product (GDP) data, poverty indicators, and district government budgets from official statistics. It also compiles district-level averages of household expenditures as well as district infrastructure from representative household surveys and the Podes village survey.

I measure school enrollment and asset ownership directly from the 2005-2012 National Socio-Economic Surveys (*Susenas*). Both measures capture household investment: durable assets can indicate improved living conditions, while school enrollment reflects migrants' oft-cited motivation to provide a better future for their families through education. The *Susenas* surveys are repeated cross-section household surveys with representative sam-

ples at the district level. The details of individual household members allow disaggregation of education statistics by gender and age. *Susenas* also provides household housing information, including the source of drinking water and various durable assets. Some questions are only available for a subset of years; for example, information on whether a household member is working overseas is only available until 2007, while asset questions are only available from 2010.

I use school availability as the primary measure of the provision of public goods.As the state is the dominant provider, I draw from the Dapodik school registry maintained by the Ministry of Education. Dapodik registry includes all operating primary, junior secondary, and senior secondary schools under the ministry's purview. It records each school's location, amenities, year of establishment, and an indicator of whether the school is public or private. I describe these datasets in more detail in the Data Appendix.

Supplementary datasets. I use other datasets in the form of household or village surveys designed for other studies to supplement my district-level analysis. While these surveys are more limited in their geographic or temporal coverages, they provide more detailed information on migration, remittances, or other variables relevant to my outcomes of interest.

In order to test the effect of exchange rates on remittances, I use migrant data from Doi et al. (2014), which includes a panel of 400 East Java households with a member migrating to work in other Asian countries. Households are selected into the sample based on their eligibility to receive pre-departure financial literacy training. Respondents were followed over the course of three waves that took place between 2011-2012. At each wave, information on remittances received by the household at home was collected. While this data provides rarely collected panel information on remittances receipt, its geographical and temporal scope is limited.

I also use SPKP survey data, which was collected to evaluate the impact of a conditional cash transfer program and a community block grant program (Alatas, 2011; Olken et al., 2014; Cahyadi et al., 2020). This rich data includes household participation in community activities and governance at the grassroots level. Respondents were drawn from five provinces, and their coverage varied between survey waves from 2007-2014. Similar to the migrant panel data, the SPKP collected detailed information in a limited sample.

4 Empirical Strategy

In this section, I first investigate the relationship between exchange rates and transfers from international migrants using household panel data. The analysis of the household panel paves the way to construct a district-level migrant exchange rate shock in Section 4.2. I discuss the use of shift-share constructions in Section 4.3 and outline the multiple channels through which exchange rate shocks could lead to effects at the origin in Section 4.4.

4.1 Linking Exchange Rates to Transfers from International Migrants

The flow of resources by migrants from migration destination countries to origin countries depends on the share of migrants and the characteristics of the destination country. These characteristics include changes in the destination country's exchange rate, although the effects are ex-ante ambiguous. When the currency of the migrant's destination country appreciates relative to the country of origin, transfers of a fixed amount in the destination

country's currency by migrants will increase the size of remittances (Yang, 2008).[6] If, however, migrants want their families to receive a fixed sum, then exchange rate fluctuations will have no effect on the transfers received.

Using an auxiliary out-of-sample dataset, I first test the effect of currency fluctuations on the size of remittances received by households of regular remitters. I construct the exchange rate change measure for each migrant following Yang (2006, 2008) and other studies that examine the effect of remittances in the Philippines in the aftermath of the Asian financial crisis (Yang and Martínez, 2005; Khanna et al., 2022) using the following equation:

$$XRshock_{it} = \frac{\text{FX rate to IDR}_{ict}}{\text{FX rate to IDR}^{o}_{ic}} \tag{1}$$

I define the exchange rate shock as the appreciation or depreciation of migrant i's host country's currency c to Indonesian Rupiah (IDR) at time t, relative to reference period o. The exchange rate to IDR fluctuates whenever each migrant sends remittances home.

The panel data of migrant households from Doi et al. (2014) allows me to add migrant fixed effects, thereby addressing self-selection bias typical in cross-sectional estimation of remittances (Funkhouser, 2012). In this regard, I estimate the following equation:

$$Remittances_{it} = \alpha + \beta XRshock_{it} + \gamma X_{it} + \theta_i + \phi_t + + \varepsilon_{it}. \tag{2}$$

where $Remittances_{it}$ is the amount received by migrant i's household of origin at time t, expressed in logarithms of IDR. The coefficient of interest is β, which expresses changes in remittances due to fluctuations in the relative exchange rate to IDR, $XRShock$. The $XRShock$ is standardized to have a mean of zero and a standard deviation of one. The migrant fixed effect term, θ_i, adjusts for time-invariant characteristics of the household of origin and the household member who migrates. Effects from the migrant's unobserved invariant characteristics are also absorbed by the migrant fixed effects. The survey wave fixed effect term ϕ_t controls for time effects common to all respondents in each survey wave. The X_{it} vector adjusts for other time-varying characteristics. Standard errors are clustered at the household level in my main specification, but I also perform robustness checks with wild cluster bootstrap at the country-survey wave level to account for correlated shocks for migrants working in the same country.

I argue that the exchange rate shock that each migrant experiences is plausibly exogenous conditional on the included control variables. Migrants take the exchange rate as given: they transfer remittances in small amounts relative to the economy and thus are unlikely to alter the exchange rate, ruling out reverse causality. Furthermore, migrant families cannot anticipate changes in the exchange rate.[7]

I also include the following control variables that could drive variations in remittances: migrant's duration abroad and amount of time to the next religious holiday (Eid al-Fitr). Duration abroad proxies for the migrant's experience, which may help the individual find a better currency conversion and transfer service with a cheaper fee or a better exchange rate. Migrants may also be more likely to send money to family on the occasion of a

[6] Official bilateral remittance estimates are constructed using the currency exchange rates, the share of migrants in the destination country and other characteristics (IMF, 2009; KNOMAD, 2017; Ratha and Shaw, 2007).

[7] Two descriptive statistics lend support to this argument. First, 60% of remitters in the Doi et al. (2014) survey stated at baseline that they have either never heard of the term "exchange rate" or they do not understand the meaning of the term. Second, a survey of 5,564 former migrants from Bazzi et al. (2021) shows that only 2% of respondents have their contracts state their salaries in IDR. For the majority, on the other hand, their salaries are denominated in dollars, dinars, or riyals in their contracts. Consequently, if they were to send a fixed portion of their salaries, then their remittances would be subject to currency rate fluctuations. In a different setting–namely, a survey of Tongan migrants in New Zealand–three times as many respondents regularly send a constant amount of NZ dollars as remitters sending a constant amount of Tongan pa'anga (Gibson et al., 2006).

religious holiday. For Muslims, who comprise the majority of the Indonesian population, Eid al-Fitr is the biggest annual religious holiday. Overseas migrants facing costly travels are less likely to return home, especially if they work in non-Muslim countries. In such cases, migrants might send more remittances to their families for a religious holiday in order to help defray the cost of the festivities.

I reanalyze the Doi et al. (2014) panel data with migrants working in Taiwan, Hong Kong, Malaysia, or Singapore (see Appendix for details). The Doi et al. follow-up surveys were administered in three waves between 2011-2012. In each follow-up, households were asked the IDR amount of remittances that they received from their migrant family member. They reported having received an average of IDR 9.5 million (USD 1,119) total remittances since their family member migrated. With an average transfer frequency of 4.5, this corresponds to an average of ∼USD250 per transfer.[8]

Because the survey phrased the remittance question as the total remittances received since the migrant's departure, I use total remittances in the first follow-up and the difference from the previous response in subsequent follow-ups as the measure of remittances for each period. I transform this measure with natural logarithm and standardize it in the regression of equation (2). Migrants in the panel comprise the evaluation sample of a financial literacy RCT where treatment was randomized at the household level so that the intervention's effects are absorbed by the migrant fixed effect.[9] I analyze a sample of households with abroad migrants who are regular remitters and a sample that includes all abroad migrants.

I use the monthly average exchange rate for the follow-up survey month as the observed exchange rate. I fix the reference period to March 2011, the month of the first follow-up survey after the respondents began working abroad. The time to the next Eid al-Fitr is calculated based on the 2011 and 2012 dates. Workers in Hong Kong observed an average exchange rate of IDR 1,123 per Hong Kong dollar (HKD) in March 2011, and by January 2012, the rate had appreciated by 3.8 percent (Figure A.1; Refinitiv (2022)). At the same time, the exchange rate to Taiwan Dollar (TWD) appreciated by only 1.6 percent (IDR 296.7/TWD to IDR 301.7/TWD). In these two examples, the raw measure of exchange rate shock for HKD and TWD are 1.038 and 1.016, respectively. Overall, the average raw exchange rate shock for migrants in my sample is 0.995 in the second follow-up and 1.029 in the last follow-up. Table 1 (Panel A) presents the summary statistics of the main outcome and the regressor variables for my estimation sample.

Validation. Migrant households of origin receive more remittances when the currency of the migrant's host country appreciates against the IDR. Table 2 presents the estimation results of equation (2), with the addition of control variables from Columns 1-4. Correlation of remittances and exchange rate shocks is positive with the inclusion of migrant fixed effects (Column 1). This relationship is robust to two additional variables that may influence the amount of money remitted: duration abroad and amount of time to the next religious holiday (Columns 2-4). The size of the coefficients is within the same order of magnitude with the responses reported by Philippines migrants' households to the 1998 exchange rate shocks (0.6, see Yang, 2008). Appendix Table A.5 shows that the relationship survived bootstrap tests that address how the shocks may be correlated for migrants in the same country. Table A.6 uses all abroad migrants regardless of their remittance receipt status. The estimated coefficients are higher in this sample, which may reflect the wider variance from coding remittances for non-recipients as IDR 1.

This analysis presents one of the first systematic investigations to link remittance

[8] Gibson and McKenzie (2017) surveyed pairs of Tongan immigrants to New Zealand and their households of origin in Tonga, and they found that the survey responses produce reliable estimates (i.e., remitters and receivers consistently reported sending and receiving the same transactions, respectively).

[9] The original analysis showed that none of the treatment arms have significant effects on the likelihood of receiving remittances, the frequency of remittances, or the amount received (Doi et al., 2014) .

responses to exchange rate fluctuations using household panel data. Prior research has used cross-section and aggregate data to argue that the resilience of remittances during the 2008 Financial Crisis is due to the depreciation of South Asian currencies against Gulf countries' currencies (Sirkeci et al., 2012). Remittances to Nepal rose by 28% in Quarter 1 of 2009 (Riester, 2012; Mohapatra et al., 2012), and 94% of migrant households in South Asia reported regularly receiving remittances during that period (Rajan and Narayana, 2012). Researchers have argued that migrants are willing to absorb large negative shocks in order to continue sending remittances; to this end, unskilled migrants in the Gulf reported sharing accommodations and reducing their food consumption to save money to send home (Sirkeci et al., 2012).[10] In estimating remittances from pre-World War I migration out of Europe, Esteves and Khoudour-Castéras (2009) write that "migrants often waited for the most favorable exchange rates before sending money [to Europe]." The panel structure of the data that I use provides a way to mitigate self-selection bias among migrants and remitters in cross-sectional data (Funkhouser, 2012). Furthermore, the Doi et al. (2014) survey explicitly collected information on remittances to migrant households, which is rarely captured in general purpose household surveys conducted in developing countries.[11]

It is unlikely that my results are due to Indonesian migrants responding to exchange rate changes by changing jobs or industries because every instance of migration is based on a fixed-term contract that a migrant signs prior to departure, making it difficult (if not impossible) for migrants to change employment while abroad. For my analysis sample, the positive relationship could also be driven by an increased frequency of sending remittances. Table A.8 suggests the remittance frequency increased with positive exchange rate shocks. One should note that remittance transactions are subject to fees from banks and Money Transfer Operators (MTO) so origin households may not receive the full amount from each transaction. I discuss possibilities of other non-remittance channels through which migrants and potential migrants respond to the exchange rate shocks in Section 4.4.

4.2 District-Level Migrant Exchange Rate Shock

When many individuals from the same district migrate abroad, changes to the foreign exchange rates could influence the origin district through its international migrants. I proxy the size of foreign resources that the origin is exposed to with a district-level migrant exchange rate shock. I construct this measure following an approach analogous to the construction of bilateral remittance flow estimates (KNOMAD, 2017; Ratha and Shaw, 2007)—namely, I use exchange rate shocks and variations in migration intensity as the determinants of the proxy.[12] The exchange rate shock for each district is defined as follows:

$$XRshock_{dt} = \frac{1}{mig_{dt}} \sum_{c} mig_{dct} \frac{\text{FX rate to IDR}_{ct}}{\text{FX rate to IDR}_{c}^{o}} \tag{3}$$

where d indexes districts, c indexes destination countries, and t indexes years. The mig_{dct} is thus the number of migrants from a district d who are abroad in country c in year t.

[10] In the Indonesian migrant panel, sub-sample analysis of regular remitters between survey waves 1-2 (slight drop) and wave 3 (slight increase in exchange rates) in Table A.7 shows noisier estimates but largely symmetric patterns. When remitting regularly, migrants may be more likely to send the same amounts.

[11] For example, only 47 of 10,992 households in the IFLS panel received international remittances, which underscores that it was not designed as a remittance survey (Cuecuecha and Adams Jr., 2016).

[12] Analyzing the effects of remittances on Indonesian districts is naturally also of interest. This analysis, however, necessitates sub-national remittance data, which is scarcely available. The IMF's International Transaction in Remittances: Guide for Compilers and Users notes, "options for direct measurement of remittance transactions are very limited (IMF (2009), p.46)." The Indonesian Central Bank only publishes national remittance estimates from reports by banks and MTOs. Staff from one of Indonesia's largest banks with knowledge of the bank's remittance operations described these reports as confidential.

The latter denotes the relative appreciation or depreciation of the host country's currency relative to a reference period o. This shock variable averages the foreign exchange rate shocks its migrants face due to their locations, using the share of its migrants in each destination as the weight. In this way, the $XRshock_{dt}$ variable represents the variation in foreign income a district will receive due to currency rate fluctuation from its destination mix in a given year.

I complement the above calculations with a measure of the district's migration intensity at baseline, which I define as the natural log of the proportion of its migrant workers per a population of one million inhabitants.[13]

$$MigShare_d^0 = \log(\frac{migrant_d}{pop_d}). \tag{4}$$

The migrant exchange rate shock is the interaction between the exchange rate shock and migration intensity, which I use in the following regression:

$$Y_{dt} = \alpha + \beta MigShare_d^0 \times XRshock_{dt-1} + \gamma XRshock_{dt-1} + \eta X_d^0 \Delta_t + \theta_t + \theta_d + \varepsilon_{dt} \tag{5}$$

where Y_{dt} is the outcome of interest, comprising of various development indicator variables at the household level (consumption, assets, and education), and the district level (GDP per capita, poverty rate, and public goods). In this analysis, we are interested in the β coefficient for the interaction term of migration intensity and exchange rate shock. The interacted $XRshock$ term is lagged by one period to $t-1$ to alleviate concerns of reverse causality between the outcome of interest and the migrant exchange rate shock, since the shock precedes any changes in the outcome of interest. The regression equation also includes the time-varying $XRshock_{dt-1}$ as a control, which is also lagged by one year. The baseline district migration intensity is absorbed by the district fixed effect θ_d, which captures the variation in outcomes due to the district's time-invariant characteristics. θ_t is the year fixed effects that capture common time effects shared across all districts.

The inclusion of $X_d^0 \Delta_t$, the interaction of year fixed effects with various baseline level controls, flexibly accounts for potential confounders that may have affected the outcomes of interest. The variables included as baseline level controls include the following: (i) density of public schools, (ii) total population and ethnicity share, which Bazzi (2012) showed influenced migration destination, and (iii) average per capita household expenditure. My results do not hinge on these controls, but they provide further support of robustness. The term ε_{dt} is a mean-zero error term. Standard errors in this estimation are clustered at the district level in the main specification, but I revisit other clustering patterns in robustness analysis.

For this reduced form analysis, a causal interpretation of β relies on the identification assumption that unobserved determinants of outcomes in the district must be unrelated to the interaction term conditional on control variables and fixed effects. For omitted variables to bias the estimates, they would need to be distributed in a way that is correlated to the interaction term, i.e., also simultaneously using the three variations from migration intensity, destination countries, and exchange rates. Without such variables being omitted, the exogeneity for the interaction term in the specification becomes more plausible. Nevertheless, I also ran sensitivity checks to omitted variables with the inclusion of foreign trades with key export commodities from Indonesia such as oil and gas, and palm oil.

[13] In subsection 7.4 I revisit specifications for migration intensity and exchange rate shocks and run checks using time-invariant country exposure shares from Podes 2005 and non-logged migration intensity. The migration specification without log transformation is connected to an interpretation of the variable as the share of migrant income in origin, if one knows or is willing to impose an assumed distribution for migrant overseas earning across destinations. Earning data by destination for Indonesian migrants are not systematically collected.

Using this construction, I find that there is considerable variation in the migrant exchange rate shock to which districts are exposed. This variation is driven by the variation of destination countries. For example, a comparison of the Purwakarta district in West Java and Pesawaran in Lampung shows that 95 percent of Purwakarta migrants worked in Saudi Arabia or Gulf countries, while only 70 percent of Pesawaran migrants worked in the same region. At the same time, a much smaller proportion of Purwakarta migrants worked in Malaysia or Singapore (2 percent) compared to migrants from Pesawaran (21 percent). These differences in the destination mix channel different magnitudes of exchange rate shocks. Compared to June 2007, Purwakarta migrants on average saw their host country's currency appreciate by 5.6 p.p. in 2008, while Pesawaran migrants' average currency appreciation was 10.1 p.p. due to its smaller exposure to SAR (which is pegged to the USD). One year later, Purwakarta migrants' average currency exchange rate rose steeply by 10.3 p.p., while Pesawaran migrants only rose by 1.5 p.p.

There are considerable spatial and temporal variations in the resulting remittance proxy measure. I plot the residual variation in the migrant exchange rate shock after adjusting for the exchange rate fluctuation, district fixed effects, and year fixed effects and superimpose them on the district boundaries in Figures 2-3. The colors of the districts on the map indicate the magnitude of the residual variation, where the blue color denotes exposure to a smaller shock while the red color denotes exposure to a higher shock. Prior to the Global Financial Crisis of 2008, districts with positive shocks are scattered across all main island groups, mainly in Riau in Sumatera, some urban districts in Java, and districts in Kalimantan and Northern/Central Sulawesi (Figure 2). After the rapid currency valuation change in 2010, considerable variation in the districts that received greater shocks occurred (Figure 3). While many districts in Java ended the year with a positive shock, some benefited considerably less from the shock and remained blue on the map in 2010. Similarly, not all southern Sumatera and southern Sulawesi districts benefited from the shock and, therefore, some districts remained blue.

4.3 Shift-share Validity

The construction of this migrant exchange rate shock measure resembles a shift-share instrumental variable. The shares in this setting are made up of the proportion of migrants from each district who work in a specific country. The shift is provided by the shock to its currency's exchange rate with the Indonesian rupiah. Recent works in the shift-share literature have formalized the validity of identification in this design, showing that identification could come from the exogeneity of shares or exogeneity of shocks.

I assess the validity of my research strategy by evaluating the plausibility of shares exogeneity, following Goldsmith-Pinkham et al. (2020).[14] They offer several diagnostics: parallel pre-trends and correlates of the shares. They argued that testing for pre-trends allows researchers to rule out a concern that the observed changes in outcomes come from pre-existing differences instead of the shocks in the instrument. Meanwhile, by evaluating the correlates of the shares, researchers can assess the possibility that there are other channels through which the shares end up affecting the outcomes of interest.

I test for pre-trends by looking at whether outcomes during the pre-period change systematically depending on the share of the migrants in the districts to particular destination groups. In particular, I look at four major migration destinations: Saudi, Hong

[14]While the fluctuations of exchange rates could plausibly be seen as exogenous shocks, the requirement of many uncorrelated shocks in Borusyak et al. (2022) makes this approach less suitable in this context for two reasons. One, Indonesian migrants are concentrated in two dozen countries. Two, several of these countries peg their currencies to the US dollar (notably Saudi and five other Gulf states, as well as Hong Kong) or are in agreement to trade their currencies at parity with each other (Singapore and Brunei, Hong Kong and Macao).

Kong, Malaysia, and Singapore. I test for pre-trends by regressing outcomes in the period of 2000-2007 on a set of year indicators interacted with the share of migrants going to a particular destination. Appendix Figure A.2 plots the coefficients, and they show that there does not appear to be significant differences in per capita education expenditure, primary school enrollment, and public school density among districts where migrants were primarily going to different destinations.

Separately, I also find that migrant exchange rate shock in the future are not correlated with past district outcomes. In Table A.9, I report the coefficients resulting from regressing equation (5), shifting the right hand side variable forward by three periods to proxy future shocks. If the remittance variable is merely a proxy for an unobserved trend, then a statistically significant correlation between this "future" shock and past outcomes should result. I run this regression on my main outcomes, and I find that the magnitude of the coefficients is small and statistically indistinguishable from zero.

I also evaluate the correlates of the destination shares with various district-level characteristics in the pre-period. In particular, I use the migrant terminal data to calculate the weights that the instrument attribute to each destination—"Rotemberg weights" in Goldsmith-Pinkham et al. (2020)—and highlighted the correlates to the top destination countries. The top weighted countries from this calculation are also among the countries that host the most Indonesian migrant workers, including the abovementioned four top destinations, plus Taiwan. Table A.10 presents the correlation of the shares with the district's demographic, economic, and geographic characteristics in that year, controlling for province dummies. Nearly all of the above characteristics show no statistically significant associations with the migrants' destination shares, with some exceptions. The share of Christians is negatively correlated with the share of migrants going to Saudi–an officially Muslim state. The distance to Dumai, an embarkation point to Malaysia, is negatively correlated with the share of migrants going to the neighbor country. I note that a district's geographic location is time-invariant, and that a district's religious and ethnicity compositions are characteristics that change very slowly with time, if at all, and to the extent these are time-invariant, the inclusion of district fixed effects in equation (5) further alleviates concerns of time-invariant unobservables related to the share driving the impact on the outcome variables. Still, I also include an array of these characteristics at baseline interacted with year fixed effects in my estimation to further minimize this concern.

What is the size of the aggregate windfall? One approach to approximate the size is to use aggregate statistics from migrant surveys that collect remittances data, and suppose that the foreign migrant income is transmitted mainly as remittances. Summary statistics from the migrant panel survey suggest that districts with the normalized remittance proxy of one receive ∼USD 45,000 more per 100,000 people compared to districts at the mean of migrant exchange rate shock distribution. Given the average population size of 588,456 for districts in my sample, a back-of-the-envelope calculation suggests a windfall of USD 260,000 to the district for every one standard deviation of the shock. This figure is roughly half of the average district budget for social protection in 2008, underscoring the significance of this financial flow to the region.[15]

4.4 Exchange Rate Shocks, Remittances, and Non-Remittance Responses

The exchange rate shocks that impact migrants while abroad could lead to effects at the origin through multiple channels, including remittances–which I have explored in subsection 4.1–and other migration decisions. For migrants already abroad, I consider two main possibilities of non-remittance responses: the migrants' decision to return, and the migrants' use of financial services. On the return migration, the migrants might either

[15]In comparison, Dinkelman et al. (2024) estimated that Malawi migrants working in a South African mine created a capital flow of USD 115,000 on average per district in 1973.

decide to stay abroad longer because of the prospect of a higher income or return home early because they could achieve their Indonesian rupiah-denominated target earning faster (Yang, 2006). The exchange rate shocks could also influence the migrants' use of financial services, e.g., by switching remittances channels from informal to formal remittances, and holding more of their salary in foreign currency-denominated savings abroad. Migrants switching remittance channels could create an apparent increase in observed transfers while the actual total transfers remain constant, leading to spurious correlation (Clemens and McKenzie, 2018). In the long run, potential migrants may decide that certain destinations are more attractive because of the positive exchange rate shocks.

To consider the above channels, I explore migrant surveys and report the correlations between exchange rates and migration statistics. First, the migrant terminal data shows that the number of returnee migrants processed from each country in a given month between 2008-2011 is uncorrelated with recent exchange rate shocks (Appendix Table A.11). The modal reason for return among these returnees is the end of their contract, but restricting the estimation to those who indicated that they return not at the end of their contract also does not show statistically significant associations.[16] This suggests that Indonesian migrants' return timing are possibly not being influenced by the currency exchange fluctuations. Some respondents in Bazzi et al. (2021)'s survey of former migrants report instead that they return *earlier* than the end of their contract (29%), typically due to family reasons, employer fit, health reasons, and the death of the cared-for persons.[17] None mentioned improved salary due to exchange rate shocks (Bazzi et al., 2021).

Nevertheless, it may be possible that when migrants renew their contracts, they renegotiate their salary with the amount influenced by the exchange rate shocks. I consider former migrants in Bazzi et al. (2021)'s sample who reported their salaries and listed different years for their last departures and tabulated selected statistics from this sample in Appendix Table A.3. For these major destinations, salaries in different years are remarkably sticky and compressed. For example, the 25th-75th percentile salaries remained constant at 800 dirhams/riyals between 2010-2013 for migrants going to UAE and Saudi Arabia, with similar patterns for Bahrain, Oman, and Qatar. Mean salaries for migrants going to Taiwan vary only in NT$260 amount between 2010-2014, a range equivalent to US$8. These limited statistics suggest a limited scope for exchange rates to directly influence the amount of salaries set for Indonesian workers.

Some budgetary reallocation between migrants' overseas savings and remittances may also occur in response to the exchange rate, but such behavior may be limited in the short run. Doi et al. (2014)'s survey of migrants reveals that more than 40% of the workers were not even aware of the term 'saving accounts.'[18] Nevertheless, migrants' complete use of financial services remains largely unobserved. None of the existing migrant surveys summarized in Appendix Table A.4 collect detailed information about the proportion of migrants' regular salaries that are used for regular consumption, kept as savings in a local or overseas bank account, and remitted home for each month of employment, which would be necessary to observe migrants' responses on this margin.

Finally, I also explore the migration response among potential migrants due to the exchange rate shocks. Appendix Table A.12 presents the correlation of recorded outmigration to 25 top destination countries post-period against (lagged) exchange rate changes based on official worker placement data 2013-2016. The estimates are noisy and not statistically significantly different than zero, suggesting that the importance of this channel may be limited.[19] Nevertheless, the above channels of non-remittance migration decisions

[16] The other two reasons are: visit to Indonesia and "troubles"–a catch all terms to identify migrants with issues abroad who return early (Bazzi et al., 2021).

[17] The breakdowns of these reasons respectively are: 24%, 21%, 13%, and 8%.

[18] See also footnote 7.

[19] Appendix Table A.13 tabulates the reasons for choosing the destination countries by former migrants

may still work as potential mechanisms in the long run. For example, the prospect of work overseas could affect education decision in origin areas. These could then show up in household outcomes in later years, beyond the period of analysis in this paper.

5 Impacts on Household Expenditures

Income from work abroad allows migrants to support their families at home. In turn, the additional funds enable families to increase their consumption. I test this relationship by estimating equation (5) on consumption outcomes. I look at key consumption indicators: the monthly expenditure per capita for the average household and the household in the bottom quintile as well as per capita expenditures on education. All variables are in log IDR unit. Data for these indicators come from Dapoer, which aggregates household responses in *Susenas* to create district averages. The averages include both households with and without overseas migrants. Table 3 presents the results.

I find that foreign migrant income shocks increase household consumption, especially for those at the bottom of the expenditure distribution. They also increase investment in education. For households in the lowest quintile, a one standard deviation (SD) of the migrant exchange rate shock increases the average household expenditure per capita by 0.10 log points (Column 2). This coefficient is more than twice the coefficient for the average household, which lacks the precision to be statistically significantly different from zero (Column 1). However, note that these statistics are constructed from representatively sampled households in the districts, which include those with and without migrants. For education and for healthcare, the shock also increases the monthly per capita expenditure. These increases are unlikely to be a mechanical response to rising prices. In Column 5, I regress the core price index from 47 districts, which is benchmarked to the 2007 price. I cannot reject the null hypothesis that the foreign migrant income has no effect on price. The estimate is imprecise, but I can rule out effects larger than the 7 percent average annual inflation rate for the 2005-2012 period (-0.97 + 3.3 $\times$ 1.96). The increases that I observe in household consumption are thus unlikely to be an artifact of mechanical responses to rising prices. I defer the discussion on the robustness of the results in this section and the next to section 7.

The effect of the migrant exchange rate shock on consumption is comparable to a government cash transfer program. At the mean, the coefficient for the migrant exchange rate shock implies a higher monthly per capita consumption of IDR 18.5 thousand for the bottom quintile households. In the same time period, Alatas (2011) evaluated PKH, an Indonesian social protection program that provides IDR 200-600 thousand per quarter to eligible households. She found that the program raises beneficiary households' consumption per capita by IDR 19 thousand per month, approximately 10 percent of the mean. Meanwhile, my estimated effect on education expenditure in Column 3 is similar to the estimates from the Philippines. Yang (2008) found that migrant households with overseas members raise their education expenditure by 55 percent in response to the exchange rate shocks due to the 1998 crisis; however, he did not observe an effect on the overall household consumption.

Foreign migrant income may finance purchases of durable assets, which is often the preferred mode of investment among households in developing countries. Appendix Table A.14 shows that the migrant exchange rate shock increases ownership of vehicles, refrigerators, and natural gas canisters. In particular, 5 p.p. more households have motorcycles, 12 p.p. more households have refrigerators and 7 p.p. more households use 12 kg gas

in Bazzi et al. (2021). Only two individuals from a sample of 5,646 former migrants mentioned a higher currency exchange. Depending on the region, workers cited religious reasons, language reasons, a higher salary, or assignment by placement agencies.

canisters due to a one SD of shock. These results are consistent with the reported use of remittances from the migrant panel data in Appendix Table A.15, early descriptive work on migrants from East Nusa Tenggara (Sukamdi et al., 2004), as well as remittances and cash transfers studies from other settings in the Philippines and Mexico (Yang, 2008; Gertler et al., 2012). These asset ownership can indicate an escape from poverty, and governments frequently determine poverty status using asset ownership. I examine different measures of poverty indicators in Section 9.

6 Education Investments

Education provides a path toward development through investment in human capital. Foreign migrant income can relax the budget constraints that prevent households from investing in education. Because education services are commonly provided by the state, analysis of state policies can reveal the different ways in which the state responds to foreign income.

6.1 Enrollment

I investigate the effect of migrant exchange rate shock on enrollment in Table 4. Net enrollment ratio expresses the total school-age students enrolled in schools as a percentage of the population of the same age group. Using age and enrollment information from Susenas, I estimate the effects for all children, and separately by gender.

The migrant exchange rate shocks increase school enrollments. A one SD shock is associated with increased school enrollments for all education levels, with a 3.3 p.p. increase for primary level, a 3.7 pp. increase for junior secondary level, and a 6.6 p.p. increase for senior secondary level (Panel A). The smaller impact on the primary level may reflect less room for improvement, as enrollment at this level already nears 90 percent. However, the increase in secondary education enrollment is particularly noteworthy, since participation rates in post-primary education have lagged behind the primary level.

The effects of migrant exchange rate shocks on school enrollment differ by gender for different education levels, which I report in Appendix Table A.16. At the primary level, girls demonstrate a 3.8 p.p. higher enrollment rate in response to a one SD shock, which is higher than the estimate for boys at 2.7 p.p. However, the gains in secondary school enrollments mainly reflect the gains in enrollments for boys in junior secondary (5.5 p.p.) and senior secondary (11 p.p.). In contrast, the enrollment gain for girls is merely a fraction of the effect sizes for boys. These gendered responses hint at the possibility that some girls forego secondary education to work as migrants. Estimation using individual survey weights in Appendix Table A.17 suggest the robustness of this effects to alternative weighting. The windfall may send the message that only primary education is important, since many women with only primary school education work abroad.

6.1.1 Enrollments at School-Entry Age

To verify that the coefficients on migrant exchange rate shocks from the regressions with enrollment rates as the outcome variable do, in fact, capture the response on the demand for education, I use individual survey data to examine the cohort-specific responses. I estimate the following equation:

$$\begin{aligned} Y_{iaudt} = \alpha + \phi\, CohortTreat_a \times Mig_u \times XRshock_{dt-1} + \beta Mig_u \times XRshock_{dt-1} + \lambda\, CohortTreat_a \\ + \delta\, CohortTreat_a \times Mig_u + \ \xi\, CohortTreat_a \times XRshock_{dt-1} + \eta\, Mig_u + \gamma XRshock_{dt-1} \\ + \theta_d + \theta_t + \varepsilon_{iaudt}. \end{aligned} \tag{6}$$

The outcome of interest Y_{iaudt} is enrollment for individual i at age a in unit u of district d observed at time t. Unit u refers to household of origin h or district, depending on the migration variable $Mig_u \in \{Mig^o_d, Mig_h\}$. Mig^o_d and $XRshock_{dt-1}$ are defined as before at the district level, whereas Mig_h indicates whether the household has a member currently working abroad. Treatment cohort indicators are defined based on the appropriate school level, i.e., 6-12 for primary, 13-15 for junior secondary, and 16-18 for senior secondary. I include the lower-term two-way interactions and fixed effects for districts and survey years. The coefficient of interest is ϕ, which indicates the differential enrollment responses to migrant exchange rate shocks by cohort. I estimate this regression on individuals ages 4-20 years in the Susenas surveys.

Table 4, Panels B-C reports the estimation results, supporting the fact that the effects on enrollment are driven by individuals in the relevant school age brackets. Panel B uses a district-level migration intensity variable. The coefficients could be interpreted as the differential effect of migrant exchange rate shocks on enrollment by the relevant age cohort relative to the untreated cohort, i.e., cohorts that are too young or too old for each level. The enrollment effects are most pronounced for primary school cohorts and senior secondary cohorts (7 p.p.). The estimated effect for junior secondary cohorts is also positive but smaller (3 p.p.).

Panel C of Table 4 focuses on the relative response of school-age cohorts between migrant and non-migrant households in the presence of the exchange rate shock. The sample for estimating this interaction is smaller because the indicator for migrant households is only available for individuals surveyed between 2005-2007. Coefficient on the interaction of treated (school-age) cohorts, migrant households, and exchange rate shock are positive and statistically significantly different from zero for primary and junior high school enrollment. For further contrast, in a placebo regression where I estimate the effects of migrant exchange rate shocks on school enrollment for the 19-24 year old population, who are older than the normal primary and secondary school students, I largely do not observe any effect of migrant exchange rate shocks on this population (Appendix Table A.18).

To better understand the cohort responses, I estimate the following regression, which replaces the treated cohort indicator with a set of age-specific dummies:

$$Y_{iadt} = \alpha + \Sigma_{a=4}^{20}\, \phi_a\, Cohort_a \times Mig^o_d XRshock_{dt-1} + \beta Mig \times XRshock_{dt-1} + \Sigma_{a=4}^{20}\, \lambda_a\, Cohort_a + \Sigma_{a=4}^{20}\, \delta_a\, Cohort_a Mig^o_d + \Sigma_{a=}^{20}\, \xi_a\, Cohort_a XRshock_{dt-1} + \gamma XRshock_{dt-1} + \theta_d + \theta_t + \varepsilon_{adt}. \quad (7)$$

Figure 4 plots the coefficients ϕ_a of the triple interaction term. The patterns of interaction are pronounced at ages 6, 13, and 16. These are the entry ages for primary, junior secondary, and senior secondary levels. When a child is about to enter a new school level, the realization of positive migrant exchange rate shocks that occurred in the preceding year is particularly timely to encourage enrollment. In contrast, for children ages 8-11 and 14-15 years, the effect is not significantly different than zero. At these ages children are simply continuing along in their primary and secondary levels. These effects are consistent with Alatas (2011), who does not find an effect on school enrollment from a cash transfer program because its disbursal to beneficiaries did not occur until the school year had already begun. In her study, Son (2015) presents a complementary picture where negative income shocks are less likely to induce dropouts when children are enrolled in their last year of school due to the sheepskin effects. With regard to foreign migrant income, the positive shocks likely allow households to afford to pay for things such as uniforms when children begin new school levels.

6.2 Public Goods

Table 5, Panel A presents the estimation results of equation (5), which investigates the impact of migrant exchange rate shocks on publicly provided goods in the district.

I find exchange rate shocks positively influence the provision of education facilities (Columns 1-3). A one SD shock leads to 0.78 more public primary schools and 0.25 more public junior secondary schools per 10,000 population one year after the shock. The coefficient for senior secondary schools is small and noisily estimated. The coefficients for primary and junior secondary school density amount to 12 percent of the mean density of elementary schools across districts (6.38 schools per 10,000 population) and 21 percent of the mean density of junior secondary schools (1.17 schools per 10,000 population). These effects thus represent a significant expansion of education facilities in support of universal basic education.

According to Table 5, Columns 4-6 of Panel A the increases in electricity, piped water access, and asphalt roads indicate that migrant exchange rate shocks improve the provision of public goods overall. For electricity and piped water, a one SD shock increases the share of households with access by 5 and 8 p.p., respectively. This effect size for piped water is nearly 50 percent of the mean share of household access to piped water (16 percent), representing a meaningful expansion of this service. The share of villages with asphalt roads in the district also rises, although the coefficient is not precisely estimated. Olken and Singhal (2011) documented the presence of informal taxes to build roads and other infrastructures in Indonesian villages. Using the SPKP data, Table A.19 shows households in remittance-positive villages are more likely to give money or in-kind contributions to village building projects and in higher amounts. In a different setting, Fernández Sánchez (2022) traced the building of schools in Spain by Gaelician migrants association, which started 5-25 years after their departures to Latin America pre-World War.

7 Alternative Explanations: Commodities and Trends

In this section I consider several alternative explanations to foreign migrant income, including commodity trade and differential regional trends. I also test for robustness against correlated shocks and alternative data sources.

7.1 Commodity Trade in Natural Resources and Foreign Investment

It is possible that the exchange rate shock mechanism actually works through a trade channel on various commodities. When the trading partners' currency appreciates, Indonesian commodities become cheaper and more attractive in the international market, leading to a trade surplus that enables districts to finance and provide public goods. If the exchange rate shocks are ordered in a similar distribution among migration destination and trading partners, then this undermines my interpretation that the effects can be attributed to foreign migrant income that can be transferred via remittances. However, the foreign trade statistics on export data reports on all ports of entry (Appendix Table A.20) show that only a few countries can be considered the top migration and export destinations. Top Indonesian trading partners such as the USA, China, and the EU are not the countries where many Indonesian migrants work. Regressions of the export value and the number of migrants recorded in the migrant terminal data at the country level also do not show a statistically significant correlation between the two variables (Appendix Table A.21).

To further corroborate the incompatibility of the trade channel with the estimated impact of foreign migrant income on public goods, I analyze two primary export commodities from Indonesia: oil and natural gas as well as palm oil. Oil and natural gas

is Indonesia's most valuable commodity, bringing in USD 22 billion in 2007 and making up nearly one-fifth of the total Indonesian export that year. I construct a measure of a district's oil and gas production by using its oil and gas revenue share in 2005 based on the following relationship: the more intensive the oil production, the higher the district's revenue share from oil. From the foreign trade statistics, I also obtain the list of countries to which specific categories of oil and gas commodities are transported (see the Appendix for the list of specific commodity categories). For these countries, I then retrieve the currency rate fluctuations to construct variable $XRshockOil_t$, which I interact with the oil production intensity.

Similarly, palm oil is Indonesia's most valuable agricultural export commodity, with USD 7.9 billion worth of export in 2007. I obtain the the list of countries to which crude palm oil and crude olein were exported and construct variable $XRshockPalm_t$. I use the area of land dedicated to oil palm plantations from the 2003 agricultural census/village census to obtain a measure of palm oil intensity at the district level and then interact the two variables to obtain the trade shock exposure variable to palm oil.[20] I then include these trade shock variables in regression equation 5.

Table 6 reports the results with the inclusion of commodity trade controls. Panel A reproduces the main estimates, and Panel B presents the coefficients including the two commodities as control. The magnitudes of the effects on the expenditures for households in the bottom quintile did not vary more than 5 percent of the original estimates. For the education variables other than the primary school enrollment, the inclusion of controls raises the magnitudes of the coefficients by 7-23 percent of the main estimates. By and large, the coefficients on the oil and gas trade shock and the palm oil trade shock themselves are an order of magnitude smaller than the migrant exchange rate coefficients (not shown).

These results are consistent with the estimates reported in Cassidy (2022), who ruled out changes in public service delivery due to the oil and gas grant. Edwards (2019) argues that the expansion of palm oil plantations since 2000 has led to a faster poverty reduction. His analysis focus on districts outside of Java, where comparatively fewer migrants originated. In an alternate specification, I interact the migrant exchange rate shock directly with the pre-period revenue from oil and gas production or with the pre-period palm oil production to check if the migrant exchange rate shock effects are systematically different in oil/gas-producing areas or in palm-oil producing area. In this specification, the magnitude of the interaction is roughly one-tenth of the migrant exchange rate shock coefficients. In contrast, the effects of migrant exchange rate shock on their own remain positive.

I also investigate if the exchange rate shock could instead be transmitted through foreign direct investment/FDI. Investigations on foreign investment are limited by the absence of FDI data at the district level disaggregated by countries of origin. Nevertheless, from aggregate statistics we see that similar to trade, the list of top countries where FDI in Indonesia originated also has little overlap with top migration destinations (Appendix Table A.20). At the country level, FDI in current year or in the next year are also uncorrelated with the relative changes in the currency exchange rates or the intensity of migration to the country as recorded by the BNP2TKI placement statistics (Appendix Table A.23). Together, these results suggest that trade and investment shock are unlikely to be the underlying driver of public service delivery change that I associate with foreign migrant income in this paper.

[20] Appendix Table A.22 shows that the intensity of migration at the district level and the intensity of oil and gas production as well as palm oil land area are not significantly correlated.

7.2 Regional Trends

Another alternative account for the presented results concerns differential trends. If areas observed with high foreign migrant income have the inherent propensity to exhibit different development paths due to their characteristics, the effects observed on the outcomes should not be attributed to foreign income. I test for the robustness of the effects of migrant exchange rate shocks with the inclusion of variables that flexibly controls for regional trends.

Table A.24 reports the results with the inclusion of regional trends. The regressions reported in this table add island-year interaction terms that flexibly accounts for potential differential trajectories in outcome variables between districts in different islands. Panel A reproduces the main estimates, while Panel B presents the results with regional trends for various development indicators and education outcomes, respectively. The migrant exchange rate shock coefficients are stable across the two specifications both for development indicators and education outcomes. All indicators maintain their statistical precision and magnitudes. For the density of senior secondary school, the estimated coefficient is nearly 50 percent larger, which improves the precision of the effect.

7.3 Correlated Shocks

I account for the possibility that the shocks are correlated across districts due to similarities in the migration patterns between districts. I construct two alternative clustering, based on the rank ordering of the country destinations from a district, and the quartile of migration intensity to the top destination countries. In these construct, multiple districts in different parts of the country belong to the same cluster if they e.g., send all their migrant workers to Malaysia, or have similar proportions of migrants going to Malaysia, Saudi Arabia, and Taiwan. Appendix Table A.25 presents the estimation results with the resulting standard errors from the alternative clustering structures. The precision is qualitatively unchanged across all outcomes, despite the increase of standard errors by up to 16%.

7.4 Other Robustness Checks

I conduct several additional robustness checks using alternative data and construction of migration and exchange rate shocks. Since I use the migrant count from the 2005 village survey as the measure of district migration intensity, one concern that arises is that the number of migrants may have changed substantially by the end of my sample period. In Appendix Table A.26, I present estimates from an alternate construction that addresses this concern using data from the three waves of village survey (2005, 2008, 2011). I limit my use of the 2005 migrant count to the years 2006-2008, and I refer to the 2008 and 2011 survey to update the count for 2009-2011 and 2012, respectively. The results remain consistent, reflecting the strong correlation between migrant counts within a district during the three periods.

Another possible concern is the inaccuracies in destinations recorded in the migrant terminal dataset. Officials collect this data when migrants return to Indonesia. These measurement errors can potentially bias the results. Therefore, I address this using village-level plurality destination recorded in the 2005 village survey, since this is the only year in which the survey collected migrant destination information. The responses are limited to only the top 11 migration destinations and include only one country per village, i.e., the country to which the most migrants from the village left. Using the same exchange rate data, I measure the shock and aggregate it to the district level. Appendix Table A.27 presents the estimation results. The main estimates are robust to different information sources of migration destinations. Additionally, the specification for this check implies

that the destination shares are kept constant from 2005 for the entire period of analysis. This specification uses less flexibility in migrant destination choices over time given that typical migrant contract only last 2-3 years, but provides a comparative application to typical shift-share applications where the shares are fixed at the beginning of the period.

I revisit the use of log transformations and test an alternative specification to my measure of migration intensity without this transformation in Appendix Table A.28. One argument to use the non-transformed variable is to highlight its connection to the share of overseas migrant incomes in the origin, although this interpretation requires information on migrant overseas earnings across destinations. This information is not available for the Indonesian context for all destinations, as data on overseas migrant earning at the contract level is not systematically collected. Nevertheless, with the alternative specification the results for education outcomes are preserved with comparable magnitudes. The estimates for household expenditures lose their precision with the smaller magnitudes.

The inclusion of the lagged outcome variable as a regressor addresses the concern that future outcomes are predicted by past outcomes. If past outcomes are correlated with the migrant exchange rate shocks when it is omitted from the right hand side of equation (5), this will bias the coefficient upward. In Appendix Table A.29, I show that the results are also mostly robust to the inclusion of lagged outcomes as a control variable.

8 Heterogeneity and Mechanisms

What drives the government to provide public goods in the presence of positive migrant exchange rate shocks? Typically, foreign income from migrants are private transfers of money between individuals. In this way, local governments do not have access to them. Furthermore, constructing public facilities typically requires significant investment, and governments in developing countries are often resource-strapped.

I investigate several pathways through which foreign income may influence local governments in providing public goods. First, foreign income may influence government policies through interactions with pre-existing policy priorities. Especially when governance is decentralized, local governments may have a better position to provide public goods for their population. Second, electoral competition may induce politicians to provide public goods to win votes. And, finally, governments may capture the windfall through taxation.

8.1 Pre-existing Policy Priorities and Government Splits

Governments pursue their policy goals by allocating public budgets to reflect their priorities. With limited resources, officials may decide to improve their provision of public goods and services only if the improvements align with pre-existing policy priorities. For example, a government with a solid commitment to education may interpret increased enrollment changes brought by foreign migrant income windfall as a positive feedback signal, leading to improved provision of public education facilities.

To test this mechanism, I use district finance data from the Ministry of Finance to proxy a district's commitment to education by the share of the district's expenditure on education out of its total expenditure. I estimate a regression of education facilities at time t on the interaction of migrant exchange rate shock at time $t-1$ and the district's share of education expenditure at time $t-2$. The two-period lag for the education expenditure variable helps guard against the contemporaneous effect of the migrant exchange rate shock on the district's spending profile. The coefficient of the interaction term in this regression will elucidate the relationship between foreign migrant income and a district's policy priorities.

The results in Table 7, Panel A suggest that migrant exchange rate shocks strengthen the provision of education facilities in districts with a stronger fiscal commitment to education. The interaction term between migrant exchange rate shock and share of education expenditure has positive and significant coefficients in estimations with elementary and junior secondary schools as the outcome. This finding suggests that the marginal impact of migrant exchange rate shocks on basic education facilities increases with the district government's level of fiscal commitment to education.

Village Head Survey. How does government policy adaptation operate in practice? At the lowest level, village governments have the best vantage point because they frequently interact with both villagers and the service providers (teachers and school principals). In the SPKP survey, village heads in five provinces were asked to list the main challenges they face in education service provision. Frequent answers included inadequate facilities or families not being able to afford education for their children. I use the survey responses and create indicators of whether the village heads mention facilities and/or cost concern, and whether they rank facilities concern higher than cost concern. I regress these indicators on modified equation (5), specifying the migrant exchange rate shock at the village level instead of at the district level. Panel B, Table 7 reports the results.

Village heads are less likely to mention education cost concern in villages with positive migrant exchange rate shocks (Column 2), which is consistent with the positive effects on household welfare that I documented earlier. The coefficient for facility concern is positive but, statistically, is not significantly different than zero (Column 1). When comparing facility concern and cost concern directly, inadequate education infrastructure was ranked higher than unaffordability of school education within the top three challenges village heads face in education provision (Column 3).

Government Splits. The officials' ranking of challenges to education suggests that local governments are likely to support policies aimed at increasing education facilities leading to the effects on the number of public elementary and junior secondary schools. The process to provide education facilities could be more effective in a more decentralized governance, which Indonesia fostered with district splits that created smaller government units (Bazzi and Gudgeon, 2021). As previously noted, district splitting also substantially increases the transfers from central government to the district (Cassidy, 2022). I investigate whether public good provisions in response to migrant exchange rate shocks are different in split districts.

I use a binary variable of district splitting, which takes a value of 1 for parent districts and their children in the year the split occurred/the children districts are created and thereafter. The indicator takes a value of 0 for the following two scenarios: (i) districts that never split and (ii) districts that have not yet split. I regress the public school density on the migrant exchange rate shock interacted with the district split indicator.

Table 5, Columns 1-3 of Panel B reports the estimation results: some of the effects of migrant exchange rate shock on public goods are driven by the creation of public schools in districts that had split. In a regression where public primary schools per 10,000 population is the outcome, the interacted term has a coefficient roughly half the size of the migrant exchange rate shock coefficient in the main specification (Column 1). For public junior high school density, the coefficient for the interaction is roughly one-third of the coefficient in the main specification (Column 2). For these outcomes, the coefficients for the migrant exchange rate shock remain precisely estimated. Split districts also receive more transfers from the central government, but analysis in Cassidy and Velayudhan (2022) show that the district split alone does not improve public services. It is likely that these results that I observe on public goods are due to the interplay between migrant exchange rate shock, stronger accountability, and the districts' fiscal space.[21]

[21] Conversations with several former teachers who taught in primary schools constructed within this

Constructing junior high school facilities. Another policy to increase education facilities is to build junior high schools through a more intense use of existing resources. In the 1970s and 1980s, the Indonesian government built numerous public primary schools across the country through the INPRES program (Duflo, 2001). This celebrated program provided an initial stock of land that the government in the 2000s could use to expand junior secondary education.

I look into a program that allows local governments to build junior high schools using existing primary schools, which led to the building of smaller schools with fewer amenities. Within the scope of this "One Roof" program, district governments can build junior high schools as attachments to existing primary schools. The expansion of the existing elementary school enables current students to seamlessly continue into the subsequent three grades of junior high school. In this program, local governments are still responsible for hiring teachers for the newly created schools; although, in practice, existing primary school teachers or educated locals may be asked to teach the junior high students students (Departemen Pendidikan Nasional, 2008). The junior high school may also borrow already existing primary school classrooms while construction of the junior high facilities takes place. Some of the school constructions under this programs are supported with aid money from Australia (Antara, 2016).[22] School management are administered jointly between the two schools with the primary school principals are responsible for both the primary and junior high schools. This policy allows rapid establishment of schools because the district governments do not need to acquire additional land.

I use detailed school-level characteristics from the Ministry of Education's administrative data to examine this margin of response. I look into the following outcome variables: an indicator of whether a junior high school is attached to an primary school, the average number of classrooms per junior high school in the district, and the average number of teachers per junior high school. When new schools are constructed with fewer amenities, which typically occurs under this program, the average number of teachers within the district falls. Table 7, Panel C reports the results of estimating equation (5) for these variables.

I find district governments economize on new school constructions in their responses to the migrant exchange rate shocks. In Table 7, Panel C, Column 1, a one SD shock results in 3 p.p. increase in the share of junior high schools that are attached to primary schools in the district. These newly created junior high schools also have fewer classrooms than "normal" junior high schools (Column 2), and fewer teachers (Column 3). Overall, these results point to the trade-off district governments make in order to respond to the migrant exchange rate shock; they establish schools with less-than-perfect facilities in order to ensure that more children have access to secondary education.[23]

8.2 Election

Politicians may provide public goods to bolster their chances of winning votes during elections. During election years, as they campaign for public office, candidates may become sensitive to citizen demand for public goods. As foreign migrant income increase the use

period highlighted the salience of proliferation of government units. These teachers also mentioned lower-level government splits at the village level as the reason why a primary school was built in a particular village. In other places, village-owned land could provide the land and resources for school constructions—as seen with *bengkok* land in Lim (2024).

[22]Two aid programs to support Indonesia's education sector ran consecutively between 2006-2015: Australia-Indonesia Basic Education Partnership/AIBEP until 2010 and Australia's Education Partnership with Indonesia/AEPI from 2011 (AEPI, 2010; AIBEP, 2010). These programs provided A$197 million in soft loans and A$156 million in grants for activities including school constructions (Antara, 2016).

[23]Appendix Table A.30 shows the responses to the shock from private schools and *madrasa* Islamic schools. The effects points to similar direction, albeit at a smaller magnitude.

of public facilities such as schools (see Section 5), mayors seeking reelection may intensify provision of public goods in areas with high migrant exchange rates during the election period. Where the accountability mechanism between citizens and elected politicians is weak, the construction and provision of public goods will correspondingly decrease outside of this period.

To test the aforementioned mechanism, I interact the migrant exchange rate shock in equation (5) with a dummy for election years. I compile various publicly available information to create a district-year election dummy, which takes a value of 1 if the district holds a direct election in the given year, and 0 otherwise. Suppose elections are the main mediator of the effects of foreign migrant income on public goods. In this case, we should expect positive coefficients on the migrant exchange rate shock and election interaction term, while the uninteracted migrant exchange rate shock variable loses precision. Table 5, Columns 4-6 of Panel B presents the results where I estimate regressions with the same public goods outcome (public schools) on the interaction between migrant exchange rate shock and district election years.

I find it unlikely that electoral competition drives the local governments' responses to foreign migrant income. The interaction term coefficients in Columns 4-6 suggest that public goods provision is no different in election years than in non-election years. In contrast, the coefficients for the migrant exchange rate shock remain largely unchanged. In Appendix Table A.31, alternative timing for the election dummy variable shows that the public school establishment largely neither predate the election years nor follow them.

Analysis of household responses in the SPKP panel also indicates that migrant exchange rate shock lead to lower voter turnout as well as statistically significant lower voter turnout for mayoral elections (Appendix Table A.32). During election years, villagers also complain less to village leaders about the implementation of anti-poverty programs within the villages. Despite the lower formal engagement, villagers may still interact with government officials informally through various community groups. In this regard, migrant exchange rate shock lead to diverging effects in different community group participation, with positive effect on credit and recreation groups and negative effects on production groups (Appendix Table A.33).

8.3 Taxation

Taxation of economic activities transfers part of the economic gain to the local government which may decide to use it to provide local inhabitants public goods. The question arises: Do increased foreign migrant income due to exchange rate shocks change government revenues through taxation? I test this pathway by estimating the effects of migrant exchange rate shocks on local government's various revenue streams. I use data from the Ministry of Finance for this analysis, reporting the outcomes in log IDR and as a share of the total revenue for the district.

Suppose the government is able to capture part of the economic growth in their districts through taxation. In this case, the regression of tax revenues from centrally or locally collected taxes should result in positive coefficients for the migrant exchange rate shock when using equation (5). The migrant exchange rate shock should alter neither the general DAU budget that comes from unconditional intergovernmental transfers nor the share from natural resources revenues. With respect to the DAK budget, the effects are ex-ante ambiguous. Table 8 reports the results.

I do not find supporting evidence that the governments collected higher tax revenues collected after positive migrant exchange rate shocks. The coefficient for revenue sharing from centrally collected taxes is imprecisely estimated in log IDR (Panel A of Table 8, Column 1). In Column 2, I find suggestive evidence that the district government collects

less revenue from local taxes. When I look at the revenue streams as a share of the total budget, the negative effect on revenue sharing from centrally collected taxes becomes statistically significant at the 5 percent level, while the share of locally collected taxes loses statistical significance (Panel B of Table 8, Column 1-2).

9 Aggregate Outcomes

The potential of foreign migrant income to influence development outcomes is widely recognized. In this section, I investigate the effect of migrant exchange rate shocks on two aggregate measures: GDP per capita and poverty indicators.

9.1 Economic Growth

In aggregate, the infusion of resources due to migrant exchange rate shocks can stimulate growth. To measure growth, I use the district-level gross domestic product (GDP) from Indo-Dapoer, which is calculated and published in official reports issued by an independent statistical agency. Indonesia is one of the few developing countries in the world with reliable regional GDP estimates, and it has been used to benchmark night light satellite data with economic growth measures (Gibson et al., 2021). GDP data is expressed in constant price, benchmarked to the year 2000. I first divide the district GDP figure by population to obtain the GDP per capita value in IDR, and then transform it with a natural logarithm. I group the GDP figure into three major sectors: agriculture, service, and manufacturing. Table 9, Panel A reports the results.

The migrant exchange rate shocks increase the overall GDP per capita in the district, and the agriculture and service sectors drive this increase. A one SD shock leads to an increase of 0.08 log points in the overall GDP per capita (Column 1). It also leads to an increase in GDP per capita in the agriculture sector (0.10 log points, Column 2), the service sector (0.22 log points, Column 3), and the manufacturing sector (0.19 log points, Column 4) one year after the shock. The coefficients are most precisely estimated for the agriculture sector, while the estimates for the manufacturing and service sectors are not statistically significantly different from zero. At the mean, the increase of the total GDP per capita is equivalent to IDR 448,892 or USD 48 at the 2010 exchange rate. This estimate is roughly one-third the effect on the global income in the Philippines one decade after the 1998 exchange rate shocks (Khanna et al., 2022).

The increase in GDP per capita for agriculture possibly reflects the composition of the migrant workers, who come predominantly from agricultural households, while household purchases of goods and use of financial institutions and other services may contribute to the boost in service GDP. In Appendix Table A.34, I check the robustness of these results to the inclusion of the main commodity trade variables and island-specific trends. The estimates are especially stable for the agriculture GDP per capita.

9.2 Poverty

Finally, I examine the effect of migrant exchange rate shocks on poverty and inequality. I use four different measures: poverty headcount, the share of district population living below the poverty line, the poverty gap, and Gini coefficient. The poverty gap is a measure of poverty intensity, while the Gini coefficient serves as a measure of inequality. Table 9, Panel B reports the results.

Positive migrant exchange rate shocks reduce poverty. With households in the bottom quintile showing the strongest gain in household expenditures, the added income translates

into a reduction in district poverty rate. A one SD of shock reduces poverty by 3 p.p., roughly one-fifth of the mean poverty rate of 15 percent. In headcount terms, for a population of 10,000, more than 300 individuals become less likely to be categorized as poor. It also reduces the poverty gap by 1.1 p.p., nearly halving the mean distance of 2.6 percent between the poor's income with the poverty line. These results underscore the power foreign migrant income has to alleviate poverty. My findings echo results from the Philippines, where exchange rate shocks due to the 1998 exchange rate depreciation reduced the incidence of household poverty by two thirds of the pre-crisis mean and offset the mean increase in poverty gap in the aftermath of the crisis (Yang and Martínez, 2005). In addition to poor households primarily benefiting from migrant exchange rate shocks, I also observed a reduction in the Gini coefficient by 0.03, one-tenth of the mean dependent variable in the sample. In Appendix Table A.35, I run robustness checks with the inclusion of the main commodity trade variables and island-specific trends. The estimates for all of the outcomes are stable across the board. Foreign migrant income thus can be a powerful tool to alleviate poverty in migrant-sending areas.

10 Conclusion

Do foreign migrant income lead to public goods and local development? When we look at the provision of public goods in education and infrastructure in migrant-origin districts in Indonesia, the answer is "Yes." To isolate the causal effect of foreign migrant income, I leverage preexisting spatial variations in migration intensity and destinations across districts, along with unanticipated currency rate fluctuations in migrants' host countries. This approach builds on the positive relationship between currency rate fluctuations and remittance receipt at the household level that I document using a migrant panel survey. At the district level, I find that the migrant exchange rate shock leads to an increase in the provision of public goods, particularly an increase in the density of primary and junior high schools.

This study provides new evidence on the link between foreign migrant income and development in the migrant's area of origin. With a plausibly exogenous variation, I investigate the causal impact of migrant exchange rate shocks on local development. The variations allow me to obtain the effect of foreign income separately from the decision to migrate. Furthermore, I take advantage of a rich panel dataset from Indonesian districts to analyze the interactions between migrant households and public finance to provide insight into how foreign migrant income might influence the provision of public goods.

Since migrant exchange rate shocks can be linked to the provision of public goods in sectors that are especially salient to migrant households, this empirical relationship can be of particular interest to policymakers in countries that send off many migrants. Stakeholders can direct capital crowd-in from public finance to take further advantage of the windfall. Ultimately, more empirical research is necessary to provide a complete understanding of the pathways between international migration, remittances, and development.

References

Abarcar, P. and C. Theoharides (2021): "Medical Worker Migration and Origin-Country Human Capital: Evidence from U.S. Visa Policy," *The Review of Economics and Statistics*, 1–46.

Abdih, Y., R. Chami, J. Dagher, and P. Montiel (2012): "Remittances and Institutions: Are Remittances a Curse?" *World Development*, 40, 657–666.

Adams, R. H. and J. Page (2005): "Do international migration and remittances reduce poverty in developing countries?" *World Development*, 33, 1645–1669.

ADB (2006): "Workers' Remittance Flows in Southeast Asia," *Asian Development Bank*, 262.

AEPI (2010): "Australia's Education Partnership with Indonesia: A Contribution to the Government of Indonesia's Education Sector Support Program," Tech. rep., Australia Indonesia Partnership.

Ahmed, F. Z. (2012): "The perils of unearned foreign income: Aid, remittances, and government survival," *American Political Science Review*, 106, 146–165.

——— (2013): "Remittances deteriorate governance," *Review of Economics and Statistics*, 95, 1166–1182.

AIBEP (2010): "Australia-Indonesia Basic Partnership for Education Independent Completion Report," Tech. rep., Australia-Indonesia Basic Partnership for Education.

Alatas, V. (2011): "Program Keluarga Harapan: Main Findings from the Impact Evaluation of Indonesia's Pilot Household Conditional Cash Transfer Program," *Working Paper*.

Alpaslan, B., A. Kayaoglu, J. Meckl, J. Naval, M. Vanore, and T. H. Ziesemer (2021): "Economic Effects of Remittances on Migrants' Country of Origin," in *The Economic Geography of Cross-Border Migration*, 449–483.

Ambler, K., D. Aycinena, and D. Yang (2015): "Channeling remittances to education: A field experiment among migrants from El Salvador," *American Economic Journal: Applied Economics*, 7, 207–232.

Amuedo-Dorantes, C. and S. Pozo (2010): "Accounting for Remittance and Migration Effects on Children's Schooling," *World Development*, 38, 1747–1759.

Antara (2016): "Indonesia-Australia education partnership builds 2,725 schools: Minister Effendy," https://en.antaranews.com/news/108091/indonesia-australia-education-partnership-builds-2725-schools-minister-effendy.

Asatryan, Z., B. Bittschi, and P. Doerrenberg (2017): "Remittances and Public Finances: Evidence from Oil-Price Shocks," *Journal of Public Economics*, 155, 122–137.

Banerjee, A., L. Iyer, and R. Somanathan (2007): "Public Action for Public Goods," in *Handbook of Development Economics*, vol. 4, 3117–3154.

Bank Indonesia (2018): "Statistik Ekonomi dan Keuangan Indonesia," Tech. rep., Bank Indonesia.

Bazzi, S. (2012): "International Migration from Indonesia: Stylized Facts," *Mimeo*.

Bazzi, S., L. Cameron, S. Schaner, and F. Witoelar (2021): "Information, Intermediaries, and International Migration," *NBER Working Paper*.

Bazzi, S. and M. Gudgeon (2021): "The Political Boundaries of Ethnic Divisions," *American Economic Journal: Applied Economics*, 13, 235–266.

Bazzi, S., M. Hilmy, and B. Marx (2023): "Religion, Education, and the State," *NBER Working Paper*.

Bloomberg (2016): "Indonesia Needs More Taxpayers," https://www.bloomberg.com/opinion/articles/2016-03-28/indonesia-needs-more-taxpayers.

BNP2TKI (2014): "Penempatan dan Perlindungan Tenaga Kerja Indonesia Tahun 2013," Tech. rep., Badan Nasional Penempatan dan Perlindungan Tenaga Kerja Indonesia.

Borusyak, K., P. Hull, and X. Jaravel (2022): "Quasi-experimental shift-share research designs," *The Review of economic studies*, 89, 181–213.

Brodjonegoro, B. and J. Martinez-Vazquez (2005): "Reforming Intergovernmental Fiscal Relations and the Rebuilding of Indonesia," in *Reforming Intergovernmental Fiscal Relations and the Rebuilding of Indonesia*, ed. by J. Alm, J. Martinez-Vazquez, and S. M. Indrawati, Northampton: Edward Elgar Publishing, 159–198.

Brown, R. P. and E. Jimenez-Soto (2015): "Migration and Remittances," in *Handbook of the Economics of International Migration*, North-Holland, vol. 1, 1077–1140.

Cahyadi, N., R. Hanna, B. A. Olken, R. A. Prima, E. Satriawan, and E. Syamsulhakim (2020): "Cumulative Impacts of Conditional Cash Transfer Programs: Experimental Evidence from Indonesia," *American Economic Journal: Economic Policy*, 12, 88–110.

Cassidy, T. (2022): "Revenue Persistence and Public Service Delivery," *Working Paper*.

Cassidy, T. and T. Velayudhan (2022): "Government Fragmentation and Economic Growth," *Working Paper*.

Catrinescu, N., M. Leon-Ledesma, M. Piracha, and B. Quillin (2009): "Remittances, Institutions, and Economic Growth," *World Development*, 37, 81–92.

Chami, R., A. Barajas, T. Cosimano, C. Fullenkamp, M. Gapen, and P. Montiel (2008): *Macroeconomic Consequences of Remittances*, no. 259 in Occasional Papers, Washington, D.C.: International Monetary Fund.

Clemens, M. A. and D. McKenzie (2018): "Why Don't Remittances Appear to Affect Growth?" *Economic Journal*, 128, F179–F209.

Cuecuecha, A. and R. H. Adams Jr. (2016): "Remittances, Household Investment and Poverty in Indonesia," *Journal of Finance and Economics*, 4, 12–31.

De Arcangelis, G., M. Joxhe, D. McKenzie, E. Tiongson, and D. Yang (2015): "Directing remittances to education with soft and hard commitments: Evidence from a lab-in-the-field experiment and new product take-up among Filipino migrants in Rome," *Journal of Economic Behavior and Organization*, 111, 197–208.

Departemen Pendidikan Nasional (2008): "Petunjuk Pelaksanaan Depdiknas untuk Pembangunan Sekolah Satu Atap (SATAP)," Tech. rep.

Desierto, D. A. (2018): "What resource curse? The null effect of remittances on public good provision," *Journal of Theoretical Politics*, 30, 431–450.

Dinkelman, T., G. Kumchulesi, and M. Mariotti (2024): "Labor migration, capital accumulation, and the structure of rural labor markets," *Review of Economics and Statistics*, 1–46.

Dinkelman, T. and M. Mariotti (2016): "The Long-Run Effects of Labor Migration on Human Capital Formation in Communities of Origin," *American Economic Journal: Applied Economics*, 8, 1–35.

Doi, Y., D. McKenzie, and B. Zia (2014): "Who you train matters: Identifying combined effects of financial education on migrant households," *Journal of Development Economics*, 109, 39–55.

Duflo, E. (2001): "Schooling and Labor Market Consequences of School Construction in Indonesia: Evidence from an Unusual Policy Experiment," *American Economic Review*, 91, 795–813.

Easton, M. R. and G. R. Montinola (2017): "Remittances, Regime Type, and Government Spending Priorities," *Studies in Comparative International Development*, 52, 349–371.

Edwards, A. C. and M. Ureta (2003): "International migration, remittances, and schooling: Evidence from El Salvador," *Journal of Development Economics*, 72, 429–461.

Edwards, R. (2019): "Export agriculture and rural poverty: evidence from Indonesian palm oil," *Working Paper*.

Esteves, R. and D. Khoudour-Castéras (2009): "A fantastic rain of gold: European migrants' remittances and balance of payments adjustment during the gold standard period," *Journal of Economic History*, 69, 951–985.

Fernández Sánchez, M. (2022): "Mass emigration and human capital over a century: Evidence from the galician diaspora," *Available at SSRN 4267207*.

Funkhouser, E. (2012): "Using longitudinal data to study migration and remittances," *Handbook of Research Methods in Migration*, 186–206.

Gertler, P. J., S. W. Martinez, and M. Rubio-Codina (2012): "Investing Cash Transfers to Raise Long-Term Living Standards," *American Economic Journal: Applied Economics*, 4, 164–192.

Gibson, J. and D. McKenzie (2017): "How reliable are survey estimates of remittances? Evidence from a cross-reporting survey exercise," *Migration Studies*, 5, 97–115.

Gibson, J., D. J. McKenzie, and H. Rohorua (2006): "How cost-elastic are remittances? Estimates from Tongan migrants in New Zealand," *Pacific Economic Bulletin*, 21, 112–128.

Gibson, J., S. Olivia, G. Boe-Gibson, and C. Li (2021): "Which night lights data should we use in economics, and where?" *Journal of Development Economics*, 149, 102602.

Giuliano, P. and M. Ruiz-Arranz (2009): "Remittances, financial development, and growth," *Journal of Development Economics*, 90, 144–152.

Goldsmith-Pinkham, P., I. Sorkin, and H. Swift (2020): "Bartik Instruments: What, When, Why, and How," *American Economic Review*, 110, 2586–2624.

Gupta, S., C. A. Pattillo, and S. Wagh (2009): "Effect of Remittances on Poverty and Financial Development in Sub-Saharan Africa," *World Development*, 37, 104–115.

IMF (2009): "International transactions in remittances: Guide for compilers and users," *International Monetary Fund*.

Khanna, G. and N. Morales (2021): "The IT Boom and Other Unintended Consequences of Chasing the American Dream," *SSRN Electronic Journal*.

Khanna, G., E. Murathanoglu, C. Theoharides, and D. Yang (2022): "Abundance from Abroad: Migrant Income and Long-Run Economic Development," *Working Paper*.

KNOMAD (2017): *Migration and Remittances: Recent Developments and Outlook*, October, World Bank, Washington, DC.

Le, T. (2009): "Trade, Remittances, Institutions, and Economic Growth," *International Economic Journal*, 23, 391–408.

Lewis, B. D. (2017): "Does Local Government Proliferation Improve Public Service Delivery? Evidence from Indonesia," *Journal of Urban Affairs*, 39, 1047–1065.

Lim, G. (2024): "Local Elites, Land Rents, and the Effects of Tying Incentives to Local Development," *Working Paper*.

Martinez-Bravo, M., P. Mukherjee, and A. Stegmann (2017): "The Non-Democratic Roots of Elite Capture: Evidence From Soeharto Mayors in Indonesia," *Econometrica*, 85, 1991–2010.

Marx, B. (2018): "Elections as Incentives: Project Completion and Visibility in African Politics," *Working Paper*.

Media Indonesia (2017): "Remitansi TKI Lebih Besar dari Tax Amnesty," https://mediaindonesia.com/ekonomi/89453/remitansi-tki-lebih-besar-dari-tax-amnesty.

Mohapatra, S., D. Ratha, and A. Silwal (2012): "Migrant Remittances in Nepal: Impact of Global Financial Crisis and Policy Options," in *Migration and Remittances during the Global Financial Crisis and Beyond*, ed. by I. Sirkeci, J. H. Cohen, and D. Ratha, chap. 9, 121.

Mosley, L. and D. A. Singer (2015): "Migration, labor, and the international political economy," *Annual Review of Political Science*, 18, 283–301.

Olken, B. A., J. Onishi, and S. Wong (2014): "Should Aid Reward performance? Evidence from a field experiment on health and education in Indonesia," *American Economic Journal: Applied Economics*, 6, 1–34.

Olken, B. A. and M. Singhal (2011): "Informal taxation," *American Economic Journal: Applied Economics*, 3, 1–28.

Pierskalla, J. H. and A. Sacks (2018): "Unpaved road ahead: The consequences of election cycles for capital expenditures," *Journal of Politics*, 80, 510–524.

——— (2020): "Personnel Politics: Elections, Clientelistic Competition and Teacher Hiring in Indonesia," *British Journal of Political Science*, 50, 1283–1305.

Rajan, S. I. and D. Narayana (2012): "The Financial Crisis in the Gulf and Its Impact on South Asian Migration and Remittances," in *Migration and Remittances during the Global Financial Crisis and Beyond2*, ed. by I. Sirkeci, J. H. Cohen, and D. Ratha, The World Bank, 67.

Ratha, D., S. De, E. J. Kim, S. Plaza, G. Seshan, and N. D. Yameogo (2020): "Covid-19 crisis through a migration lens," Tech. Rep. 32, KNOMAD-World Bank.

Ratha, D., S. Plaza, and C. Ozden (2016): "Migration and Development: A Role for the World Bank Group," Tech. rep.

Ratha, D. and W. Shaw (2007): *South-South migration and remittances*, 102, World Bank Publications.

Refinitiv (2022): "Refinitiv Datastream," Accessed March 16, 2022.

Riester, A. (2012): "Resilience of Remittances during the Global Financial Crisis and the Entrenchment of Migration," in *Migration and Remittances during the Global Financial Crisis and Beyond*, ed. by I. Sirkeci, J. H. Cohen, and D. Ratha, The World Bank, chap. 11, 141.

Roodman, D., M. Ø. Nielsen, J. G. MacKinnon, and M. D. Webb (2019): "Fast and wild: Bootstrap inference in Stata using boottest," *The Stata Journal*, 19, 4–60.

Salas, V. B. (2014): "International remittances and human capital formation," *World Development*, 59, 224–237.

Sirkeci, I., J. H. Cohen, and D. Ratha, eds. (2012): *Migration and Remittances during the Global Financial Crisis and Beyond*.

Son, H. (2015): "Human capital investment when sheepskin effects matter: evidence from income shocks in Indonesia," *Working Paper*.

Sukamdi, E. Satriawan, and A. Haris (2004): "Impact of remittances on the Indonesian economy," *International Migration in Southeast Asia*, 137.

The Economist (2019): "In much of Africa the family is bank, business and welfare state," *The Economist*.

Theoharides, C. (2018): "Manila to Malaysia, Quezon to Qatar: International migration and its effects on origin-country human capital," *Journal of Human Resources*, 53, 1022–1049.

Tribun News (2013): "Transaksi Remitansi Kantor Pos Cirebon Tembus Rp 418 Miliar," https://www.tribunnews.com/regional/2013/09/04/transaksi-remitansi-kantor-pos-cirebon-tembus-rp-418-miliar.

World Bank (2006): "Global Economic Prospects: Economic Implications of Remittances and Migration," Tech. rep.

——— (2010): "Enhancing Access to Finance for Indonesian Overseas Migrant Workers: Evidence from a Survey of Three Provinces," Tech. rep., World Bank.

——— (2017): "Indonesia's Global Workers: Juggling Opportunities and Risks," Tech. rep.

——— (2019): "Leveraging Economic Migration for Development: A Briefing for the World Bank Board," Tech. rep., World Bank.

Yang, D. (2006): "Why do migrants return to poor countries? Evidence from Philippine migrants' responses to exchange rate," *Review of Economics and Statistics*, 88, 715–735.

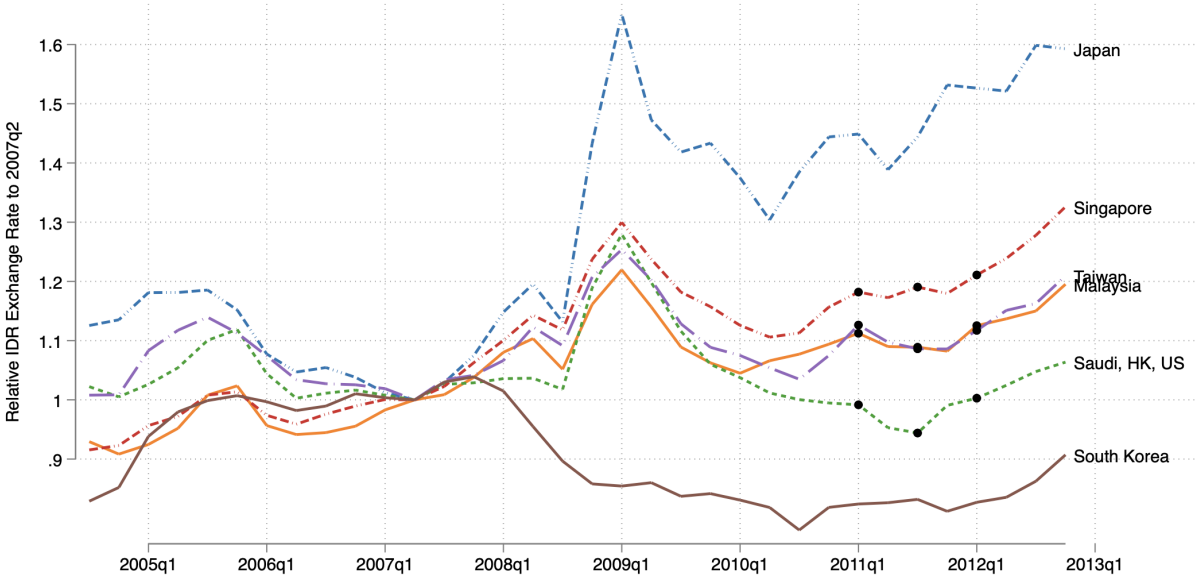
——— (2008): "International Migration, Remittances and Household Investment: Evidence from Philippine Migrants' Exchange Rate Shocks," *The Economic Journal*, 118, 591–630.

——— (2011): "Migrant Remittances," *Journal of Economic Perspectives*, 25, 129–152.

Yang, D. and C. A. Martínez (2005): "Remittances and Poverty in Migrants' Home Areas: Evidence from the Philippines," in *International Migration, Remittances, and the Brain Drain*, ed. by C. Ozden and M. Schiff, World Bank.

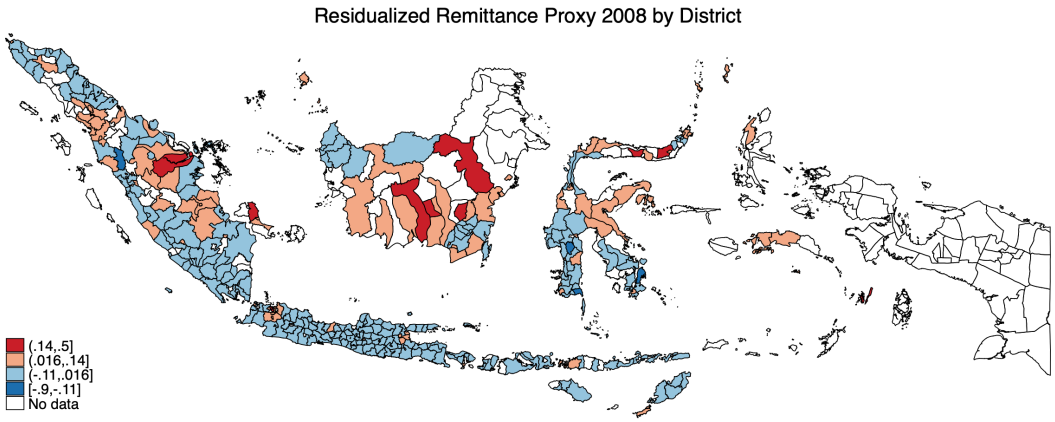
Figures and Tables

Figure 1: Variations of Exchange Rate to Indonesian Rupiah (IDR)



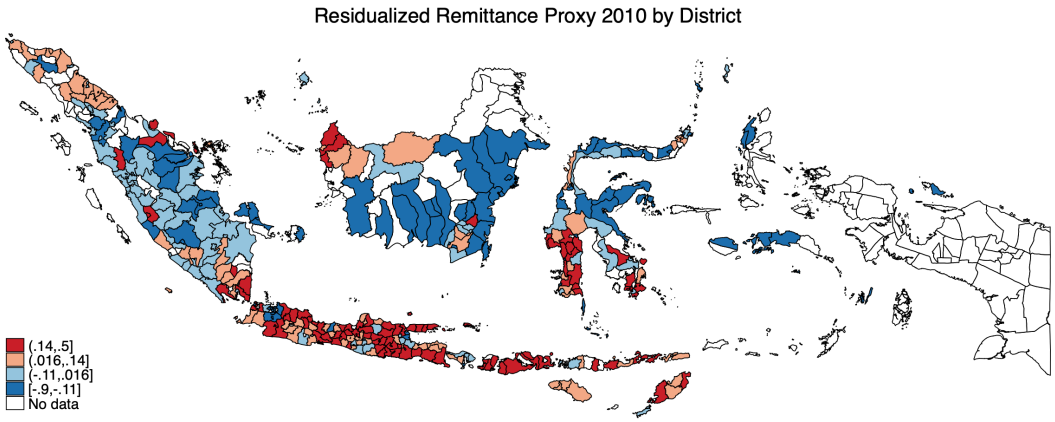
Note: Exchange rates plotted are relative to the prevailing exchange rate in Q2-2007. Countries selected are major migration destination countries. Quarterly data averaged from monthly exchange rates provided by Refinitiv Datastream (2021). Black dots denote quarters when Doi et al. (2014)'s follow-up surveys were administered.

Figure 2: Spatial Distribution of Residualized Remittance Proxy in 2008



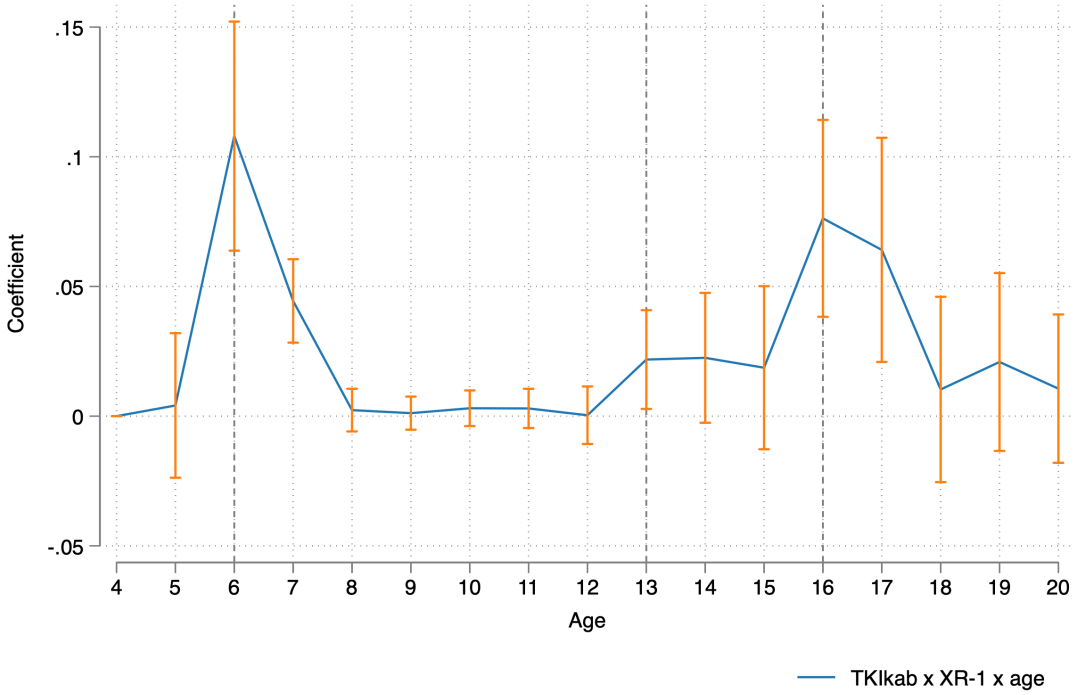
Note: This map displays Indonesian districts (*Kabupaten/Kota*) with the color indicating the magnitude of residualized remittance proxy in 2008. The residual term is from a regression of remittance proxy (interaction of migration intensity and exchange rate shock) on district and year fixed effects. Map plots district boundaries as of 2010. Bin thresholds corresponds to quartile thresholds in 2010. Districts are coded with no data if they have no record of abroad stock of TKI migrant workers in the migrant arrival data for the corresponding year.

Figure 3: Spatial Distribution of Residualized Remittance Proxy in 2010



Note: This map displays Indonesian districts (*Kabupaten/Kota*) with the color indicating the magnitude of residualized remittance proxy in 2010. The residual term is from a regression of remittance proxy (interaction of migration intensity and exchange rate shock) on district and year fixed effects. Map plots district boundaries as of 2010. Bin thresholds corresponds to quartile thresholds in 2010. Districts are coded with no data if they have no record of abroad stock of TKI migrant workers in the migrant arrival data for the corresponding year.

Figure 4: Age-specific Enrollment Responses to Remittance Shocks



Note: This figure plots coefficients of a set of age dummies with exchange rate shock and kabupaten level migration status. Spikes are 90% confidence intervals. Sample = Individuals ages 4-20 in Susenas 2005-2011. N = 2,035,426.

Table 1: Summary Statistics

	Mean	SD	Min	Max	Obs.
A. Migrant Panel Data from Doi et al. (2014)					
Remittance (z-score of log IDR)	-0.00	1.00	-3.87	2.76	418
Remittance (USD)	804.60	885.59	6.87	9943.21	418
Exchange rate shock (z-score)	0.00	1.00	-3.05	1.70	418
Exchange rate shock (%)	1.01	0.02	0.96	1.04	418
B. District-level Regressors					
Migrants (Podes 2005)	3,185	6,494	1	38,367	353
Population (Podes 2005)	588,456	593,375	44,699	4,004,632	353
Migrants per one million people (log)	7.2	1.8	.16	11	353
Exchange rate shock (%)	1.07	0.07	0.86	1.31	2419
Remittance proxy (z-score)	-0.00	1.00	-3.92	2.47	2419
C. Household Outcomes					
Enrollment elementary level (%)	93.34	2.96	70.38	100.00	2393
Enrollment junior secondary level (%)	66.52	9.93	20.25	91.47	2393
Enrollment senior secondary level (%)	46.03	12.84	1.35	86.62	2393
Household per capita (p.c.) expenditure (log IDR)	12.83	0.45	11.59	14.33	2062
Household p.c. expenditure for poorest 20%	12.08	0.38	10.85	13.10	2062
Household p.c. education expenditure (log IDR)	9.62	0.69	7.56	11.73	2062
Poor population (% of population)	15.13	7.79	1.52	45.18	2394
Poverty gap (index)	2.66	1.78	0.06	13.19	2394
D. District Education Supply					
Public elementary schools per 10,000 people	6.39	3.03	0.02	17.00	2419
Public junior high schools per 10,000 people	1.18	0.86	0.00	6.56	2419
Public high schools per 10,000 people	0.31	0.25	0.00	1.83	2419
District education expenditure (% of total)	0.35	0.11	0.00	1.00	2222
E. Other District Outcomes					
District GDP p.c. Excl. Oil & Gas (log IDR)	15.50	0.64	12.79	18.68	2401
Agriculture GDP p.c. (log IDR)	13.98	1.03	8.57	15.68	2401
Industry GDP p.c. (log IDR)	13.81	2.50	-12.29	18.08	2419
Service GDP p.c. (log IDR)	14.40	2.36	-12.29	18.57	2419

Notes: This table reports the summary statistics from various variables. Variables in Panel A are from Doi et al. (2014). Data in Panel B are from Podes 2005 and Refinitiv. Data in Panel C-Panel E are primarily from Indo-Dapoer. For more details, see Appendix A. Summary statistics for more variables are presented in Appendix Table A.1.

Table 2: Effect of Currency Exchange Fluctuations on Remittances

	(1) Remittance	(2) Remittance	(3) Remittance	(4) Remittance
XR shock	0.417**	0.452**	0.414**	0.448**
	(0.176)	(0.178)	(0.176)	(0.179)
Time abroad		-0.001		-0.001
		(0.000)		(0.000)
Time to next Eid			-0.052	-0.076
			(0.197)	(0.211)
HH, Wave FE	Yes	Yes	Yes	Yes
HH	183	183	183	183
Observations	418	418	418	418

Notes: The sample is migrant household panel from Doi et al. (2014), restricted to households reported receiving remittances in more than one follow-up surveys (March 2011-January 2012). Remittances are total received remittances since migrant departure at the first follow-up, and the difference from previous response in subsequent follow-ups. Remittances are expressed in log Indonesian rupiah (IDR), standardized. XR shock is the exchange rate to IDR relative to March 2011, standardized. Exchange rate data are from Refinitiv Datastream. Standard errors are clustered at the household level. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

Table 3: Effects of Migrant Exchange Rate Shocks on Household Expenditures

	(1) Average Household Expenditures	(2) Bottom 20% Household Expenditures	(3) Household Education Expenditures	(4) Household Healthcare Expenditures	(5) Core Price Index
$Migration_d^o \times XRShock_{dt-1}$	0.0479	0.103***	0.254***	0.187**	-0.967
	(0.0393)	(0.0320)	(0.0887)	(0.0928)	(3.302)
District FE, Year FE	✓	✓	✓	✓	✓
Dep. Var. Mean	12.83	12.08	9.62	9.05	118.99
Districts	347	347	347	347	47
Observations	2050	2050	2050	2050	273

Notes: This table reports the estimates of equation (5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable $\text{Migration}_d \times \text{XRShock}_{t-1}$ is standardized to have mean of zero and a standard deviation of one. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. The district-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and total population from the 2005 village census. GDP per capita is expressed in log of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors are clustered at the district level in parentheses.

Table 4: Effects on School Enrollment

	(1) Elementary School Enrollment Among 6-12 yo.	(2) Jr. Sec School Enrollment Among 13-15 yo.	(3) Sr. Sec School Enrollment Among 16-18 yo.
	A. District-Year Units		
$Migration_d^o \times XRShock_{dt-1}$	3.271***	3.724*	6.635***
	(0.740)	(2.132)	(2.160)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	88.97	66.71	46.50
Districts	350	350	350
Observations	2398	2398	2398
	B. Cohort Analysis, All Households		
CohortTreat$\times Mig_d^o \times XRshock_{dt-1}$	0.074***	0.027*	0.077***
	(0.006)	(0.014)	(0.015)
$Mig_d^o \times XRshock_{dt-1}$	-0.031***	-0.011***	0.029***
	(0.003)	(0.002)	(0.003)
CohortTreat	0.851***	0.603***	0.370***
	(0.001)	(0.001)	(0.001)
Year FE, Kab FE	✓	✓	✓
Dep. Var. Mean	0.417	0.138	0.092
Households	962,605	962,605	962,605
Observations	1,826,794	1,826,794	1,826,794
	C. Cohort Analysis, Present Migrant HHs		
$CohortTreat_i \times Mig_h \times XRshock_{dt-1}$	0.019**	0.051***	-0.004
	(0.008)	(0.017)	(0.018)
$CohortTreat_i \times XRshock_{dt-1}$	0.023***	0.006***	-0.015***
	(0.001)	(0.002)	(0.002)
Age FE, Year FE, Kab FE	✓	✓	✓
Dep. Var. Mean	0.409	0.143	0.094
Households	393,272	393,272	393,272
Observations	757,991	757,991	757,991

Notes: This table reports the estimates of equation (5). The sample is from the 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. Interaction variable Migration$_d \times$XRShock$_{t-1}$ is standardized to have a mean of zero and a standard deviation of one. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. The district-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and total population from the 2005 village census. Outcomes data is from Susenas household surveys. Other outcomes data details are as described in Appendix A.1. * p$\leq$ 0.10, ** p$\leq$ 0.05, *** p$\leq$ 0.01. Standard errors clustered at the district level in parentheses.

Table 5: Effects on Public Goods Provision

	(1)	(2)	(3)	(4)	(5)	(6)
	Public Schools (per 10,000 population)			Other Public Goods		
A. Public Goods	Elementary (Grades 1-6)	Junior Secondary (Grades 7-9)	Senior Secondary (Grades 10-12)	Household with Electricity	Household with Piped Water	Villages with Asphalt Roads
$Migration_d^o \times XRShock_{dt-1}$	0.782***	0.247***	0.0132	0.0519***	0.0796***	0.157
	(0.265)	(0.0843)	(0.0241)	(0.0156)	(0.0248)	(0.109)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	6.38	1.17	0.31	0.89	0.16	0.70
Districts	350	350	350	347	350	307
Observations	2403	2403	2403	2162	2398	828
B. Public Goods Results with Interaction	Elementary (Grades 1-6)	Jr. Secondary (Grades 7-9)	Sr. Secondary (Grades 10-12)	Elementary (Grades 1-6)	Jr. Secondary (Grades 7-9)	Sr. Secondary (Grades 10-12)
$Migration_d^o \times XRShock_{dt-1}$	0.431***	0.156**	0.00632	0.791***	0.250***	0.0141
	(0.160)	(0.0646)	(0.0228)	(0.272)	(0.0864)	(0.0247)
1[Split]$_t \times$ $Migration_d^o \times XRShock_{dt-1}$	0.416**	0.104*	-0.00587			
	(0.164)	(0.0596)	(0.0112)			
1[Election]$_t \times$ $Migration_d^o \times XRShock_{dt-1}$				-0.00587	-0.00214	-0.000856
				(0.0199)	(0.00611)	(0.00258)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	6.38	1.17	0.31	6.38	1.17	0.31
Districts	350	350	350	350	350	350
Observations	2403	2403	2403	2403	2403	2403

Notes: This table reports the estimates of equation (5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable Migration$_d \times$XRShock$_{t-1}$ is standardized to have a mean of zero and a standard deviation of one. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. The district-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and total population from the 2005 village census. Outcomes data sources and details are as described in Appendix A.1. * p$\leq$ 0.10, ** p$\leq$ 0.05, *** p$\leq$ 0.01. Standard errors are clustered at the district level in parentheses.

Table 6: Effects on Development and Education Outcomes, Robustness with Main Trade Commodities

	(1) Household Exp Bottom 20% (log IDR)	(2) Household Exp Education (log IDR)	(3) Household Exp Health Care (log IDR)	(4) Elementary Enrollment (Ages 6-12)	(5) Jr. Secondary Enrollment (Ages 13-15)	(6) Sr. Secondary Enrollment (Ages 16-18)	(7) Elementary School (Grades 1-6)	(8) Jr. Secondary School (Grades 7-9)	(9) Sr. Secondary School (Grades 10-12)
Panel A. Main Estimates									
$Migration_d^o \times XRShock_{dt-1}$	0.103***	0.254***	0.187**	3.271***	3.724*	6.635***	0.782***	0.247***	0.0132
	(0.0320)	(0.0887)	(0.0928)	(0.740)	(2.132)	(2.160)	(0.265)	(0.0843)	(0.0241)
District FE, Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.08	9.62	9.05	88.97	66.71	46.50	6.38	1.17	0.31
Districts	347	347	347	350	350	350	350	350	350
Observations	2050	2050	2050	2398	2398	2398	2403	2403	2403
Panel B. With Commodity Trade Controls (Oil and Natural Gas, Palm Oil)									
$Migration_d^o \times XRShock_{dt-1}$	0.0984***	0.289***	0.179*	3.177***	4.604**	7.192***	0.838***	0.270***	0.0184
	(0.0322)	(0.0866)	(0.0947)	(0.735)	(2.136)	(2.092)	(0.276)	(0.0859)	(0.0240)
District FE, Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.08	9.62	9.05	88.97	66.71	46.50	6.38	1.17	0.31
Districts	347	347	347	350	350	350	350	350	350
Observations	2050	2050	2050	2398	2398	2398	2403	2403	2403

Notes: This table reports the estimates of equation (5) with the addition of two control variables on the right hand side to account for commodity trades. The variables are $\text{OilGas}_d^0 \times \text{XROilGas}_{t-1}$ and $\text{PalmOil}_d^0 \times \text{XRPalmOil}_{t-1}$. The sample is from the 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable $\text{Migration}_d \times \text{XRShock}_{t-1}$ is standardized to have a mean of zero and a standard deviation of one. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and total population from the 2005 village census. GDP per capita is expressed in a log of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors are clustered at the district level in parentheses.

Table 7: Effects on Education Supply

	(1)	(2)	(3)
	A. Public Schools (per 10,000 Population)		
	Elementary (Grades 1-6)	Junior Secondary (Grades 7-9)	Senior Secondary (Grades 10-12)
$Migration^{o}_{d} \times XRShock_{dt-1}$	0.717**	0.286***	0.0173
	(0.291)	(0.0877)	(0.0251)
$Migration^{o}_{d} \times XRShock_{dt-1} \times \text{EduBudget}_{t-2}$	0.0711**	0.0291***	0.00536*
	(0.0320)	(0.00826)	(0.00309)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	6.42	1.16	0.31
Districts	342	342	342
Observations	2186	2186	2186
	B. Village Heads Survey Perceived Challenges in Education		
	Facility Inadequate	Cost Unaffordable	Facility Over Cost
Migration x $XRShock_{t-1}$	0.353	-0.506*	0.206*
	(0.373)	(0.286)	(0.119)
Village FE, Survey FE	✓	✓	✓
Dep.Var Mean	0.791	0.365	0.244
Villages	572	572	572
Observations	6886	6886	6886
	C. Jr. Secondary Type and Facilities		
	Jr Sec Attached to Elementary	Classrooms per Jr Sec School	Teachers per Jr Sec School
$Migration^{o}_{d} \times XRShock_{dt-1}$	0.0265**	-0.486***	-0.648***
	(0.0105)	(0.148)	(0.247)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	0.08	10.91	19.39
Districts	350	350	350
Observations	2403	2403	2403

Notes: This table reports the estimates of equation (5). Panel A include interaction terms with lagged education expenditure budget as a share of total expenditures. The sample in Panels A and C are the 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from the airport arrival data. The interaction variable $\text{Migration}_{d} \times \text{XRShock}_{t-1}$ is standardized to have a mean of zero and a standard deviation of one. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and total population from the 2005 village census. The sample for Panel B is the Village Head Survey from Olken et al. (2014) and Cahyadi et al. (2020). Other outcomes data sources and details are as described in Appendix A.1. * $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$. Standard errors are clustered at the district level in parentheses.

Table 8: Effects on District Revenue Streams

	(1)	(2)	(3)	(4)	(5)
	Central Taxes (DBH)	Local Taxes (PAD)	Natural Resources	Special Grant (DAK)	Formulaic Base Grant (DAU)
	A. District Revenue Streams (Log IDR)				
$Migration_d^o \times XRShock_{dt-1}$	-1.934	-1.290*	-0.861	0.0739	1.891
	(1.181)	(0.758)	(2.301)	(1.678)	(1.344)
District FE, Year FE	✓	✓	✓	✓	✓
Dep. Var. Mean	23.99	24.03	21.02	23.60	26.39
Districts	342	342	342	342	342
Observations	2310	2310	2310	2310	2310
	B. Revenues as Share of Total (%)				
$Migration_d^o \times XRShock_{dt-1}$	-0.0547***	-0.00692	0.0333	0.0262***	0.00767
	(0.0210)	(0.0119)	(0.0215)	(0.00967)	(0.0201)
District FE, Year FE	✓	✓	✓	✓	✓
Dep. Var. Mean	0.07	0.07	0.06	0.07	0.61
Districts	342	342	342	342	342
Observations	2307	2307	2307	2307	2307

Notes: This table reports the estimates of equation (5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable $\text{Migration}_d \times \text{XRShock}_{t-1}$ is standardized to have a mean of zero and standard deviation of one. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and total population from the 2005 village census. Outcomes data sources and details are as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors are clustered at the district level in parentheses.

Table 9: Effects on Development Indicators

	(1)	(2)	(3)	(4)
	A. GDP Per Capita (Log IDR)			
	GDP Total	GDP Agriculture	GDP Service	GDP Industry
$Migration_d^o \times XRShock_{dt-1}$	0.0838*	0.0999**	0.225	0.188
	(0.0482)	(0.0393)	(0.148)	(0.148)
District FE, Year FE	✓	✓	✓	✓
Dep. Var. Mean	15.50	13.98	14.39	13.81
Districts	347	347	350	350
Observations	2385	2385	2403	2403
	B. Poverty			
	Poverty Headcount per 10,000	Poverty Rate	Poverty Gap	Gini Coefficient
$Migration_d^o \times XRShock_{dt-1}$	-333.1***	-3.055***	-1.100***	-0.0279**
	(99.80)	(0.677)	(0.220)	(0.0124)
District FE, Year FE	✓	✓	✓	✓
Dep. Var. Mean	1543.44	15.05	2.64	0.29
Districts	347	347	347	316
Observations	2378	2378	2378	1834

Notes: This table reports the estimates of equation (5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable Migration$_d$×XRShock$_{t-1}$ is standardized to have mean of zero and a standard deviation of one. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. The district-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and total population from the 2005 village census. GDP per capita is expressed in log of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors are clustered at the district level in parentheses.

Appendix

A. Data Sources and Constructions

Main Explanatory Variables

Migration Intensity data comes from Podes (*Potensi Desa*), a triennial survey of all villages in Indonesia (2005, 2008, 2011). Information on the number of Overseas Indonesian Workers (TKI) was provided by village heads and aggregated at the district level. Migration Intensity is expressed as the natural logarithm of the ratio of the total migrant population in the district to the district's total population. Population denominator uses population estimates from Podes in the same year.

Migrant Stock data are based on migrant terminal data collected between March 2008-March 2011 and provided by BNP2TKI. The migrant terminal collects the following individual-level information: migrant home district, country of work, date of departure, date of arrival, gender, and reason for return. Using the arrival and departure month, I construct a migrant-by-month level dataset. With the average migration duration lasting 25 months, the resulting dataset has 26,235,872 observations. I aggregate this to the district-destination-month level so that each observation conveys how many migrants from a given district in a given month are working each destination country. I drop the outlier of migrants who stay longer in order to create a dataset with 215,072 observations, which covers 366 districts with information on migrants in 89 countries spanning from January 2004-March 2011. The average migrant per district-destination-month cell is 121 migrants. Each observation above is then merged based on a month and currency code with exchange rate data from Datastream (below). All exchange rates of foreign currencies to the Indonesian rupiah (IDR) are benchmarked to the rate in June 2007. I drop information from migrants in Zimbabwe (0.2% of the total migrants) because of the country's economic volatility.

I aggregate the district-destination/currency-month level data to the district-year level using the number of migrants in each destination country and month as a weight to create the average at the district-year level (N=2,463). This panel is not balanced. The resulting district-year exchange rate shock is then matched with the Dapoer dataset on district and year identifiers.

Exchange Rate data, 2005-2011. Refinitiv Datastream provides monthly exchange rates to IDR from the following currencies: US Dollar, Euro, British Pound, Singapore Dollar, Canadian Dollar, Swiss Franc, Danish Kroner, Malaysian Ringgit, New Zealand Dollar, Norwegian Kroner, Philippines Peso, Thai Baht, and Australian Dollar. Currencies to other migration destination countries not listed above are only available against the US Dollar, British Pound, and Euro. These are converted to the exchange rate to Indonesian rupiah using the prevailing USD-IDR, GBP-IDR, and EUR-IDR exchange rates for the same month. This data is supplemented with data from the Pacific Exchange Rate Service for Kuwait Dinar and Bahrain Dirham to Indonesian Rupiah, and the Bloomberg Terminal for Syrian Pound and Solomon Islander Dollars to US Dollar.

Commodity data comes from Statistik Perdagangan Luar Negeri Indonesia on Exports and Imports 2005. The Central Bureau of Statistics compiled export and import data from Customs and Excise at the port level to aggregate commodities using Harmonized Systems and SITC/Standard International Trade Classification. I aggregate the commodities at the SITC code level to the country destination level. The commodities covered under palm oil are: crude palm oil (SITC 42221) and crude olein (42229). The commodities covered under oil and natural gas include: crude petroleum oil, condensate (SITC 33300), motor spirit premium leaded (33419), topped crudes, other lubricating oil (33429), lubricating oil basestock (33450), other fuel oils (33430), liquid natural gas (34310), liquid propane (34210), liquid butanes (34250), liquid ethylene, liquid propylene, butylene, butadiene (34410). The palm oil plantation area comes from Podes 2003 (Agricultural Census).

Election data are obtained from Sam Bazzi and Ben Marx's work and are supplemented by reports from Indonesian media for districts not covered in the dataset.

Outcomes Variables

Indo-Dapoer (Indonesia Database for Policy and Economic Research) is a compilation of Indonesian district-level indicators compiled from various sources by the World Bank. The unit

of observation is districts as defined by the 2014 boundaries. Observations of post-split district children are backcasted to years before the split. Most indicators are available yearly, and I use data from 2005-2012. I use the following variables from Dapoer: household expenditures (average household, household in bottom 20%, education), GDP in constant price by sector, population, CPI/consumer price index (based on 2002 and 2007), poverty rate, poverty gap, Gini coefficient, share of households with electricity, share of villages with asphalt roads, education budget, revenue streams (DBH, PAD, DBH SDA, DAK, DAU, oil and gas revenue), employment (total labor force, employment, unemployment, underemployment, employment by sector). I conduct the following transformations: household expenditure data are transformed with log, GDP sectoral data are combined into three big sectors: agriculture, service, industry; converted from million IDR to IDR, divided by population, and then transformed with log. Population data in Dapoer is based on the 2000 and 2010 censuses, with population projection in intervening years from BPS. I rescale CPI base-2002 to CPI base-2007 to create a longer series. Price data is only available in 45 cities for the 2002 base, and 66 cities for the 2007 base. Asphalt road is available only every three years because it aggregates data from the triennial Podes survey. For district budget and expenditures, I create a share of each revenue stream out of the total budget and share of education expenditures out of the total expenditures.

Susenas (*Survei Sosio-Ekonomi Nasional*/National Socioeconomic Survey) is a household survey with representative sampling at the district level conducted by the Central Bureau of Statistics (BPS). I use data from 2005-2012 for the following variables: participation in school (elementary, secondary), gender, age, and location in order to create a district-average enrollment rate by gender and age groups (7-12, 13-15, 16-18, 7-18, and 19-24 as placebo). I also use households' answers to source of drinking water and assets. Asset data are only available from 2010-2012.

Dapodik (*Data Pokok Pendidikan*) is an administrative school registry maintained by the Mistry of Education, Culture, Research, and Technology. Dapodik covers the universe of schools under the purview of MOECRT in Indonesia. These include 166,257 publicly run schools and 52,888 privately run schools. School administrators submit information periodically to the database, which isrequired for schools to access capitation funds (BOS/*Bantuan Operasi Sekolah*). In areas with poor connectivity, schools often pool resources to hire a dedicated IT administrator who handles periodic submissions to the MOECRT system. I use the following information from Dapodik: whether a school is public, its education level (primary, junior secondary, or senior secondary), year of establishment (for all levels of schools). I aggregate this using location and year of establishment at the district-year level to create a count of schools existing in a given district in a given year. I further use the following information for junior secondary schools: name of school, number of teachers per school, number of classrooms per school, number of toilets per school. I create an indicator of whether the junior high school is a "One-Roof School" that share a location with an elementary school by extracting from its name string ("Satap" or "Satu Atap"). I aggregate this to district-year level.

Local budget. I obtained district budget and expenditure data from the Ministry of Finance (MoF; *Direktorat Jenderal Perimbangan Keuangan*). This dataset provide information at the district-year level, based on reports from the district governments to the MoF. The datasets are downloadable at http://djpk.kemenkeu.go.id.

I used Kabupaten crosswalk to merge district identifiers across datasets, i.e., to merge Susenas, Podes, and Dapoer datasets. Other datasets are merged at the district level by name after standardizing the spelling, i.e., for BNP2TKI terminal data and Dapodik.

Alternative Clusters Based on Destinations

For each district, I retrieve the destinations of its migrants based on BNP2TKI's arrival data. I create two alternative clustering: (1) based on their destinations ranks, and (2) based on the destination quartiles. Clustering on (1) restricts the destinations up to the sixth countries with the most migrants. Clustering on (2) calculated the quartiles for the following countries: Saudi, Malaysia, Singapore, Kuwait, Taiwan, Hongkong, UAE, Jordan, Oman.

Overall, the districts are clustered into 266 clusters by destination ranks and 290 clusters by destination quartiles. In some cases, these clusterings reflect the districts' geographic proximity: Musi Banyuasin and Banyuasin in South Sumatera send their migrants to the following countries in the same descending order: Malaysia, Saudi, Taiwan, Singapore, Hong Kong, and Jordan. Aceh Timur, Bireuen, Pidie, Aceh Barat and Kota Langsa–all in the Aceh province–are in a cluster

top quartile districts sending migrants to Malaysia and nowhere else. At the same time, there are also clusters made up of geographically disparate regions with similar proportions to different destination countries. The cluster defined by destination ranks that sends to Saudi, Malaysia, Taiwan, Singapore, Hong Kong, and Kuwait are made up of three districts in three different provinces: Lampung Timur, Grobogan in Central Java, and Ngawi in East Java. By destination quartiles, Bengkalis in Riau and Timor Tengah Utara in NTT are in the same cluster of districts in the top quartile to Malaysia and bottom quartile to Saudi, and second quartile to Singapore.

Supplementary Datasets

Migrant Panel data. This data comes from Doi et al. (2014). This dataset follows 400 migrant workers from East Java between 2010-2012. A baseline interview was administered prior to their departure (February-June 2010) and households were re-interviewed during three follow-up surveys (March-April

2011, September-October 2011, January 2012). The same household members interviewed at baseline were interviewed during the follow-up surveys. The re-contact rates were 91-98% for the three follow-up surveys. I retained samples from the survey: (1) the migrant was located abroad during more than one of the follow-up rounds, (2) the household reported receiving international remittances, and (3) the migrant sent remittances after the last follow-up survey. With regard to criteria (1), I excluded households that did not know in which country the migrant was working. For criteria (3), I used the difference in the reported amount of remittances received between the follow-up surveys, since the migrant's departure is an indicator of subsequent remittance transfers.

SPKP data (*Survei Pelayanan Kesehatan dan Pendidikan*) are a set of baseline and follow-up surveys conducted in 700 subdistricts across Indonesia to evaluate the impact of a household cash transfer program (PKH/*Program Keluarga Harapan*) and a community block grant program (Generasi, see: Alatas, 2011; Olken and Singhal, 2011; Olken et al., 2014; Cahyadi et al., 2020). The respondents are households, village heads, schools, health workers, and subdistrict heads. I analyzed data from the following four survey waves: 2007, 2008, 2009, and 2014. Village and household samples are a mixture of cross-section and panel (i.e. some households/villages were observed only once). Sample sizes vary between survey waves, depending on its purpose, e.g., the 2008 was a midline survey only for the Generasi block grant program. The surveys cover: West Java, East Java, North Sulawesi, Gorontalo, and NTT.

I use the following variables from the village head surveys: challenges in junior secondary education in the village, and complaints about the anti-poverty programs made to village head. I code an indicator for whether the village head (unprompted) mentioned that the village lacks a junior secondary education facility, or the facility is located too far away, or the infrastructure is inadequate. I also code an indicator for whether statements were made about the high education cost or insufficient financial assistance for the school to operation/offer scholarship. Lastly, I code an indicator if the infrastructure concern is ranked higher than the cost concern.

From the household surveys, I use the following variables: indicator for participation in community work/*gotong royong*, household contribution (manpower, goods or money), voting history, and participation in community groups. Voting history variables are indicators pertaining to the 2009 presidential election, district election (if there were any elections in the past 2 years), and village head election (if there was any election in the past 2 years). I use village codes to match SPKP villages with Podes dataset, constructing the remittance shock variable based on migrant count and village plurality destinations from Podes 2005. I match this with the exchange rate data (above) to construct the shock variable.

IFLS (Indonesia Family Life Survey) data is a series of panel surveys of ∼40k households. The first survey took place in 1993 and was representative of approximately eighty percent of the Indonesian population at that time. My study period overlaps only with the fourth wave of the survey (2007), which I use to investigate the correlation between remittances and household children's aspiration for education.

Table A.1: Summary statistics – Supplementary

	Mean	SD	Min	Max	Obs.
A. Other Migrant Panel Variables from Doi et al. (2014)					
Remittances since last follow up (IDR)	7,149,120	7,953,597	60,000	90,000,000	418
Remittance transactions since departure	4.54	3.79	1	23	418
Work in Hong Kong	0.58	0.49	0	1	418
Work in Taiwan	0.41	0.49	0	1	418
Work in Singapore	0.01	0.12	0	1	418
IDR exchange rate per 1 Hong Kong Dollar	1138.23	21.06	1095	1166	242
IDR exchange rate per 1 Taiwan New Dollar	297.15	3.66	284	302	170
IDR exchange rate per 1 Singapore Dollar	6990.25	72.87	6903	7080	6
Days since migration departure	160.81	217.18	0	1100	418
Month(s) to next Eid al-Fitr	7.81	2.46	1	11	418
B1. Alternative District-level Regressors					
Migrants (Podes 2008)	3,811	7,995	0	57,067	353
Population (Podes 2008)	591,363	583,632	47,824	4,219,324	353
Migrants (Podes 2011)	3,857	8,412	0	55,459	353
Population (Podes 2011)	604,238	613,640	47,591	4,626,937	353
Migrants 2008 per one million people (log)	7.3	1.9	.47	12	352
Migrants 2011 per one million people (log)	7.2	2	.34	12	348
District Oil & Gas revenues 2005 (log IDR)	11.7	11	0	28.5	353
Palm oil plantation (Podes 2003, in ha.)	6,382	22,565	0	299,541	291
B2. Time-varying Regressors Common to All Districts					
Exchange Rate shock, Oil & Gas export dest.	1.13	0.10	1.00	1.29	8
Exchange Rate shock, Palm Oil export dest.	1.02	0.06	0.95	1.10	8
C. Other Household Outcomes					
Ownership of a motorcycle	0.59	0.17	0.11	0.94	928
Ownership of a car	0.07	0.05	0.00	0.28	580
Ownership of a bicycle	0.34	0.21	0.00	0.85	928
Ownership of a refrigerator	0.31	0.17	0.02	0.83	928
Ownership of a 12-kg LPG canister	0.14	0.12	0.00	0.65	928
Household water from piped water	0.16	0.15	0.00	0.95	2413
Household water from a protected well	0.29	0.18	0.00	0.82	2413
Households with electricity	0.89	0.15	0.10	1.00	2177
Villages with asphalt road (%)	69.54	24.15	3.39	100.00	873
D. Other District-level Education Characteristics					
Public elementary schools	323.88	250.95	1	1534	2419
Public junior high schools	45.57	23.29	0	152	2419
Public high schools	12.35	7.45	0	45	2419
District education expenditure (log IDR)	25.61	3.27	0.00	28.00	2222
E. District Finances					
Total district revenues	27.10	1.25	0.00	29.47	2326
Tax sharing rev. with central govt (log IDR)	23.98	3.19	0.00	28.64	2326
Own district rev. (local taxes and fees, log IDR)	24.01	2.55	0.00	28.46	2326
Share central govt tax sharing out of total rev.	0.07	0.06	0.00	0.86	2322
Share of own revenues out of total rev.	0.07	0.06	0.00	1.00	2322

Table A.2: Major Migration Destination Countries

	Country	Migrants Arrival 2008-2010
1	Saudi	563,016
2	UAE	83,629
3	Kuwait	74,101
4	Malaysia	73,346
5	Taiwan	41,332
6	Singapore	32,096
7	Jordan	31,139
8	Oman	27,966
9	Qatar	25,373
10	Hong Kong	19,067
11	Syria	9,057
12	Bahrain	8,944
13	Brunei	5,755
14	Samoa	2,040
15	Egypt	1,108
16	United Kingdom	1,080
17	South Korea	718
18	Macao SAR	638
19	Yemen	575
20	Malawi	538
	Total	1,006,241
	Top 20 subtotal	99%

Table A.3: Statistics on Migrant Salaries by Departure Years, Selected Countries

Region	Country	Departure Year	p25	p50	p75	Mean	Obs
Middle East	Bahrain (BHD)	2012	70	80	80	124.8	61
		2013	75	80	80	132.6	29
	UAE (AED)	2010	800	800	800	768.6	59
		2011	800	800	800	797.2	125
		2012	800	800	800	805.7	390
		2013	800	800	800	814.4	315
		2014	800	1,000	1,000	944	45
	Oman (OMR)	2011	70	70	80	91	44
		2012	70	80	80	90	138
		2013	80	80	80	92	110
	Qatar (QAR)	2011	700	800	800	785	71
		2012	750	800	800	792	218
		2013	800	800	800	810	165
	Saudi (SAR)	2010	800	800	800	809	216
		2011	800	800	800	804	233
		2012	800	800	800	801	99
East Asia	Hong Kong (HKD)	2013	3,500	3,625	3,740	3,617	44
		2014	3,480	3,660	3,800	3,618	304
		2015	3,580	3,740	3,920	3,726	179
	Taiwan (TWD)	2010	15,528	15,840	16,999	16,152	91
		2011	15,840	16,000	17,000	16,413	418
		2012	15,800	15,850	17,000	16,197	491
		2013	15,672	15,895	17,000	16,162	151
		2014	15,550	15,840	17,000	16,299	36
SE Asia	Malaysia (MYR)	2012	546	700	900	741	26
		2013	650	700	900	780	27
	Singapore (SGD)	2011	400	430	450	427.9	57
		2012	420	450	470	450.8	86
		2013	450	501	530	496.8	106
		2014	450	500	520	501.2	52
Total Observations							4,386

Notes: This table tabulates summary statistics reported by former migrants from Bazzi et al. (2021), limiting to former migrant respondents with concordant country destination and currency code. Summary statistics are reported in local currencies limited to nonzero values, and responses are trimmed above at 10,000 dollars/dinar/dirham monthly and 100,000 dollars for Hong Kong and Taiwan. Only country-years with at least 25 migrant responses are reported for the salary data.

Table A.4: Remittance Estimates from Survey Data

Publication	Survey Year	N	Average Surveyed Remittances	Unit	Average Frequency	Estimated Annual Remittances	Destinations	Survey Locations
ADB (2006)	2005	647	USD 376	per transaction	7	USD 2,390	Hong Kong, Japan, Malaysia, Singapore	Hong Kong, Japan, Malaysia, Singapore
World Bank (2010)	2008	3,368	USD 200	per transaction	N/A	N/A	Saudi Arabia and Malaysia	East Java, NTB, NTT
Doi et al. (2014)	2011	400	USD 1,119	since departure	4	USD 1,119	Hong Kong, Taiwan, Malaysia, Singapore	East Java
World Bank (2017)	2013	4,660	USD 82	monthly	N/A	USD 984	Middle East, Malaysia	15 Indonesian provinces
Bazzi et al. (2021)	2019	2,705	USD 183	monthly	N/A	USD 2196	Taiwan, Hongkong, Singapore, UAE, Saudi, Malaysia, Qatar, and others	West Java, East Java, Central Java

Table A.5: Bootstrap P-values for the Regressions of Remittances on Exchange Rate Shock

	(1) Remittances	(2) Remittances	(3) Remittances	(4) Remittances
XR shock	0.417	0.452	0.414	0.448
	(0.176)	(0.178)	(0.176)	(0.179)
p-value	[0.019]**	[0.012]**	[0.020]**	[0.013]**
bootstrap p (household)	{0.021}**	{0.021}**	{0.027}**	{0.006}***
bootstrap p (country)	< 0.000> ***	< 0.000> ***	< 0.000> ***	< 0.000> ***
bootstrap p (country, wave)	((0.099))*	((0.056))*	((0.118))	((0.080))*
Time abroad		✓		✓
Time to Next Eid			✓	✓
HH FE, Wave FE	✓	✓	✓	✓
HH	183	183	183	183
Observations	418	418	418	418

Notes: This table presents the p-values from Table 2 with the additional displays of p-values (square brackets) and the wild cluster bootstrap p-values, bootstrapped respectively on households (curly brackets), country (angle brackets), and country-survey wave (double parentheses). The implementation of wild cluster bootstrap p-values uses the -boottest- command from Roodman et al. (2019). Clustered standard errors in parentheses. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

Table A.6: Effect of Currency Exchange Fluctuations on Remittances, All Abroad Migrants

	(1) Remittance	(2) Remittance	(3) Remittance	(4) Remittance
XR shock	1.518**	1.522**	1.343*	1.348*
	(0.762)	(0.769)	(0.760)	(0.768)
Time abroad		-0.000		-0.000
		(0.002)		(0.002)
Time to next Eid			-1.245	-1.244
			(0.763)	(0.762)
HH, Wave FE	Yes	Yes	Yes	Yes
HH	288	288	288	288
Observations	757	757	757	757

Notes: The sample is households with abroad migrants Doi et al. (2014), where non-remittance receiving households are coded as received 1 rupiah remittances for inclusion in the regression. Remittances are total received remittances since migrant departure at the first follow-up, and the difference from previous response in subsequent follow-ups. Remittances are expressed in log Indonesian rupiah (IDR), standardized. XR shock is the exchange rate to IDR relative to March 2011, standardized. Exchange rate data are from Refinitiv Datastream. Standard errors are clustered at the household level. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

Table A.7: Effect of Currency Exchange Fluctuations, By Survey Waves Subsamples

	(1) Remittances	(2) Remittances	(3) Remittances	(4) Remittances
XR shock	0.448**	0.455	0.339	0.294
	(0.179)	(0.622)	(0.254)	(0.370)
Waves	1, 2, 3	1, 2	1, 3	2, 3
HH, Wave FE	Yes	Yes	Yes	Yes
HH	183	85	82	114
Observations	418	170	164	228

Notes: The sample is migrant household panel from Doi et al. (2014) that reported receiving remittances in more than one follow-up surveys (March 2011-January 2012). Remittances are the total remittances received since the migrant's departure in the first follow-up, and the difference from the previous response in subsequent follow-ups. Remittances are expressed in log IDR, and XR shock is the exchange rate to IDR relative to March 2011. Exchange rate data is from Refinitiv Datastream. Standard errors are clustered at the household level. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

Table A.8: Effect of Currency Exchange Fluctuations on Remittances Frequency

	(1) Remittances Frequency	(2) Remittances Frequency	(3) Remittances Frequency	(4) Remittances Frequency
XR shock	0.896*	0.903*	0.925*	0.929*
	(0.502)	(0.510)	(0.496)	(0.504)
Time abroad		-0.000		-0.000
		(0.001)		(0.001)
Time to next Eid			0.480	0.478
			(0.393)	(0.396)
HH, Wave FE	Yes	Yes	Yes	Yes
HH	183	183	183	183
Observations	418	418	418	418

Notes: The sample is migrant household panel from Doi et al. (2014) that reported receiving remittances in more than one follow-up surveys (March 2011-January 2012). Remittances frequency is as reported by household respondents, and XR shock is the exchange rate to IDR relative to March 2011. Exchange rate data is from Refinitiv Datastream. Standard errors are clustered at the household level. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

Table A.9: Correlations between Subsequent Shocks and Past Outcomes

	(1) Household Expenditure (log IDR)	(2) Household Exp Bottom 20% (log IDR)	(3) Elementary Enrollment (Ages 6-12)	(4) Jr. Secondary Enrollment (Ages 13-15)	(5) Sr. Secondary Enrollment (Ages 16-18)	(6) Elementary School (Grades 1-6)	(7) Jr. Secondary School (Grades 7-9)	(8) Sr. Secondary School (Grades 10-12)
$Migration_d^o \times XRShock_{dt+2}$	0.0429	0.0275	-0.179	2.339	3.152	0.00906	-0.0504	0.0383
	(0.0454)	(0.0341)	(0.830)	(2.089)	(2.308)	(0.269)	(0.0849)	(0.0243)
District FE, Year FE	✓	✓	✓	✓	✓	✓	✓	
Dep. Var. Mean	12.37	11.69	87.75	64.68	42.84	7.08	1.43	0.52
Districts	339	339	349	349	349	350	350	350
Observations	1957	1957	2356	2356	2356	2398	2398	2398

Notes: This table reports the estimates of a modified version of equation (5), where the exchange rate shock variable (XRShock) is shifted forward by two periods. Sample is from 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable Migration$_d$×XRShock$_{t+2}$ is standardized to have a mean of zero and a standard deviation of one. XRShock is the district-level yearly average of migrant-weighted foreign currency exchange rates between the host country's currency and IDR, relative to June 2007. The district-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration (intensity) is the natural log of ratio between the total migrant and total population from the 2005 village census. GDP per capita are expressed in a log of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors are clustered at the district level in parentheses.

Table A.10: Correlates of Destination Shares in 2004

	(1) share to Malaysia 2004	(2) share to Hongkong 2004	(3) share to Singapore 2004	(4) share to Saudi 2004	(5) share to Taiwan 2004
Urban	-0.096	-0.021	-0.097	0.162	0.023
	(0.093)	(0.049)	(0.091)	(0.098)	(0.019)
Land area (log)	-0.016	0.019	-0.027	0.050	-0.008
	(0.024)	(0.020)	(0.020)	(0.032)	(0.007)
Agri GDP pc (log)	0.014	-0.030	-0.010	-0.013	0.013
	(0.025)	(0.023)	(0.022)	(0.029)	(0.010)
Oil GDP pc (log)	0.000	0.002	0.001	-0.002	0.000
	(0.003)	(0.002)	(0.002)	(0.003)	(0.000)
HH expenditure pc (log)	0.119	-0.010	0.012	-0.004	-0.008
	(0.115)	(0.060)	(0.041)	(0.115)	(0.014)
Enrollment Primary	-0.010	0.007	-0.001	-0.003	0.004
	(0.009)	(0.004)	(0.003)	(0.008)	(0.003)
Enrollment Jr. Sec	0.001	0.000	0.001	-0.001	-0.000
	(0.002)	(0.001)	(0.001)	(0.002)	(0.000)
km to Dumai (log)	-0.246*	0.083	-0.029	0.249	0.001
	(0.148)	(0.062)	(0.090)	(0.179)	(0.012)
Muslim share	0.385	-0.251	-0.252	-0.052	-0.050
	(0.772)	(0.284)	(0.228)	(0.581)	(0.122)
Catholic/Protestant share	1.236	0.145	-0.023	-1.610***	0.039
	(0.770)	(0.210)	(0.223)	(0.520)	(0.123)
Arab eth. share	-7.857	-15.697	-6.507	15.693	1.207
	(12.581)	(13.370)	(7.060)	(16.210)	(2.439)
Chinese eth. share	0.228	-0.724*	-0.841	-0.159	0.100
	(1.318)	(0.404)	(0.534)	(1.389)	(0.236)
Java eth. majority	-0.074	-0.010	-0.012	-0.038	0.016
	(0.076)	(0.034)	(0.032)	(0.076)	(0.010)
Bugis eth. majority	0.035	0.004	0.012	-0.024	0.003
	(0.090)	(0.027)	(0.020)	(0.165)	(0.012)
Madura eth. majority	-0.010	-0.109**	-0.014	0.137	0.000
	(0.101)	(0.045)	(0.042)	(0.105)	(0.013)
Sunda eth. majority	-0.033	-0.002	0.014	0.103	0.007
	(0.046)	(0.022)	(0.036)	(0.093)	(0.011)
Population (log)	0.018	-0.060*	-0.012	0.074	0.000
	(0.035)	(0.034)	(0.024)	(0.050)	(0.006)
r2	0.696	0.395	0.258	0.664	0.404
N	178	178	178	178	178

Note: This table presents coefficients from regressions of the share of migrants from a district going to top destinations by Rotemberg weight following Goldsmith-Pinkham et al. (2020). The demographic characteristics regressors are from the 2000 population census, and the regression includes province fixed effects. The sample is restricted to districts with more than one migrant in the BNP2TKI data in 2004. Robust standard errors in parameters. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.11: Monthly Returnees Processed and Exchange Rate Fluctuations

	(1) Returnees	(2) Returnees	(3) Returnees	(4) Returnees
Panel A. All returnees				
$XRshock_{m}$	-192.8			
	(289.9)			
$XRshock_{m-1}$		-277.6		
		(277.2)		
$XRshock_{m-2}$			-274.5	
			(225.4)	
$XRshock_{m-3}$				-127.7
				(248.8)
Observations	1145	1057	1020	980
Panel B. Returnees not at the end of contracts				
$XRshock_{m}$	102.8			
	(99.63)			
$XRshock_{m-1}$		141.1		
		(132.7)		
$XRshock_{m-2}$			141.5	
			(132.4)	
$XRshock_{m-3}$				213.0
				(156.8)
Observations	929	808	780	759
Panel C. All returnees, quarterly				
$XRshock_{q}$	1497.2			
	(1871.9)			
$XRshock_{q-1}$		1157.6		
		(1938.4)		
$XRshock_{q-2}$			590.4	
			(2062.1)	
$XRshock_{q-3}$				-51.62
				(2262.8)
Observations	978	943	908	873
Panel D. All returnees, half-yearly				
$XRshock_{t}$	2782.6			
	(3426.1)			
$XRshock_{t-1}$		797.9		
		(3838.5)		
$XRshock_{t-2}$			-1055.9	
			(4676.9)	
$XRshock_{t-3}$				-1562.2
				(5152.8)
Observations	510	475	440	405

Notes: This table presents estimates at the country-month level data (Panel A-B), country-quarter level data (Panel C), and country-half-year level data (Panel D) from the migrant terminal database. The regressions uses the number of returnees from each country on the left hand side and monthly averages of the exchange rates on the right hand side, lagged by 0-3 months/quarters/half-years, respectively in Columns 1-4. Panel A, C, and D use arrival data from all migrants. Panel B uses arrival data from migrants who indicated that they return not at the end of the contract, i.e. on leave or has problems. Standard errors in parenthesis are clustered by host countries. * $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$.

Table A.12: Post Period Migration

	(1) Migrants	(2) Migrants	(3) Migrants	(4) Migrants	(5) Migrants
XRshock_t	-771.6	-1626.2			-3407.0
	(2022.4)	(1988.0)			(6451.5)
XRshock_t-1			-1122.7		1604.9
			(2246.6)		(9089.1)
XRshock_t-2				-651.5	2172.6
				(3093.5)	(9576.2)
year FE	No	Yes	Yes	Yes	Yes
region FE	No	Yes	Yes	Yes	Yes
Observations	150	150	126	101	99

Notes: This table presents estimates at the country-year level data from the official migrant placement statistics 2012-2016, which publishes the number of Indonesian worker placement to the top 25 destination countries. The regressions uses migrant placements to each country on the left hand side and yearly averages of the exchange rates on the right hand side, lagged by 0-2 years, respectively in Columns 1-5. Columns 2-5 include year fixed effects and region fixed effects. Standard errors in parenthesis are robust. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

Table A.13: Reasons Reported by Former Migrants in Bazzi et al. (2021) for Selecting Migration Destination Countries

		Only 1 country			2-3 countries		Switchers		
No.	Reasons for choosing destinations	MENA	SEA	EAP	MENA	SEA/EAP	2 countries	3 countries	Others
1	Religious reasons	0.27	0.04	0.01	0.10	0.01	0.02	0.03	0.04
2	Language reasons	0.12	0.31	0.15	0.08	0.13	0.08	0.06	0.06
3	Higher salary	0.13	0.17	0.57	0.21	0.58	0.56	0.52	0.34
4	Closer to Indonesia	0.00	0.15	0.00	0.00	0.01	0.02	0.01	0.00
5	Assigned by agent/sponsor	0.26	0.09	0.02	0.25	0.03	0.07	0.08	0.25
6	Comfortable with the country	0.23	0.25	0.31	0.17	0.28	0.21	0.21	0.13
7	Worked there before	0.20	0.09	0.15	0.06	0.11	0.07	0.06	0.05
8	Know other migrant workers there	0.08	0.12	0.20	0.05	0.19	0.11	0.07	0.05
9	Lighter workload	0.05	0.09	0.24	0.08	0.25	0.35	0.27	0.16
10	Migrant protection	0.03	0.14	0.21	0.02	0.20	0.12	0.10	0.04
11	Looking for experience	0.04	0.07	0.07	0.18	0.17	0.17	0.23	0.23
12	Some MENA countries routes closed	0.03	0.01	0.00	0.11	0.00	0.02	0.03	0.04
13	Easy to find jobs	0.04	0.07	0.05	0.04	0.02	0.02	0.04	0.03
14	Personal reasons	0.04	0.03	0.03	0.07	0.03	0.03	0.05	0.06
15	Offered a job there	0.04	0.04	0.02	0.04	0.03	0.04	0.04	0.05
16	Following employers	0.02	0.01	0.01	0.02	0.01	0.02	0.01	0.01
17	Husband permission	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
18	Stronger local currency	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	Faster deployment	0.04	0.06	0.01	0.03	0.01	0.01	0.02	0.02
20	Age/Education requirements cap	0.01	0.05	0.01	0.01	0.00	0.01	0.01	0.02
21	Freedom	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.02
22	Calling visa	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	Economic reasons at home	0.02	0.01	0.01	0.01	0.01	0.00	0.01	0.01
24	Other reasons	0.04	0.05	0.04	0.06	0.06	0.04	0.06	0.05
25	Want to go to Qatar/UAE	0.01	0.00	0.00	0.03	0.00	0.00	0.01	0.02
	Observations	936	350	782	1869	464	504	367	383

Notes: MENA refers to Middle East and North Africa, SEA refers to Southeast Asian countries (Singapore, Malaysia, Brunei), and EAP refers to East Asia countries (Hongkong, Taiwan). Switchers: migrants going to different regions in different migration spells. Others: migrants going to four different countries or more.

Table A.14: Effects on Household Assets Ownership

	(1) Motorbike	(2) Car	(3) Bicycles	(4) Fridge	(5) LPG 12kg
$Migration_d^o \times XRShock_{dt-1}$	0.0471***	0.0347	0.0666***	0.121***	0.0721***
	(0.0177)	(0.0400)	(0.0236)	(0.0200)	(0.0187)
Dep. Var. Mean	0.59	0.07	0.35	0.31	0.14
Districts	326	252	326	326	326
Observations	904	504	904	904	904

Notes: The sample is the 2005-2012 unbalanced panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. XRShock is the district-level yearly average of migrant-weighted foreign currency exchange rates between host country's currency and IDR, relative to June 2007. District-level migrant stock abroad is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration intensity is the natural log of the ratio between the total number of migrants and total population from the 2005 village census. Outcomes data sources are as described in Appendix A. All regressions include district and year fixed effects. Standard errors are clustered at the district level in parentheses. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

Table A.15: Use of Increased Remittances

	(1) School Fee	(2) Durables	(3) Mig. Loan	(4) Electronics	(5) Consumption
Remittance	0.740**	0.459**	0.510	0.271	0.716
	(0.368)	(0.216)	(0.332)	(0.212)	(0.467)
HH, Wave FE	Yes	Yes	Yes	Yes	Yes
HH	183	183	183	183	183
Observations	418	418	418	418	418

Notes: The sample is the migrant household panel from Doi et al. (2014) who reported receiving remittances during more than one of the follow-up surveys (March 2011-January 2012). Reported coefficients are OLS regressions of remittance category uses on remittances receipt as reported during the first follow-up, and the difference from the previous response in subsequent follow-ups. Remittances are expressed in log IDR, and XR shock is the exchange rate to IDR relative to March 2011. Exchange rate data are from Refinitiv Datastream. Standard errors are clustered at the household level. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

Table A.16: Effects on School Enrollment

	(1) Elementary School Enrollment Among 6-12 yo.	(2) Jr. Sec School Enrollment Among 13-15 yo.	(3) Sr. Sec School Enrollment Among 16-18 yo.
		A. Boys	
$Migration_d^o \times XRShock_{dt-1}$	2.681***	5.455**	11.42***
	(0.959)	(2.354)	(2.784)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	88.91	65.55	45.96
Districts	350	350	350
Observations	2398	2398	2398
		B. Girls	
$Migration_d^o \times XRShock_{dt-1}$	3.798***	1.463	1.541
	(0.878)	(2.909)	(2.647)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	89.03	67.98	47.16
Districts	350	350	350
Observations	2398	2398	2398

Notes: This table reports the estimates of equation (5). The sample is from the 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. Interaction variable $\text{Migration}_d \times \text{XRShock}_{t-1}$ is standardized to have a mean of zero and a standard deviation of one. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. The district-level migrant stock abroad for XR-shock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and total population from the 2005 village census. Outcomes data is from Susenas household surveys. Other outcomes data details are as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors clustered at the district level in parentheses.

Table A.17: Effects on School Enrollment, with Survey Weight

	(1) Elem School Enrollment among 6-12 yo. (Weighted)	(2) Jr. Sec School Enrollment among 13-15 yo. (Weighted)	(3) Sr. Sec School Enrollment among 16-18 yo. (Weighted)
	A. Boys and Girls		
$Migration_d^o \times XRShock_{dt-1}$	3.331***	3.919*	5.531***
	(0.747)	(2.201)	(2.026)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	88.97	66.71	46.24
Districts	350	350	350
Observations	2398	2398	2398
	B. Boys		
$Migration_d^o \times XRShock_{dt-1}$	2.545***	5.047**	9.888***
	(0.968)	(2.448)	(2.656)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	88.92	65.56	45.72
Districts	350	350	350
Observations	2398	2398	2398
	C. Girls		
$Migration_d^o \times XRShock_{dt-1}$	4.061***	2.251	0.889
	(0.904)	(2.909)	(2.534)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	89.03	67.99	46.86
Districts	350	350	350
Observations	2398	2398	2398

Notes: This table reports the estimates of equation (5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with the record of returnees from airport arrival data. The interaction variable $\text{Migration}_d \times \text{XRShock}_{t-1}$ is standardized to have a mean of zero and standard deviation of one. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. The district-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total number of migrants and total population from the 2005 village census. Outcomes data comes from the Susenas household surveys, aggregated to the district level with the survey weight. Other outcomes data details are as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors are clustered at the district level in parentheses.

Table A.18: Placebo Effects on School Enrollment

	(1) Elementary School Enrollment Among 19-24 yo.	(2) Jr. Sec School Enrollment Among 19-24 yo.	(3) Sr. Sec School Enrollment Among 19-24 yo.
	A. Boys and Girls		
$Migration_d^o \times XRShock_{dt-1}$	-0.122	-0.0202	-1.202
	(0.0976)	(0.150)	(0.731)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	0.04	0.20	2.85
Districts	350	350	350
Observations	2398	2398	2398
	B. Boys		
$Migration_d^o \times XRShock_{dt-1}$	-0.117	0.167	-0.696
	(0.103)	(0.196)	(0.866)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	0.04	0.23	3.43
Districts	350	350	350
Observations	2398	2398	2398
	C. Girls		
$Migration_d^o \times XRShock_{dt-1}$	-0.184	-0.206	-1.720*
	(0.160)	(0.204)	(0.894)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	0.03	0.16	2.28
Districts	350	350	350
Observations	2398	2398	2398

Notes: This table reports the estimates of equation (5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with the record of returnees from airport arrival data. The interaction variable $\text{Migration}_d \times \text{XRShock}_{t-1}$ is standardized to have a mean of zero and standard deviation of one. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. The district-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total number of migrants and total population from the 2005 village census. Outcomes data comes from the Susenas household surveys. Other outcomes data details are as described in Appendix A.1. * $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$. Standard errors are clustered at the district level in parentheses.

Table A.19: Effects on Village Informal Taxation

	(1) Household Manpower for Building Village	(2) Household Contribute Money/ Goods for Building	(3) Money/ Goods Contribution for Building (Log IDR)	(4) Household Manpower for Maintenance in Village	(5) Household Contribute Money/ Goods for Maintenance	(6) Money/ Goods Contribution for Maintenance (Log IDR)
Migration x $XRShock^{t-1}$	0.0341	0.0514**	0.489**	0.00852	0.0369	0.361
	(0.96)	(2.23)	(2.06)	(0.26)	(1.59)	(1.60)
Dep. Var. Mean	0.2	0.1	0.9	0.6	0.1	1.3
Clusters	611	611	611	611	611	611
Observations	55975	55975	55975	55975	55975	55974

Notes: This data from Generasi SPKP survey (Olken et al, 2014). The respondents are households. This table presents the regression coefficients of the outcome variables on the migrant exchange rate shock, i.e., the interaction of migration intensity and currency exchange rate changes lagged by one year from migrant destinations recorded in Podes 2005. The outcomes are participation in and contribution to building and maintenance activities in the village. All regressions include village fixed effects, survey wave fixed effects, and subdistrict-trend terms. Standard errors are clustered at the subdistrict level. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

Table A.20: Indonesia's Major Trading Partners and Foreign Investment Origins

		Export value			Import value			FDI 2008-2011
	Country	2007 US$		Country	2007 US$		Country	(million US$)
1	Japan	23,632,796,842	1	Singapore	9,839,794,842	1	Singapore	16,516
2	USA	11,614,229,704	2	China	8,557,877,121	2	Japan	4,273
3	Singapore	10,501,617,286	3	Japan	6,526,673,892	3	Netherlands	3,251
4	China	9,675,512,723	4	Malaysia	6,411,927,287	4	USA	2,741
5	South Korea	7,582,734,443	5	USA	4,787,174,352	5	South Korea	2472
6	Malaysia	5,096,063,502	6	Thailand	4,287,065,396	6	UK	1,796
7	India	4,943,905,977	7	Saudi	3,372,825,227	7	Hong Kong	842
8	Australia	3,394,557,284	8	South Korea	3,196,686,587	8	Germany	617
9	Thailand	3,054,275,983	9	Australia	3,004,011,966	9	Australia	419
10	Netherlands	2,749,459,736	10	Germany	1,982,022,283	10	Taiwan	391
11	Taiwan	2,596,730,725	11	Brunei	1,864,720,849	11	Switzerland	343
12	Germany	2,316,013,330	12	Kuwait	1,705,790,311	12	France	330
13	Spain	1,906,222,913	13	India	1,609,606,816	13	Canada	151
14	UK	1,454,164,863	14	France	1,443,687,264	14	India	94
15	Italy	1,380,002,074	15	Canada	1,055,580,227	15	Italy	76
	Total	114,100,890,751			74,473,430,118			61,376
	Subtotal top 15	81%			80%			56%

Notes: Export and import statistics are tabulated from *Statistik Perdagangan Luar Negeri Indonesia*. Foreign Direct Investment data from Central Bureau of Statistics, *Realisasi Investasi Penanaman Modal Luar Negeri Menurut Negara*/Realized Investment from Foreign Sources by Country, 2008-2011.

Table A.21: Migration Destination and Trade Countries

	(1) Export Weight 2007 (kg)	(2) Export Weight 2007 (kg)	(3) Export Value 2007 (USD)	(4) Export Value 2007 (USD)
Migrants 2008-2010	5160.48	-12237.45	2946.94	-1425.55
	(12286.29)	(11807.95)	(3755.16)	(3705.65)
Africa		-7.41e+09***		-1.97e+09***
		(1.43e+09)		(4.47e+08)
Oceania		-7.28e+09***		-1.85e+09***
		(1.74e+09)		(5.45e+08)
Americas		-7.27e+09***		-1.71e+09***
		(1.46e+09)		(4.59e+08)
Europe		-6.94e+09***		-1.74e+09***
		(1.42e+09)		(4.46e+08)
Constant	1.57e+09***	7.52e+09***	5.17e+08***	2.01e+09***
	(4.89e+08)	(1.09e+09)	(1.49e+08)	(3.42e+08)
Observations	215	215	215	215

Notes: Standard errors are in parentheses. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.10.

Table A.22: Correlation between Commodity Production and Migration

	(1) Oil and Gas Revenue 2005 (Log IDR)	(2) Oil and Gas Revenue 2005 (Log IDR)	(3) Palm oil Area 2003 (Log Ha)	(4) Palm oil Area 2003 (Log Ha)
Migration Intensity	0.34	0.15	-0.22	0.16
	(0.68)	(0.090)	(0.18)	(0.11)
FE		prop		prop
Clusters	31	31	31	31
Observations	384	384	384	384

Notes: Standard errors are clustered at the province level in parentheses. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

Table A.23: Foreign Direct Investment, Exchange Rates, and Migration

	(1) $logFDI_t$	(2) $logFDI_{t+1}$	(3) $logFDI_t$	(4) $logFDI_{t+1}$
Currency Exchange Rate	-1.056	-0.762		
	(1.129)	(1.156)		
log(Migrants)			-0.00251	-0.000633
			(0.0595)	(0.0381)
Constant	5.664***	5.334***	4.259***	4.585***
	(1.385)	(1.402)	(0.221)	(0.142)
Country	21	21	21	21
Observations	356	336	211	212

Notes: Currency exchange rates are relative to mid-2007. Migrants are aggregate number from BNP2TKI annual reports for top country destinations. FDI are in millions of USD from Central of Bureau Statistics report for selected top investor countries. Regressions include country and year fixed effects. Sample includes data from 2004-2020 for Columns 1-2 and 2006-2016 for Columns 3-4. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors are clustered by country in parentheses.

Table A.24: Effects on Development and Education Outcomes, Robustness with Island-specific Trends

	(1) Household Expenditure (log IDR)	(2) Household Exp Bottom 20% (log IDR)	(3) Household Exp Education (log IDR)	(4) Elementary Enrollment (Ages 6-12)	(5) Jr. Secondary Enrollment (Ages 13-15)	(6) Sr. Secondary Enrollment (Ages 16-18)	(7) Elementary School (Grades 1-6)	(8) Jr. Secondary School (Grades 7-9)	(9) Sr. Secondary School (Grades 10-12)
Panel A. Main Estimates									
$Migration_d^o \times XRShock_{dt-1}$	0.0479	0.103***	0.254***	3.271***	3.724*	6.635***	0.782***	0.247***	0.0132
	(0.0393)	(0.0320)	(0.0887)	(0.740)	(2.132)	(2.160)	(0.265)	(0.0843)	(0.0241)
Panel B. With Island Trends									
$Migration_d^o \times XRShock_{dt-1}$	0.0390	0.0997***	0.329***	2.564***	4.989**	6.153**	0.660**	0.222***	0.0388**
	(0.0408)	(0.0336)	(0.0948)	(0.838)	(2.261)	(2.398)	(0.284)	(0.0822)	(0.0197)
District FE, Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.83	12.08	9.62	88.97	66.71	46.50	6.38	1.17	0.31
Districts	347	347	347	350	350	350	350	350	350
Observations	2050	2050	2050	2398	2398	2398	2403	2403	2403

Notes: This table reports the estimates of equation (5) with the addition of island trends on the right hand side. The sample is from the 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. The district-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and total population from the 2005 village census. GDP per capita is expressed in log of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors are clustered at the district level in parentheses.

Table A.25: Effects on Development and Education Outcomes, Alternative Clustering by District-Level Destination Patterns

	(1) Household Expenditure (log IDR)	(2) Household Exp Bottom 20% (log IDR)	(3) Household Exp Education (log IDR)	(4) Elementary Enrollment (Ages 6-12)	(5) Jr. Secondary Enrollment (Ages 13-15)	(6) Sr. Secondary Enrollment (Ages 16-18)	(7) Elementary School (Grades 1-6)	(8) Jr. Secondary School (Grades 7-9)	(9) Sr. Secondary School (Grades 10-12)
$Migration_d^o \times XRShock_{dt-1}$	0.0479	0.103	0.254	3.271	3.724	6.635	0.782	0.247	0.0132
	(0.039)	(0.032)***	(0.089)***	(0.740)***	(2.132)*	(2.160)***	(0.265)***	(0.084)***	(0.024)
	{0.046}	{0.032}***	{0.104}***	{0.707}***	{2.240}*	{2.849}***	{0.278}***	{0.083}***	{0.026}
	[0.046]	[0.031]***	[0.101]***	[0.711]***	[2.232]*	[2.778]***	[0.277]***	[0.082]***	[0.025]
District FE, Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.83	12.08	9.62	88.97	66.71	46.50	6.38	1.17	0.31
Districts	347	347	347	350	350	350	350	350	350
Observations	2050	2050	2050	2398	2398	2398	2403	2403	2403

Notes: This table reports estimates of equation (5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with records of returnees from the airport arrival data. XRShock is the district-level yearly average of migrant-weighted foreign currency exchange rates between host country's currency and IDR, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and the total population from the 2005 village census. GDP per capita are expressed in logarithm of 2010 IDR. Standard errors in parentheses are clustered by district, standard errors in curly brackets are clustered by destination country ranking, standard errors in square brackets are clustered by country quartiles. Other outcomes data sources and details are as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

Table A.26: Effects on Development and Education Outcomes, Robustness Checks Using Podes 2005, 2008, 2011 migrant count

	(1) Household Expenditure (log IDR)	(2) Household Exp Bottom 20% (log IDR)	(3) Household Exp Education (log IDR)	(4) Elementary Enrollment (Ages 6-12)	(5) Jr. Secondary Enrollment (Ages 13-15)	(6) Sr. Secondary Enrollment (Ages 16-18)	(7) Elementary School (Grades 1-6)	(8) Jr. Secondary School (Grades 7-9)	(9) Sr. Secondary School (Grades 10-12)
A. Main Estimates - Podes 2005 migrant count only									
$Migration^{o}_{d} \times XRShock_{dt-1}$	0.0479	0.103***	0.254***	3.271***	3.724*	6.635***	0.782***	0.247***	0.0132
	(0.0393)	(0.0320)	(0.0887)	(0.740)	(2.132)	(2.160)	(0.265)	(0.0843)	(0.0241)
B. Podes 2005, 2008, 2011 migrant count									
$Migration_{dt-1} \times XRShock_{dt-1}$	0.0673*	0.100***	0.288***	2.965***	4.454**	6.027***	0.659**	0.220**	0.0164
	(0.0404)	(0.0323)	(0.0942)	(0.765)	(2.104)	(2.326)	(0.291)	(0.0885)	(0.0279)
District FE, Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.83	12.09	9.62	88.97	66.61	46.43	6.41	1.17	0.31
Districts	356	356	356	359	359	359	359	359	359
Observations	2078	2078	2078	2432	2432	2432	2437	2437	2437

Notes: This table reports estimates of equation (5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with records of returnees from the airport arrival data. XRShock is the district-level yearly average of migrant-weighted foreign currency exchange rates between host country's currency and IDR, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and the total population from the 2005 village census. GDP per capita are expressed in logarithm of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. * p$\leq$ 0.10, ** p$\leq$ 0.05, *** p$\leq$ 0.01. Standard errors are clustered at the district level in parentheses.

Table A.27: Effects on Development and Education Outcomes, Robustness Checks using Village Plurality Destinations in Podes 2005

	(1) Household Expenditure (log IDR)	(2) Household Exp Bottom 20% (log IDR)	(3) Household Exp Education (log IDR)	(4) Elementary Enrollment (Ages 6-12)	(5) Jr. Secondary Enrollment (Ages 13-15)	(6) Sr. Secondary Enrollment (Ages 16-18)	(7) Elementary School (Grades 1-6)	(8) Jr. Secondary School (Grades 7-9)	(9) Sr. Secondary School (Grades 10-12)
A. Main Estimates - Migrant Terminal data for destination exposure									
$Migration_d^o \times XRShock_{dt-1}$	0.0479	0.103***	0.254***	3.271***	3.724*	6.635***	0.782***	0.247***	0.0132
	(0.0393)	(0.0320)	(0.0887)	(0.740)	(2.132)	(2.160)	(0.265)	(0.0843)	(0.0241)
B. Podes 2005 village plurality destination									
$Migration_d^o \times XRShock_{dt-1}^{2005dest}$	-0.00241	0.0405	0.253**	2.381**	3.761*	3.387	0.570	0.292**	-0.0291
	(0.0406)	(0.0352)	(0.106)	(0.975)	(2.218)	(2.311)	(0.354)	(0.114)	(0.0494)
District FE, Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.92	12.17	9.69	89.23	67.30	48.33	6.57	1.33	0.36
Districts	404	404	404	407	407	407	407	407	407
Observations	2396	2396	2396	2831	2831	2831	2846	2846	2846

Notes: This table reports estimates of equation (5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with records of returnees from the airport arrival data. XRShock is the district-level yearly average of migrant-weighted foreign currency exchange rates between host country's currency and IDR, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and the total population from the 2005 village census. GDP per capita are expressed in logarithm of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors are clustered at the district level in parentheses.

Table A.28: Effects on Development and Education Outcomes, Robustness Checks to Log Transformations for Migration

	(1) Household Expenditure (log IDR)	(2) Household Exp Bottom 20% (log IDR)	(3) Asset Index	(4) Elementary Enrollment (Ages 6-12)	(5) Jr. Secondary Enrollment (Ages 13-15)	(6) Sr. Secondary Enrollment (Ages 16-18)	(7) Elementary School (Grades 1-6)	(8) Jr. Secondary School (Grades 7-9)	(9) Sr. Secondary Schools (Grades 10-12)
A. Main Estimates - Migration Intensity log Transformed									
$log\text{Migration}_d^o \times XRShock_{dt-1}$	0.0479	0.103***	0.254***	3.271***	3.724*	6.635***	0.782***	0.247***	0.0132
	(0.0393)	(0.0320)	(0.0887)	(0.740)	(2.132)	(2.160)	(0.265)	(0.0843)	(0.0241)
District FE, Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.83	12.08	9.62	88.97	66.71	46.50	6.38	1.17	0.31
Districts	347	347	347	350	350	350	350	350	350
Observations	2050	2050	2050	2398	2398	2398	2403	2403	2403
B. Migration Intensity Not log-Transformed									
$Migration_d^o \times XRShock_{dt-1}$	0.00560	0.0372	0.165*	2.608***	2.876	5.707**	0.535***	0.188**	0.0373*
	(0.0388)	(0.0317)	(0.0892)	(0.765)	(1.966)	(2.507)	(0.148)	(0.0765)	(0.0206)
District FE, Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.83	12.09	9.62	88.98	66.63	46.52	6.39	1.17	0.31
Districts	356	356	356	359	359	359	359	359	359
Observations	2087	2087	2087	2441	2441	2441	2446	2446	2446

Notes: This table reports estimates of equation (5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with records of returnees from the airport arrival data. XRShock is the district-level yearly average of migrant-weighted foreign currency exchange rates between host country's currency and IDR, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and the total population from the 2005 village census in Panel A and only the ratio, not log transformed in Panel B. GDP per capita are expressed in logarithm of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors are clustered at the district level in parentheses.

Table A.29: Effects on Development and Education Outcomes, Robustness with Lagged Outcome Variables

	(1) Household Expenditure (log IDR)	(2) Household Exp Bottom 20% (log IDR)	(3) Household Exp Education (log IDR)	(4) Elementary Enrollment (Ages 6-12)	(5) Jr. Secondary Enrollment (Ages 13-15)	(6) Sr. Secondary Enrollment (Ages 16-18)	(7) Elementary School (Grades 1-6)	(8) Jr. Secondary School (Grades 7-9)	(9) Sr. Secondary School (Grades 10-12)
A. Main Estimates									
$Migration_d^o \times XRShock_{dt-1}$	0.0479	0.103***	0.254***	3.271***	3.724*	6.635***	0.782***	0.247***	0.0132
	(0.0393)	(0.0320)	(0.0887)	(0.740)	(2.132)	(2.160)	(0.265)	(0.0843)	(0.0241)
District FE, Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.83	12.08	9.62	88.97	66.71	46.50	6.38	1.17	0.31
Districts	347	347	347	350	350	350	350	350	350
Observations	2050	2050	2050	2398	2398	2398	2403	2403	2403
B. with Lagged Outcome Variables									
$Migration_d^o \times XRShock_{dt-1}$	0.0391	0.105***	0.234***	3.322***	4.234**	6.291***	0.775***	0.222***	0.0245
	(0.0366)	(0.0315)	(0.0803)	(0.738)	(1.975)	(2.114)	(0.203)	(0.0699)	(0.0179)
District FE, Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.81	12.06	9.59	88.96	66.69	46.50	6.38	1.17	0.31
Districts	335	335	335	350	350	350	350	350	350
Observations	1678	1678	1678	2384	2384	2384	2403	2403	2403

Notes: This table reports estimates of equation (5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with records of returnees from the airport arrival data. XRShock is the district-level yearly average of migrant-weighted foreign currency exchange rates between host country's currency and IDR, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and the total population from the 2005 village census. GDP per capita are expressed in logarithm of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. * $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$. Standard errors are clustered at the district level in parentheses.

Table A.30: Private Education Responses

	Private Schools			Private Islamic Madrasa		
	Elementary (1)	Jr. Secondary (2)	All levels (3)	Elementary (4)	Jr. Secondary (5)	All levels (6)
$Migration^{o}_{d} \times XRShock_{dt-1}$	0.0943	0.0673**	0.187	0.146***	0.0625	0.218**
	(0.128)	(0.0267)	(0.151)	(0.0473)	(0.0491)	(0.103)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	0.66	0.43	1.37	0.50	0.34	1.05
Districts	350	350	350	345	345	350
Observations	2403	2403	2403	2380	2380	2403

Notes: This table reports estimates of equation (5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with records of returnees from the airport arrival data. XRShock is the district-level yearly average of migrant-weighted foreign currency exchange rates between host country's currency and IDR, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and the total population from the 2005 village census. GDP per capita are expressed in logarithm of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors are clustered at the district level in parentheses.

Table A.31: Public Schools Provision, Regression with Interactions with Different Election Timing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Elementary Schools per 10,000 pop				Jr. Secondary Schools per 10,000 pop			
$Migration^o_d \times XRShock_{dt-1}$	0.882***	0.791***	0.787***	0.584**	0.271***	0.250***	0.248***	0.195**
	(0.248)	(0.272)	(0.266)	(0.265)	(0.0836)	(0.0864)	(0.0851)	(0.0822)
$1[\text{Election}]_{t+1} \times Migration^o_d \times XRShock_{dt-1}$	-0.0370				-0.0103			
	(0.0272)				(0.00857)			
$1[\text{Election}]_t \times Migration^o_d \times XRShock_{dt-1}$		-0.00587				-0.00214		
		(0.0199)				(0.00611)		
$1[\text{Election}]_{t-1} \times Migration^o_d \times XRShock_{dt-1}$			0.0189				0.00327	
			(0.0199)				(0.00667)	
$1[\text{Election}]_{t-2} \times Migration^o_d \times XRShock_{dt-1}$				0.0465*				0.0122
				(0.0279)				(0.00958)
District FE, Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	6.45	6.38	6.38	6.42	1.17	1.17	1.17	1.20
Districts	350	350	350	350	350	350	350	350
Observations	2151	2403	2403	2183	2151	2403	2403	2183

Notes: This table reports estimates of equation (5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with records of returnees from the airport arrival data. XRShock is the district-level yearly average of migrant-weighted foreign currency exchange rates between host country's currency and IDR, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and the total population from the 2005 village census. GDP per capita are expressed in logarithm of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors are clustered at the district level in parentheses.

Table A.32: Effects on Voting Behavior

	(1) Presidential Election 2009	(2) District Election (in past two years)	(3) Village Head Election (in past two years)	(4) Complaints to Village Head about Anti- Poverty Programs
Migration x $XRShock^{t-1}$	-0.0162	-0.0260**	-0.00250	-0.0969*
	(-0.95)	(-2.21)	(-0.15)	(-1.65)
Dep. Var. Mean	0.98	0.97	0.97	0.58
Clusters	605	520	549	589
Observations	18539	16636	12079	5301

Notes: This data is from the Generasi SPKP survey (Olken et al, 2014). The respondents are households for Columns 1-3 and village head for Column 4. The table presents the regression coefficients of the outcome variables on the interaction of migration intensity and currency exchange rate changes lagged by one year from migrant destinations recorded in Podes 2005. The outcomes are voting turnout for the presidential, mayoral, and village head elections in Columns 1-3, and complaints to the village head about the implementations of anti-poverty programs in Column 4. Presidential elections are cross-section regressions in 2009 with subdistrict fixed effects. Regresssions of mayoral and village head elections use survey waves 2009 and 2013 as well as subdistrict and survey wave fixed effects. The regression of complaints to the village head use survey waves 2009 and 2013 as well as village fixed effects, survey wave fixed effects, and subdistrict trend terms. Standard errors are clustered at the subdistrict level. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

Table A.33: Effects on Household Participation in Community Groups

	(1) Religious Groups	(2) Social Service Groups	(3) Credit Groups	(4) Production Groups	(5) Governance Groups	(6) Recreation Groups	(7) Political Groups
Migration x $XRShock^{t-1}$	-0.0414	0.0455	0.0799*	-0.0470*	-0.0114	0.0268*	0.00874
	(-0.88)	(1.01)	(1.67)	(-1.66)	(-0.43)	(1.79)	(1.15)
mean(y)	0.58	0.30	0.29	0.09	0.09	0.02	0.01
Clusters	611	611	611	611	611	611	611
Observations	45518	45518	45518	45518	45518	45518	45518

Notes: This data is from the Generasi SPKP survey (Olken et al, 2014). The respondents are households. This table presents the regression coefficients of outcome variables on the interaction of migration intensity and currency exchange rate changes lagged by one year from migrant destinations recorded in Podes 2005. The outcomes are participation in various community groups. All regressions include village fixed effects, survey wave fixed effects, and subdistrict trend terms. Standard errors are clustered at the subdistrict level. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

Table A.34: Robustness Checks for Effects on GDP per Capita

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	GDP Total			GDP Agriculture			GDP Service		
$Migration_d^o \times XRShock_{dt-1}$	0.0838*	0.0623	0.0486	0.0999**	0.102**	0.101**	0.225	0.243	0.269
	(0.0482)	(0.0494)	(0.0537)	(0.0393)	(0.0396)	(0.0420)	(0.148)	(0.159)	(0.201)
District FE, Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Commodity Trade Vars.		✓			✓			✓	
Island Trends			✓			✓			✓
Dep. Var. Mean	15.50	15.50	15.50	13.98	13.98	13.98	14.39	14.39	14.39
Districts	347	347	347	347	347	347	350	350	350
Observations	2385	2385	2385	2385	2385	2385	2403	2403	2403

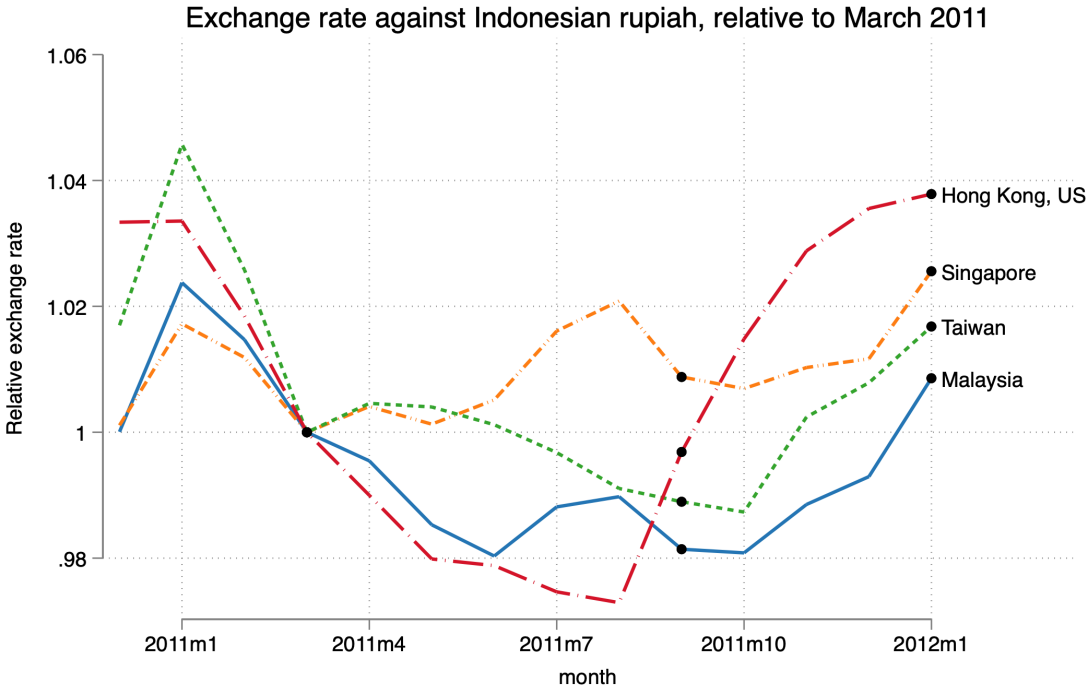
Notes: This table reports estimates of equation (5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with records of returnees from the airport arrival data. XRShock is the district-level yearly average of migrant-weighted foreign currency exchange rates between host country's currency and IDR, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and the total population from the 2005 village census. GDP per capita are expressed in logarithm of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors are clustered at the district level in parentheses.

Table A.35: Robustness Checks for Effects on Poverty

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Poverty Rate			Poverty Gap			Gini Coefficient		
$Migration_d^o \times XRShock_{dt-1}$	-3.055***	-3.325***	-3.176***	-1.100***	-1.163***	-1.099***	-0.0279**	-0.0261**	-0.0290**
	(0.677)	(0.670)	(0.804)	(0.220)	(0.219)	(0.246)	(0.0124)	(0.0126)	(0.0132)
District FE, Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Commodity Trade Vars.		✓			✓			✓	
Island Trends			✓			✓			✓
Dep. Var. Mean	15.05	15.05	15.05	2.64	2.64	2.64	0.29	0.29	0.29
Districts	347	347	347	347	347	347	316	316	316
Observations	2378	2378	2378	2378	2378	2378	1834	1834	1834

Notes: This table reports estimates of equation (5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with records of returnees from the airport arrival data. XRShock is the district-level yearly average of migrant-weighted foreign currency exchange rates between host country's currency and IDR, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and the total population from the 2005 village census. GDP per capita are expressed in logarithm of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors are clustered at the district level in parentheses.

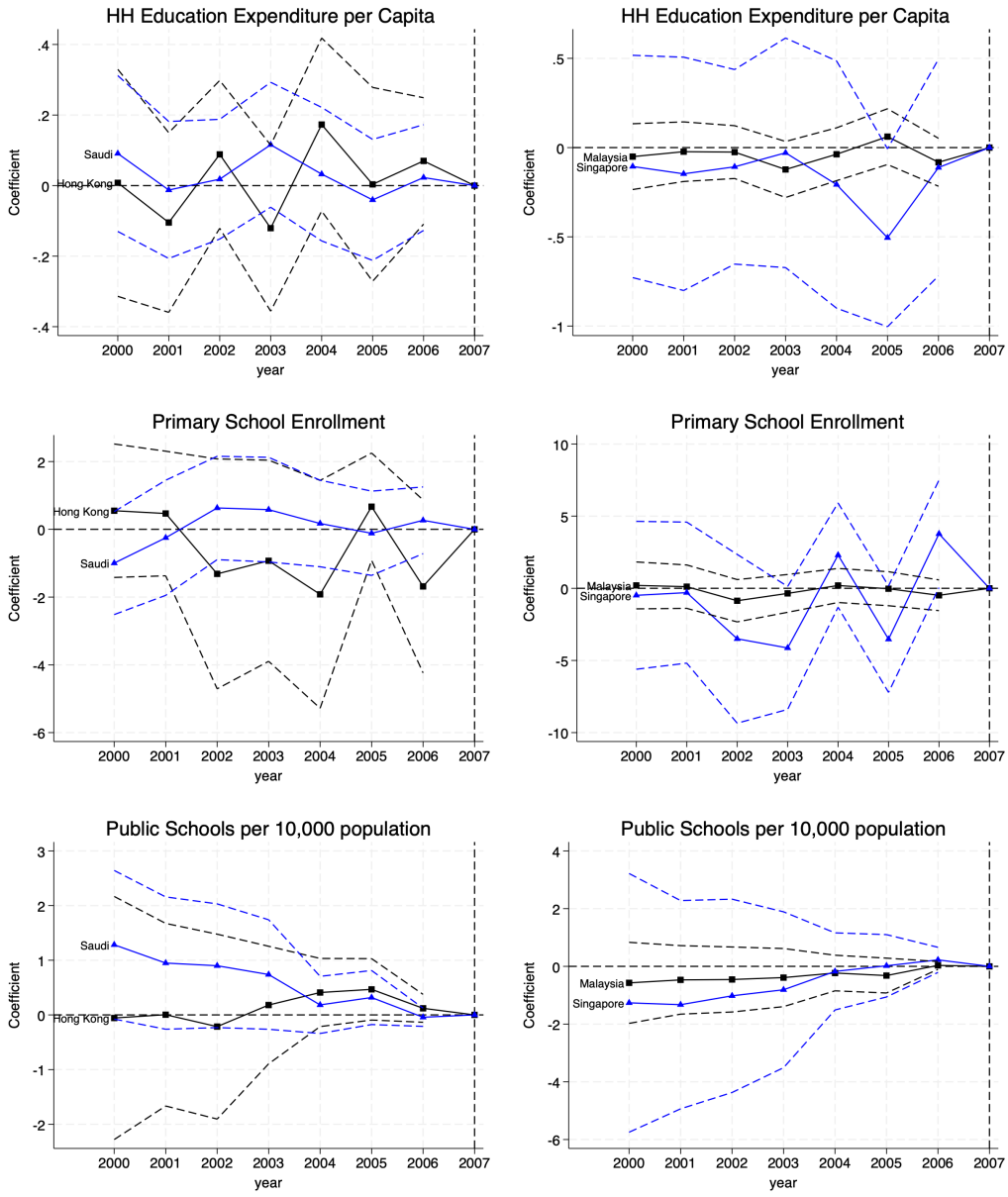
Figure A.1: Monthly Exchange Rate Variation for Year 2011



Note: Monthly exchange rate variation for 2011, by destination countries of migrants in the Doi et al. (2014) panel. Black dots denote when the follow up surveys were conducted. Data are from Refinitiv Datastream (2022).

Figure A.2: Trends of Selected Outcomes Pre-2008, by Key Migration Destinations

(a) Destinations: Saudi and Hongkong (b) Destinations: Malaysia and Singapore



Note: These graphs plot the coefficient estimates from the regression of selected outcome variables on the share of migrants from a district going to a particular destination in 2005, interacted by the year dummies with the year 2007–the last year before the 2008 Global Financial Crisis–as the reference period. Dashed lines are 95% confidence intervals for the respectively colored coefficients. Plots in the left column (a) show the estimates from the share of migrants to Saudi and Hong Kong, respectively for the outcomes of household education expenditure per capita, primary school enrollment, and the number of total public schools per 10,000 population. Plots in the right column (b) show the corresponding estimates from Malaysia and Singapore destinations. Regressions include district fixed effects, year fixed effects, and the following controls from the year 2000 interacted by year dummies: the number of public primary schools, public junior high schools, public senior high schools, per capita household expenditure, share of Arab ethnics, share of Chinese ethnics, Javanese, Sundanese, Minang, Bugis, share of Christians, and the total population.