

# International Migration, Exchange Rate Shocks, and Education Investment

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## 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 taxation or elections, but rather by administrative splitting that strengthens accountability channels.

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# 1 Introduction

International migrants use their incomes from work abroad to help their families back home, and these are an important resource for many developing countries. A portion of these incomes is 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 incomes sent back to migrants' origin surpassed the flow of foreign aid to developing countries (Ratha, De, 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, Plaza, and Ozden, 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; World Bank, 2017).

However, the state's reactions to incoming resources from abroad could create negative consequences. If the migrant origin households use this 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 incomes 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 provides 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 differ 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.<sup>1</sup>

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 earnings home, making Indonesia the 14th largest remittance receiver in the world (World Bank, 2019). Indonesia also provides reliable subnational data, making it possible

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<sup>1</sup>This strategy builds on studies by Yang (2008) and Khanna, Murathanoglu, et al. (2026), who estimated the effect of exchange rate shocks to the Philippines Peso on household outcomes and domestic incomes, but did not analyze public goods outcomes.

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 analysis by showing that positive exchange rate changes increase the size of remittances received by migrants' origin, both at the household and district levels. To show the relationship at the household level, I use panel data of migrant households from Doi, McKenzie, and Zia (2014). Origin households report higher remittances when the Indonesian rupiah (IDR) depreciates against the migrants' host country's currency. At the district level, I use datasets of selected regional statistics from newly compiled sources for additional validations. These datasets include monthly and quarterly remittances reported by the central bank or in the media. These analyses allow me to demonstrate the link between variations in exchange rates and changes in the flow of foreign migrant incomes at the origin.<sup>2</sup>

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 used 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.<sup>3</sup> 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, Sorkin, and Swift (2020).<sup>4</sup> 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 lead to increased household education investments. Households with school-age children reported higher per capita education expenditures after the shock. I also observe a corresponding increase in school enrollment rates. A one standard deviation (SD) shock raises the enrollment rate by 3 p.p., 5 p.p., and 9 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 at school transition ages at each level drive the increased 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 more public junior high schools as early as one year after the shock. Some of these new

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<sup>2</sup>These datasets are limited in their spatial and temporal coverages. The datasets are collected/published beyond the main period of study, making these validation exercises akin to out-of-sample analyses.

<sup>3</sup>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 (Refinitiv, 2022). The SAR is pegged to the USD at a rate of 3.75. The exchange rate changes to the Malaysian ringgit were 11% and 24% in June 2008 and February 2009.

<sup>4</sup>Another approach of shift-share analysis in Borusyak et al. (2022) follows a different set of assumptions.

junior secondary schools are made possible by the expansion of existing primary schools under a “One Roof” scheme, which allows new schools to be established rapidly with fewer classrooms and teachers. 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. These include electricity, piped water, and asphalt roads, complementing household investments in durable assets such as motorcycles, refrigerators, and cooking gas canisters.

Beyond the documented public good responses in the first year after the shock, other improvements can take time to materialize. Using distributed lags of up to four years, I find dynamic effects in the provision of basic education facilities. Consecutive positive shocks for four lags lead to an additional 1.4 schools per 10,000 population for elementary schools and 0.65 schools for junior high schools. Both of these responses are meaningful expansions of the existing basic education infrastructure.

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 differential trends, commodity trade, or biases from correlated shocks. My regressions include an array of baseline controls, which provide evidence of robustness to differential trends. Furthermore, the inclusion of trade windfall proxies for oil and gas and palm oil—Indonesia’s primary export commodities—does not significantly change the estimated coefficients. I check for correlated shocks in two ways: I test the sensitivity of the estimates from dropping a group of pegged currencies at a time, which addresses factors that simultaneously move currencies together, and I 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. Additionally, further checks with the concurrent migration rate, its interaction with major destination currencies, or instrumenting contemporaneous migration destinations with its lagged shares also result in qualitatively unchanged conclusions.

What drives this supply-side response to migrant exchange rate shocks? I consider several possible drivers of local governments’ actions: local accountability, redistribution of tax windfalls, and electoral concern. The push to make local governments more accountable led to the creation of smaller administrative units (“splitting”). With a smaller area, the government could be more accountable. Governments may also see their revenues increase with migrant foreign income windfalls through local taxes. Separately, politicians may time public goods delivery strategically with the cycle of local elections.

I find that migrant exchange rate shocks’ influence on the provision of local public goods may operate over time through a strengthened accountability channel with the availability of fiscal space. At the district level, the total of coefficients from the interactions between splitting indicators and the migrant exchange rate shock increases with longer lags since the split. This process may also play a role at a lower administrative level, as villages that split earlier are more likely to have new elementary and junior secondary schools. Surveys of village heads illustrate a suggestive pathway for grassroots policy change associated with foreign incomes: migrant households have more connections to the village governments, and villages with higher migration request more public facilities, use more support in their requests, resulting in higher success rates. Furthermore, as districts with positive migrant shocks allocate higher shares of capital expenditure over time, appropriate fiscal allocations could further strengthen local accountability channels to improve public service delivery.

On the other hand, my findings support neither taxation nor election-driven responses. Using budget reports from the Ministry of Finance, I find that migrant exchange rate shocks do not lead to increased tax revenues for the district. It also appears that the electoral cycle is not a strong driver of public school provision. Analysis of a database of mayoral candidates’ campaign platforms shows that local election wins and votes garnered are inconsistently associated with specific campaign promises to improve education services.

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 that a one SD shock is associated with 0.14 log points higher total GDP per capita, with improvements in the agriculture and service sectors. This result implies a local multiplier estimate of 2.62, which is broadly comparable with existing studies of other liquidity injections.<sup>5</sup> 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. Exploratory analysis of long-run effects 9-15 years after the shock shows increasing rates of secondary and post-secondary education completion, but a more muted labor market return.

**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.<sup>6</sup> Yang (2008) and Khanna, Murathanoglu, et al. (2026) 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), Ahmed (2012), and Ahmed (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, or that remittances are more likely to increase government spending on education in democracies, or that there is no remittance curse (Desierto, 2018; Easton and Montinola, 2017; Ramkissoon et al., 2026). 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, Bittschi, and Doerrenberg (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, 2026). Banerjee, Iyer, and Somanathan (2007) highlight cases in India and elsewhere where top-down interventions financed by public budgets have been central to public goods expansion. Pierskalla and Sacks (2018) and Pierskalla and Sacks (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 elections but through improved accountability when administrative units are split into smaller areas.

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<sup>5</sup>Egger et al. (2022) study of cash transfers in Kenya produces an estimate of 2.5, while Breza and Kinnan (2021) study of microfinance in India has an estimated multiplier of 2.9.

<sup>6</sup>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, Pattillo, and Wagh, 2009). For reviews of recent empirical evidence, see Yang (2011), Brown and Jimenez-Soto (2015) and Alpaslan et al. (2021).

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, Aycinena, and Yang, 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). 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. In particular, several studies focus on the demand for private education (Salas, 2014; Clemens and Tiongson, 2017; Valatheeswaran and Khan, 2018). Within this strand of literature, 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 fishermen (5 percent, BNP2TKI, 2014). Prospective migrants need to only show that they have completed six years of education in primary school 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.1, 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, Cameron, et al., 2026).

With their low educational 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 creation 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, Cameron, et al., 2026). 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, Cameron, et al., 2026). 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 and 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, Cameron, et al. (2026) 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.3. 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 through banking institutions (ADB, 2006). Banks and Money Transfer Operators (MTOs) report transaction statistics to the Central Bank, which publishes national aggregate remittance data. However, nationwide sub-national data does not exist, other than occasional reports covering important milestones in remittance transactions in the news. 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 the 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 their 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, Hilmy, and Marx, 2026). 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 around 90 percent at the primary level, this number drops to 67 percent at the junior secondary level and 42 percent at the 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 health services, piped water, electricity, and roads. Frontline health services are provided through community health centers (*Puskemas*), which are typically staffed by government doctors at their outpatient clinics. Some community health centers also provide inpatient care if their facilities are adequate. 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 the 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, Mukherjee, and Stegmann, 2017; Pierskalla and Sacks, 2018).

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, 2026). 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 a ~20% increase in transfers to the district from the central government. Lower-level administrative units can also be divided with similar splitting processes, including at the village level.

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), and local taxes (6.5 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 the total collected income tax and 9 percent of the 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, 2026). Revenues from local taxes are classified as Own Source Revenue (PAD) and are based on local taxes imposed by the district governments (i.e., vehicle and hotel taxes). To analyze the expenditures, district spending is classified into three major categories: personnel, goods, and capital. Personnel spending covers payroll, goods spending includes services,

i.e., recurrent non-pay operating spending. Capital spending covers investment or spending to procure fixed assets, which may include infrastructure building and equipment.

### 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 (*Podés*) surveys collect data from village heads every 2–3 years on the number of migrants from the universe of Indonesian villages. The main analysis uses migrant counts from the 2005 survey. 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.1 lists 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 the 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 Podés village survey. Data on community health centers are sourced from select provinces’ statistical reports.

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-sectional household surveys with representative samples 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 in-

indicator of whether the school is public or private. [Table A.2](#) presents the summary statistics for these variables of interest. 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 three datasets with recorded remittances. First, I use migrant panels from Doi, McKenzie, and Zia (2014). Households in the sample are selected to receive a financial literacy training. Respondents were followed over 2011–2012 in three survey waves with surveyors collecting information on remittances received by the household. Second, I use a monthly remittance series from one district in East Java covering the 2016–2020 period. Third, I use a dataset of quarterly remittances from selected districts in the same province compiled from various regional central bank reports and archives maintained by the Indonesian news bureau Antara. This dataset covers periods in 2007, 2008, and 2012. Each of these datasets provides rarely collected remittances information, but their geographical and temporal scopes are more limited.

I also use various village survey datasets. One village dataset comes from the SPKP survey, which was collected to evaluate the impact of a conditional cash transfer program and a community block grant program (Olken, Onishi, and Wong, 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. Other village datasets come from the MCLE survey, which was collected in a study of conflict mediation and community empowerment in Aceh and Maluku (World Bank, 2009). Another dataset comes from the PEKKA survey, which was fielded to inform women-headed household empowerment programs (World Bank, 2011). Similar to the remittances data, these surveys 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](#) and its validation in [4.3](#). I discuss the use of shift-share constructions in [Section 4.4](#) and outline the multiple channels through which exchange rate shocks could lead to effects at the origin in [Section 4.5](#).

### 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).<sup>7</sup> If, however, migrants want their families to receive a fixed sum, then exchange rate fluctuations will have no effect on the transfers received.

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<sup>7</sup>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).

Using auxiliary out-of-sample datasets, I first test the effect of currency fluctuations on the size of remittances received by households or districts. I test this relationship in three datasets: (i) a panel data of migrant households from Doi, McKenzie, and Zia (2014), (ii) a monthly time series of reported remittances in one district, and (iii) newly compiled data of quarterly remittances in select districts. I describe the validation with the household panel in this subsection and discuss the validation with the two district datasets in the next subsection.

For the migrant household, I construct the exchange rate change measure for each migrant following studies that examine the effect of remittances in the Philippines in the aftermath of the Asian financial crisis (Yang, 2008; Khanna, Murathanoglu, et al., 2026). I use the following equation to define the exchange rate shock:

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

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 the reference period  $o$ . The exchange rate to IDR fluctuates whenever each migrant sends remittances home.

The panel data of migrant households allows me to add migrant fixed effects, thereby addressing self-selection bias typical in cross-sectional estimation of remittances (Funkhouser, 2012). Importantly, the survey explicitly collected information on remittances to migrant households, which is rarely captured in general-purpose household surveys conducted in developing countries. I estimate the following equation:

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

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  $\beta$ , 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,  $\theta_i$ , adjusts for time-invariant characteristics of the household of origin and the household member who migrates, including those that are unobserved.

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.<sup>8</sup>

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) in total remittances since their family member migrated. With an average transfer frequency of 4.5, this corresponds to an average of  $\sim$ USD250 per transfer.<sup>9</sup> My analysis sample includes

<sup>8</sup>Two descriptive statistics lend support to this argument. First, 60% of remitters in the Doi, McKenzie, and Zia (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, Cameron, et al. (2026) 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, McKenzie, and Rohorua, 2006).

<sup>9</sup>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).

all households with abroad migrants, as well as a subsample of households that are regular remitters.

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.<sup>10</sup>

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. Workers in Hong Kong observed that the average exchange rate appreciated by 3.8 percent between March 2011 and January 2011, while the exchange rate to the Taiwan Dollar appreciated by only 1.6 percent (Figure A.1; Refinitiv, 2022). 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.

**Validation.** Migrant households of origin receive more remittances when the currency of the migrant's host country appreciates against the IDR. Table 1, Columns 1-2, present the estimated coefficient from equation (2). The correlation of remittances and exchange rate shocks is positive. The size of the coefficients is in a similar order of magnitude to the responses reported by the Philippines migrants' households to the 1998 exchange rate shocks (0.6, see Yang, 2008). The estimated coefficients are higher for the overall sample, which may reflect the wider variance from coding remittances for non-recipients as IDR 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 (Table A.4).<sup>11</sup>

For my analysis sample, the positive relationship could also be driven by an increased frequency of sending remittances. Table A.5 suggests the remittance frequency among regular remitters increased with positive exchange rate shocks. One should note that remittance transactions are subject to fees from banks and Money Transfer Operators (MTOs), 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 4.5.

This result presents one of the first systematic investigations to link remittance responses to exchange rate fluctuations using household panel data. Prior research has used cross-sectional and aggregate data to link remittances and their resilient flows to exchange rate fluctuations, e.g., during the 2008 Financial Crisis to South Asia, but not using a migrant panel (Sirkeci, Cohen, and Ratha, 2012). Researchers have argued that migrants are willing to absorb large negative shocks in order to continue sending remittances, e.g., unskilled migrants in the Gulf reported sharing accommodations to save money to send home (Sirkeci, Cohen, and Ratha, 2012). 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]."

## 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

<sup>10</sup>The original analysis showed that none of the treatment arms had significant effects on the likelihood of receiving remittances, the frequency of remittances, or the amount received (Doi, McKenzie, and Zia, 2014).

<sup>11</sup>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 send money to family during a religious holiday such as *Eid al-Fitr* to compensate for not being able to be home, especially if they work in a non-Muslim country.

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. The exchange rate shock for each district is defined as follows:

$$XRshock_{dt} = \frac{1}{mig_{dt}} \sum_c mig_{dct} \frac{\text{FX rate to IDR}_{ct}}{\text{FX rate to IDR}_c^o} \quad (3)$$

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  $t$ . The latter term 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. The share of the migrant location is based on the arrival data in the migrant terminal, which includes information on their original departure dates. I use the migrants' original departure dates to impute migrant stock distribution from each district. Therefore, the resulting variable  $XRshock_{dt}$  represents the variation in foreign income a district will receive due to currency rate fluctuation from its destination mix in a given year.<sup>12</sup>

I complement the above calculations with a measure of the district's migration intensity at baseline, which I define as the proportion of its migrant workers per a population of one million inhabitants. The count of migrants is based on the village-level count of migrants in 2005, prior to the global financial crisis, aggregated to the district level.<sup>13</sup>

$$MigShare_d^0 = \left( \frac{migrant_d}{pop_d} \right). \quad (4)$$

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

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

where  $Y_{dt}$  is the outcome of interest, comprising various development indicator variables at the household level (consumption, assets, and education), and the district level (public goods, poverty rate, and GDP per capita). In this analysis, we are interested in the  $\beta$  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  $\theta_d$ , which captures the variation in outcomes due to the district's time-invariant characteristics.  $\theta_t$  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. These baseline variables include: (i) the 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

<sup>12</sup>In other words, the return flow of migrants becomes the basis to impute distribution of the migrant stock, and this inferred stock determines the weight of specific currency shock to a given district. Estimates of migrant distributions from the terminal data are strongly correlated with estimates published by the central bank, with some differences in level.

<sup>13</sup>In [subsection 8.5](#) I revisit the specifications for migration intensity and exchange rate shocks and run checks using alternative constructions such as time-invariant country exposure shares from Podes 2005 and migration counts from later Podes surveys.

results do not hinge on these controls, but they provide further support for robustness. The term  $\varepsilon_{dt}$  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. I also explore possible dynamic effects of the migrant exchange rate shock with a distributed lag model with lags of up to four periods.

For the reduced form analysis, a causal interpretation of  $\beta$  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 of the interaction term in the specification becomes more plausible. Nevertheless, I also ran sensitivity checks for omitted variables with the inclusion of export commodity exchange rate shocks.

I test the sensitivity of the main migrant exchange rate shock towards trade channels with the inclusion of two main export commodities: palm oil and oil and gas. These are Indonesia's most valuable commodities in agriculture and overall exports.<sup>14</sup> I construct the commodity exchange rate shock variable with the interaction of the district's oil revenue or the district's palm oil plantation area with the currency fluctuations of each commodity's export destination countries. The commodity sensitivity checks guard against the possibility that the exchange rate shock caused a trade surplus that enables districts to finance and provide public goods as Indonesian commodities become cheaper and more attractive in the international market. In the result section, I present estimated coefficients from four specifications: using only district and year fixed effects; adding baseline control interacted with year fixed effects; adding commodity exchange rate shocks; and adding both baseline-year interaction and the commodity controls.

Overall, I find that the migrant exchange rate shock variable exhibits both spatial and temporal variations. For example, a comparison of the Purwakarta district in West Java and Pesawaran in Lampung shows different exchange rate shocks due to the variation of destination countries. Nearly all of Purwakarta migrants worked in Saudi Arabia or Gulf countries, while only 70 percent of Pesawaran migrants worked in the same region and 21 percent worked in Malaysia or Singapore. Purwakarta migrants on average saw their host country's currency appreciate by 5.6 p.p. between June 2007–2008, 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. Across the country, districts with positive shocks prior to the Global Financial Crisis of 2008 are scattered across all main island groups. After the crisis started, the value of the Indonesian rupiah changed rapidly, but not all districts benefited from the shock (Figure A.2)

### 4.3 Validating District-Level Migrant Exchange Rate Shocks

It is theoretically possible to use the district-level migrant exchange rate shocks as an instrumental variable for sub-national remittances that will allow analysis of the effects of remittances on Indonesian districts. However, the sub-national remittance data is scarcely available. More generally, 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)." In Indonesia, the Central Bank

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<sup>14</sup>In 2007, Indonesia's palm oil export was worth USD 7.9 billion, while oil and gas brought in USD 22 billion.

only publishes national remittance estimates from reports by banks and MTOs.<sup>15</sup>

To strengthen the conceptual link between the exchange rate shocks and sub-national remittances, I analyze two auxiliary datasets on district-level remittances in East Java. The first dataset is a monthly remittance series from one district covering the 2016–2020 period, while the second dataset contains quarterly figures for selected districts. These datasets provide out-of-sample validations as the Indonesian central bank does not maintain or publish nationwide sub-national remittance statistics.<sup>16</sup> Therefore, these auxiliary datasets represent the most regular sub-national remittance dataset that is publicly available despite the uneven coverage.

I validate the link between exchange rate shocks and subnational remittances by regressing the log of district remittances on contemporaneous exposure-weighted exchange rate shocks. I report the results in Columns 3-5 of [Table 1](#). Both Columns 3 and 4 use the first dataset with different fixed effect specifications, and Column 5 reports the estimated coefficient using the second dataset. In Column 3, I find that the exchange rate shock is correlated with the recorded monthly remittances flowing into the Tulungagung district in East Java. In Column 4, the quarter-by-year fixed effect specification resulted in an estimated coefficient that is nearly twice the size of the coefficient from the quarter indicators and year indicators being included separately. Column 5 also shows a consistent positive correlation between reported remittances by the regional central bank and the migrant exchange rate shock. Overall, the relationship between exchange rate shocks and the reported remittances is present across datasets, although with different magnitudes depending on the specifications. In [Appendix Table A.4](#), I show that these relationships are robust to the inclusion of indicators of major Islamic holidays and lagged remittances as controls.<sup>17</sup>

#### 4.4 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, Sorkin, and Swift (2020).<sup>18</sup> They offer several diagnostics: parallel pre-trends and correlates of the shares. They argued that testing for pre-trends allows researchers to rule out the 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 migrants in the districts to particular destination groups. In particular, I look

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<sup>15</sup>Regional remittances reports from banks are not publicly available. Staff from one of Indonesia's largest banks with knowledge of the bank's remittance operations described these reports as confidential.

<sup>16</sup>Consultations with central bank librarians and staff with institutional knowledge of its statistical reports confirmed this policy.

<sup>17</sup>The exchange rate shock is also correlated with the physical cash inflow to regional offices of the central bank reported in the SPIP series, but this inflow is conceptually distinct from the sub-national remittance flow.

<sup>18</sup>While the fluctuations of exchange rates could plausibly be seen as exogenous shocks, the requirement of many uncorrelated shocks in Borusyak, Hull, and Jaravel (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 Arabia 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).

at several major migration destinations: Malaysia, Saudi Arabia, Singapore, Kuwait, Hong Kong, and Taiwan. 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.3 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 shocks in the future are not correlated with past district outcomes. In Table A.6, 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 attributes to each destination—“Rotemberg weights” in Goldsmith-Pinkham, Sorkin, and Swift (2020)—and highlight 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.<sup>19</sup> Table A.8 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 Arabia—an officially Muslim state. The distance to Dumai, an embarkation point to Malaysia, is negatively correlated with the share of migrants going to the neighboring 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. Statistics from available remittances data suggest that migrants remit on average ~USD 1,200 per year. Given the migration size and exchange rate changes in this period, a back-of-the-envelope calculation from comparing districts with a one standard deviation difference of the migrant exchange rate shock suggests a windfall of USD 180,000–230,000. These estimates are roughly half of the average district budget for social protection in 2008, indicating a sizable flow to the region.<sup>20</sup>

## 4.5 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,

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<sup>19</sup>Table A.7 presents the list of top-weighted countries and the correlations between the shocks and the country weights. The estimated correlation in this setting lies between the two canonical settings in Goldsmith-Pinkham, Sorkin, and Swift (2020).

<sup>20</sup>In comparison, Dinkelman, Kumchulesi, and Mariotti (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.

the migrants might either 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 earnings 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. 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.9). Migrant returns are also not correlated with destination countries' macroeconomic conditions, such as their recorded GDP growth or unemployment rates (Table A.10).<sup>21</sup> The modal reason for return among these returnees is the end of their contract, but restricting the estimation to those who indicated that they returned not at the end of their contract also does not show statistically significant associations.<sup>22</sup> This suggests that Indonesian migrants' return timing is possibly not being influenced by the currency exchange fluctuations. Some respondents in Bazzi, Cameron, et al. (2026)'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.<sup>23</sup> None mentioned improved salary due to exchange rate shocks (Bazzi, Cameron, et al., 2026).

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, Cameron, et al. (2026)'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.12. 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 the UAE and Saudi Arabia, with similar patterns for Bahrain, Oman, and Qatar. Mean salaries for migrants going to Taiwan vary only by NT\$260 between 2010-2014, a range equivalent to US\$8. These statistics suggest a limited scope for exchange rates to directly influence the amount of salaries set for Indonesian workers.

It is unlikely that my results are driven by occupation changes by the migrants in response to the exchange rate shocks, employment sorting of Indonesian migrants across countries, or sorting due to migration policies across countries. Different destination countries may attract different migrant profiles (unskilled workers in one country vs skilled workers in other countries) or have different migration policies. However, the occupation of the majority of Indonesian migrants is relatively uniform across destinations, making differences in occupation-based residency policies immaterial for these migrants.<sup>24</sup> Specifically, Indonesian workers across different regions—in Saudi Arabia, Singapore, and Hong Kong—are mainly working as domestic helpers or housemaids. Furthermore, migration policies are uncorrelated with the movements of the exchange rates to the Indonesian rupiah and the stock of Indonesian migrants (Table A.11). Finally, it is unlikely for Indonesian migrants to respond to the exchange rate changes by changing jobs or industries because every instance of migration is based on a fixed-term

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<sup>21</sup>Qualitative studies in migrant-intensive districts at the time also did not find any dramatic increase in migrant returns due to host countries' economic contractions (SMERU, 2009; SMERU, 2010). These studies report that families of workers in Hong Kong and Taiwan had not received news from their members abroad on the impact of the GFC.

<sup>22</sup>The other two reasons are: visit to Indonesia and "troubles"—a catch-all terms to identify migrants with issues abroad who return early (Bazzi, Cameron, et al., 2026).

<sup>23</sup>The breakdowns of these reasons respectively are: 24%, 21%, 13%, and 8%.

<sup>24</sup>For example, while Singapore is relatively welcoming to immigration of professional expatriates, Indonesian housemaids typically earn well below the thresholds needed for consideration of residency or eventual citizenship.

contract that a migrant signs prior to departure, making it difficult (if not impossible) for migrants to change employment while abroad.

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, McKenzie, and Zia (2014)'s survey of migrants reveals that more than 40% of the workers were not even aware of the term 'saving accounts.'<sup>25</sup> Nevertheless, migrants' complete use of financial services remains largely unobserved. None of the existing migrant surveys summarized in Appendix Table A.3 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.13 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.<sup>26</sup> Nevertheless, the above channels of non-remittance migration decisions may still work as potential mechanisms in the long run. For example, the prospect of work overseas could affect educational decision in origin areas. These could then show up in household outcomes in later years. I discuss exploratory analysis toward long-run outcomes in Section 7.3.

## 5 Education Investments and Public Goods

Income from work abroad 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. In this section, I present an analysis of household education investments in Section 5.1 and responses in public goods provision in 5.2. Section 5.3 presents the analysis of dynamic responses to the shock.

### 5.1 Household Education Investment

I investigate the effect of migrant exchange rate shock on reported expenses for education in households. The outcome variable for this analysis comes from the Susenas household surveys, calculated to obtain households' per capita expenses expressed in log IDR units. Reported expenditures are deflated using the consumer price index to account for inflation. I test the relationship by estimating equation (5). Table 2, Panel A, reports the result.

I find that households increase their education expenditure in response to a positive migrant income shock in the district. On average, households in a district with a one-standard-deviation (SD) shock increased their per capita education spending by 0.28 log points. Separate analyses with the sample split along the presence of school-age children in the household in Columns 2-3 reveal an intuitive result: this increase is driven by households with any children aged 6-18 years, with a coefficient that is 50% larger than that of the average household.

Next, I analyze the effect of migrant exchange rate shock on school enrollment indicators. The net

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<sup>25</sup>See also footnote 8.

<sup>26</sup>Appendix Table A.14 tabulates the reasons for choosing the destination countries by former migrants in Bazzi, Cameron, et al. (2026). 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.

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. Panel B, [Table 2](#) presents the results.

Migrant exchange rate shocks increase school enrollment. A one SD shock is associated with increased school enrollments across all education levels, with a 3 p.p. increase at the primary level, a 5 p.p. increase at the junior secondary level, and an 8.6 p.p. increase at the senior secondary level, in the specification with only district- and year-fixed effects. Adding baseline controls interacted with year fixed effects reduces the size of the coefficients, although the estimates remain statistically significantly different from zero. I test the robustness of these results with the inclusion of the trade shock exposure, which represents an alternative explanation where the exchange rate shock actually works through the commodity trade boom due to cheaper Indonesian currency instead of through foreign migrant income. I constructed the trade shock exposure variables using the interaction of a district’s commodity production with the currency rate fluctuations of the export destination countries for two of Indonesia’s primary export commodities: oil and natural gas, as well as palm oil. The last two specifications in Panel B present these results, showing the robust relationship between the migrant exchange rate shocks and district enrollment levels. Overall, I obtain smaller impacts for the district enrollment rates at the lower levels of education. 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.15](#). At the primary level, girls demonstrate a 2.4 p.p. higher enrollment rate in response to a one SD shock, which is higher than the estimate for boys at 2.0 p.p. At the junior secondary level, the effects for girls are estimated at 2–3 times the effects for boys, but this pattern flips at the senior secondary level. At the senior secondary level, the estimated effects are between 10.8–11.2 p.p. for boys, depending on the specification. In contrast, the estimates for girls at the same level are not statistically significantly different from zero. These gendered responses hint at the possibility that some girls forego upper secondary education to work as migrants. Estimation using individual survey weights in [Appendix Table A.16](#) suggests the robustness of these effects to alternative weighting. The windfall may send the message that only basic education is important, since many women work abroad with only primary or lower secondary education.

**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  $Mig_u \in \{Mig_d^o, Mig_h\}$ .  $Mig_d^o$  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 age group for the appropriate school level, i.e., 6-12 for primary, 13-15 for junior secondary, and 16-18 for senior secondary, or by each year of age-specific dummies ( $\phi_a$  for  $a \in [4, 20]$ ). I include the lower-term two-way interactions and fixed effects for districts and survey years. The coefficient of interest is  $\phi$ , which indicates the differential enrollment responses to migrant exchange rate shocks by each age cohort. I estimate this regression on individuals aged 4-20 years in the Susenas surveys.

Panel C of [Table 2](#) reports the estimation results on the relative response of school-age cohorts be-

tween migrant and non-migrant households in the presence of the exchange rate shock. The sample for estimating this interaction is restricted to the 2005-2007 period, when the indicator for migrant households was collected in the survey. Coefficients 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.17).

Figure 2 plots the  $\phi_a$  triple-interaction coefficients from the regression with age-specific dummies. The patterns of interaction are most pronounced at ages 6–7, 13–14, and 16–17. 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 8-12 years, the effect is not significantly different than zero. At these ages, children are simply continuing in elementary school. These effects are consistent with Son (2015), who found that 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.<sup>27</sup>

## 5.2 Public Education Infrastructure and Other Public Goods

Table 3 presents the estimation results from the investigation of the impact of migrant exchange rate shocks on publicly provided goods in the district.

I find that migrant exchange rate shocks positively influence the provision of education facilities (Columns 1-3). A one SD shock leads to 0.25–0.34 more public junior secondary schools per 10,000 population one year after the shock. The coefficients for elementary and senior secondary schools are noisily estimated, although the size of the coefficients for elementary schools is comparable to that of the junior secondary schools. For junior secondary schools, the size of the coefficients amounts to 21 percent of the mean density of junior secondary schools (1.19 schools per 10,000 population). These effects thus represent a significant expansion of education facilities in support of universal basic education.

Other public goods provided by the state exhibit a similar pattern of positive impact in response to the migrant exchange rate shocks. I evaluate the impacts on community health centers, the share of households with electricity and piped water, and the share of villages with asphalt roads. In the most stringent specification with commodity controls and baseline control interacted with year fixed effects, the effects are estimated in the 4–5 p.p. range, although the coefficients for community health centers are not precisely estimated. For villages with asphalt roads, Olken and Singhal (2011)’s result on informal taxes to build roads in Indonesian villages is illustrative of a possible pathway from migrant exchange rate shocks to improvements in infrastructure. Certain projects funded by the government may require a matching contribution from the community (*dana swadaya*) to be approved, and migrant transfers could help a project meet its matching fund requirements. In East Java, a qualitative study reported that the local community in a migration-intensive district contributed a larger amount than the district transfer for a road project (SMERU, 2010). Using the SPKP data, Appendix Table A.18 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 (Forthcoming) traced the

<sup>27</sup>Summary statistics on expenditure from the IFLS present a lumpy spending pattern for school registration and uniforms that depend on the children’s grades (Figure A.4). Respondents report a spike in both uniform and registration expenses in Grades 1 and 7, when students start new levels. Expenses for continuing grades are typically lower than the starting grades.

building of schools in Spain by the Galician migrants association, which started 5-25 years after their departures to Latin America pre-World War.

The analysis on piped water access reveals a meaningful expansion of the service at 30 percent of the mean share of household access to piped water (16 percent). Furthermore, additional analysis on alternative sources of households' drinking water suggests that these estimates reflect tangible public service improvements, beyond those that are due to the relaxation of household liquidity constraints. Households' use of piped water contrasts with other sources of drinking water, such as bottled water, unprotected wells, or borehole or protected wells. All of these sources require cost either in capital investment or monthly expenditures (Nastiti et al., 2017). Table A.19 shows a declining use of bottled water, unchanged use of unprotected wells, and increased use of boreholes. These results suggest household liquidity is not the entire driver of the response to changes in the use of piped water. If it were, migrant income shock would have led to positive effects on all of these sources, considering that the cost for bottled water use or to dig a well is comparable to the cost of piped water service in a year. The qualitative literature has also analyzed public water services in Indonesia, with studies that describe the governmental role in connecting households to the municipal piped water network. In a district in West Java, Suar et al. (2025) described the building of a residential piped water network that began with the village head instituting a local water committee with community involvement. In another district, Nastiti et al. (2017) described that households that use piped water decided to connect when local leaders arranged for an application for collective installation to be made to the municipal water company.

There is a similar pattern with electricity provision. Anthropologists have examined rural electrification in Indonesia and the role of local leadership in the process, especially in villages and sub-villages where the electricity network does not exist (PLN, 2010). Historical rural electrification in Bali was driven by the public desire to watch television, with village heads playing a key role (Barker, 2017; Mohsin, 2017).<sup>28</sup> More broadly, journalistic outlets continue to report when advocacy by local governments has been pivotal in securing or improving a village's access to electricity (e.g., SalamOlahraga (2024) in West Sumatra, and PolitisiNusantara (2026) in East Nusa Tenggara).

### 5.3 Dynamic effects and timing

My analysis shows improvements in public good provision after a one-year lagged shock variable for junior secondary schools, connections to electricity and piped water, and asphalt roads. To investigate the dynamics, I estimate a distributed lag model with lags of up to four periods,  $t = \{t-1, t-2, t-3, t-4\}$ . The length of this lag is chosen to minimize the Akaike Information Criterion for the seven types of public goods that I consider. Table 4 presents the result.

I find that the coefficients for shocks with longer lags are significantly different from zero for elementary schools, junior secondary schools, and community health centers with peaks at  $t - 3$ . I note that for the schools, they are also different from zero at  $t - 2$  and positive in all lagged periods. Across four lags, the coefficients sum to 1.4 schools for elementary schools and 0.65 schools for junior high schools. Both of these responses are meaningful expansions of the existing education infrastructure. For elementary schools, this expansion would allow the education system to meet the demand of a still-rising population: Indonesia grew by 35 million between 2000 and 2010. More children require additional space in the education infrastructure, even while enrollment rates for primary schools appear to be near universal at baseline. In contrast, none of the coefficients for senior secondary schools are statistically different from zero, and their magnitudes remain a fraction of those for junior secondary schools. The limited response

<sup>28</sup>In his analysis of the State Electricity Company's launch of the Village Electrification Package (PKD) installment scheme, Mohsin (2017) wrote, "The role of village heads in getting the word out about the PKD was crucial and villagers put in their connection requests through their village heads. The PKD program became very popular."

at the upper secondary level could be due to several factors, including requirements for more teachers and potential pupils than at the primary level, and existing senior secondary schools typically had some slack capacity. In West Java—a high-migrant province with low senior secondary enrollment rates—the average senior secondary school in 2010 had only 383 students per school, 20% fewer than the average of 484 students per junior secondary school in the province (BPS, 2011). The estimates for piped water, electricity, and asphalt roads are noisy, suggesting the dynamic effects are not driving the results for these outcomes.

The dynamic results on elementary schools suggest that infrastructure improvements can take time to materialize. Public service improvement proposals that are not immediately approved and funded the first time they surface in community meetings may be successful in later periods. Still, if the timing for the shock is fortuitous, the local governments' responses could be rendered visible rapidly, such as those for the junior high schools. One potential factor that allows such a timeline is the different cycles that academic years, fiscal years, and development planning follow. Transfers from migrants in the middle of the year could impact enrollment rates in the academic year that follows the July–June cycle. These household responses could feed into the October–December village development planning process, with funds disbursed and projects implemented in January–December of the following year.<sup>29</sup> This factor can encourage local governments to undertake responsive improvements with supportive policies in place.

**Constructing junior high schools.** I investigate one of the possible supportive policies that enable local governments to increase education facilities and shape the observed effects on the availability of public junior high schools. Under the “One Roof” program, district governments can build junior high schools using existing primary schools. 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.

The “One Roof” program allows local governments to build junior high schools through a more intense use of existing resources. Within the scope of this program, junior high schools can be built as an attachment to existing primary schools, i.e., new schools are built smaller and with fewer amenities. Nevertheless, 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 school 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 program are supported with aid money from Australia (Antara, 2016).<sup>30</sup> School management is administered jointly between the two schools, with the primary school principals responsible for both the primary and junior high schools. This policy allows the 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 proportion of One Roof junior high schools out of all public junior high schools, as well as the average number of classrooms and teachers per junior high school. [Table A.20](#) presents the result: district governments established more One Roof junior high

<sup>29</sup>The government fiscal year follows the calendar year. However, because villages and districts are required to ratify their budgets by the new year for intergovernmental transfers to be disbursed, this shifts planning for the next year in the latter half of the preceding year (Kemenko PMK, 2016).

<sup>30</sup>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).

schools in response to the migrant exchange rate shocks. A one SD shock over four years results in a 6 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), with estimates that are significantly different from zero at the 10% level in  $t-3$ . These results provide suggestive evidence of the trade-off that 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.

How do the infrastructure expansions affect the quality of education in the newly established schools? I explore the quality dimension with an analysis of teacher competency. In 2015, the Ministry of Education mandated that all teachers be examined for their mastery of the curriculum and their pedagogic ability. This test thus provides a rare proxy of teaching quality in the classrooms. Using teachers’ starting date, I construct a panel of district-year average of teachers’ scores in various types of schools. The estimates from this exercise are presented for the sample of all public schools, and a subsample of only the ones established in 2002 or later.

At the primary school level, [Table A.21](#) shows that newer public schools have 0.6 fewer teachers compared to the mean number for all public schools. With positive migrant shocks, the mean number of teachers in these new schools drops in comparison to the counterfactual district. The sum of all lagged coefficients amounts to 1.5 fewer teachers, a 20% decrease compared to the mean. The estimates for the teacher scores are indicative of the recruitment of new lower-quality teachers across all public schools, not just new schools. The responses to migrant income shocks across four lags amount to a full point lower average competency score (0.2 standard deviations). At the junior secondary level, Columns 4-8 show even sharper responses. The number of teachers becomes lower by 23-29% compared to the mean after four lags of one standard deviation of shocks each period. The teachers’ mean scores are also lower by nearly two full points, with a gap of four points observed in new schools that were built after 2001. These estimates point to trade-offs in broadening basic education access to students with the expansion of schools and maintaining service quality.

At the same time, these public schools coexist with private schools in the education system. I investigate the responses of private schools and *madrassa* Islamic schools to the migrant exchange rate shock in [Table A.22](#). The effects point in a similar direction, albeit at a smaller magnitude for the elementary and junior secondary levels. In contrast, at the senior secondary level, the sum of lagged coefficients up to four periods is positive and statistically significantly different from zero. This pattern offers a nuanced contrast with findings from Peru, the Philippines, and India, where overall enrollment shifts from public to private schools in response to remittances (Salas, 2014; Clemens and Tiongson, 2017; Valatheeswaran and Khan, 2018). In the present setting, as migrant exchange rate shocks lead to increased provision of public schools at the basic education level, it suggests that the constituency for public expenditures on schooling need not diminish in response to foreign migrant incomes. I next explore the possible pathways that could lead to the observed government responses.

## 6 Heterogeneity and Mechanisms

What drives the government to provide public goods in the presence of positive migrant exchange rate shocks? Typically, the foreign incomes 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, local governments may have a better position to provide public goods for their population when governance is decentralized. Second, electoral competition may induce politicians to provide public goods to win votes. And, finally, governments may impose taxes.

## 6.1 Government Splits and Village Governance

The process to provide education facilities could be more effective in a more decentralized governance, which Indonesia fostered with administrative splits that created smaller government units (Bazzi and Gudgeon, 2021). As previously noted, splitting at the district level also substantially increases the transfers from central government to the district (Cassidy, 2026). 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 contemporaneous district split indicator for lags of up to four periods.

**Table 5** 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. The sums of lagged interacted coefficients are several times the magnitude of the sums of non-interacted lagged migrant income shock coefficients. For both levels of basic education, the coefficients for the migrant exchange rate shock remain precisely estimated. Split districts also receive more transfers from the central government, but the analysis in Cassidy and Velayudhan (2026) shows 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, accountability channels, and the districts' fiscal space. Next, I explore accountability channels by looking into administrative splits at the village level. I then turn to an analysis of the districts' budgets for capital spending.

**Village splits.** The push for decentralization not only led to splits at the second level of sub-national administrative division, but all the way to the grassroots level in villages. Qualitative conversations with education facilitators in Aceh, where new schools were built during the study period, highlighted the salience of village splits in influencing constructions of new schools. Their observations motivated my analysis of the determinants of new schools using education administrative data with village names combined with crosswalks of village splitting in **Table A.23**. This table shows that villages that have ever split are more likely to have a new elementary school constructed, and this effect is particularly strong the earlier the split occurred. At the junior secondary level, early- and late-village splitting indicators pull in opposite directions. Villages with earlier splits are more likely to receive new junior high schools on average, with existing facilities and baseline enrollment rates accounted for as control variables.<sup>31</sup>

**Village Head Surveys.** How do various levels of government work together to shift responses in local public goods provision? Across levels of government, village governments have the best vantage point because they frequently interact with villagers, the service providers, and higher levels of government. I explore the role of village heads using three surveys: the SPKP survey of perception of education challenges, the MCLE survey of village requests for public facilities, and the PEKKA survey of household networks in the village.

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

<sup>31</sup>In some places, village-owned land could provide the resources for school constructions, e.g., with *bengkok* land (Lim, 2024).

the village heads mention facilities and/or cost concern, and whether they rank facilities concern higher than cost concern. I regress these indicators on village-level migrant exchange rate shocks in a modified specification from the district level. [Table A.24](#) reports the results.

Village heads are less likely to mention education cost concerns in villages with positive migrant exchange rate shocks (Column 2), consistent with the positive effects on household welfare 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 the unaffordability of school education within the top three challenges village heads face in education provision (Column 3). The officials' ranking of challenges to education suggests that local governments are likely to support policies aimed at increasing education facilities, leading to the observed effects on the number of public elementary and junior secondary schools.

The MCLE survey describes how village governments request public facilities and infrastructure from higher levels of government. [Table A.25](#) presents the summary statistics, comparing public service provision efforts between villages with an above- and below-median migration rate (TKI and non-TKI villages). On average, TKI villages requested 5.6 village facilities or infrastructure projects within two years, compared to 4.6 projects in non-TKI villages. The project mix varies among villages, but TKI villages consistently requested projects at a higher share. For example, the proposal rate is 14 p.p. higher for roads and worship houses and 23 p.p. higher for irrigation. These villages also use support and assistance by parliament members in more projects (0.74 vs. 0.64) or assistance by public employees (0.65 vs. 0.42). Conditional on requesting a type of public goods, these villages also have a 1-6 p.p. higher success rate for their proposals for irrigation, education or health facilities, and roads. Given that the survey sampled more villages in Aceh, columns (3) and (4) present a comparison between TKI and non-TKI villages within the province. These patterns hold with a particularly stark 6-19 p.p. gap in proposal rates for roads, education or health facilities, and a 6-8 p.p. higher success rate gap.

The PEKKA survey complements the above analysis with descriptions of how migrant households are connected to village governments. [Table A.26](#) summarizes this survey, showing that migrant households value education more and are more connected to village governments. Comparing households with members abroad and households in the same villages without them, I find differences in educational aspirations and network size between the two types of households. Households with members abroad are more likely to agree that early childhood education is important and desire the same level of school attainment for boys and for girls. At the same time, they are less likely to desire that boys have a higher level of schooling than girls. As girls' education is often very sensitive to distance to school, the educational preferences of migrant households may play a part in bringing educational facilities closer to their villages. Separately, migrant households report a 6-11 p.p. higher proportion of likelihood of having a family member who is a sub-village leader or a village leader. These positions could be key in transmitting migrant educational preferences to grassroots public service provision. They also report a 60% bigger size of close networks in their village (1.16 vs. 0.73). These further suggest that migrant households may be pivotal in shaping the priority of public services in a village.<sup>32</sup>

**Government budget.** District governments pursue their policy goals by allocating budgets to reflect their priorities. With limited resources, officials may decide to improve their provision of public goods and services when it aligns with their policy priorities. A government prioritizing capital investments could be more responsive in providing public services, which include education facilities.

To test this mechanism, I use district finance data from the Ministry of Finance to run two analyses. First, I estimate the effect of the migrant exchange rate shocks on the share of district budgets for three

<sup>32</sup>The qualitative literature also points to migrant protection initiatives (e.g., *Desbumi*, *Desmigratif*) and migrant household community groups (KKBM) in the village. These groups could further assist in bridging migrant households and local governments' development priorities.

expenditure categories: capital, personnel, and goods. Second, I estimate the effect of interacting the migrant exchange rate shocks with the capital expenditure share in the district budgets.

**Table 6** presents the effects on district budgetary shares in Columns (1)-(3). Across four lags, the migrant exchange rate shock led to an increased share of capital expenditure in the district. This increase appears to occur with an overall reallocation away from the budget for goods and consumables. Nevertheless, the dynamic pattern of the estimated coefficients also hints at possible reallocation from the personnel budget at  $t - 2$ . Even so, the sum of all lagged coefficients across four periods is not statistically significantly different from zero.

I explore the interplay between budget allocation and the migrant exchange rate shock in **Table 7**. Using the interaction between contemporaneous budget share for capital expenditure and the migrant exchange rate shock (i.e., both at time  $t - 1$ , etc.), I estimate its effect on elementary and junior high schools. While the timing of the budget and the shock appear concurrent, the planning cycle for the budget had occurred in the year prior. The interaction term thus allows us to obtain insight into the relationship between foreign migrant income and a district's fiscal space. Across specifications where the interacted coefficients are included with lags of up to  $t = t - 4$ , the sums of interacted coefficients are generally positive. These sums are statistically significantly different from zero for both the elementary schools and junior high schools in the specification with the inclusion of the full four interacted lags. This pattern suggests that the marginal impact of migrant exchange rate shocks on basic education facilities increases with the district government's fiscal space for capital investments.

## 6.2 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 increases the use 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 an election year dummy for lags of up to four periods. 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 could expect positive coefficients on the migrant exchange rate shock and election interaction term, while the uninteracted migrant exchange rate shock variable loses precision. **Table 8** presents the results where I estimate regressions with elementary and junior high schools as the outcome variables on lagged migrant exchange rate shocks and their interactions with the district election years.

The provision of basic education facilities as a response to foreign migrant income shock doesn't appear to be strongly influenced by the election cycle. Columns 1-4 present the estimated coefficients of the interacted lagged variables for elementary schools and Columns 5-8 for junior high schools. The sums of all interacted lagged coefficients have negative signs and are not precisely estimated. Nevertheless, for elementary schools, the interactions between the migrant exchange rate shocks and the election dummy at  $t = t - 2$  are statistically significantly different from zero at the 10% level. In Appendix **Table A.27**, regressions using alternative timings for the election dummy variable interacted with lagged migrant exchange rate shocks show that more public schools are neither established in the years preceding the

election nor following them. Analysis of household responses in the SPKP panel also indicates that migrant exchange rate shocks lead to lower voter turnout as well as statistically significant lower voter turnout for mayoral elections (Appendix Table A.28). During election years, villagers also complain less to village leaders about the implementation of anti-poverty programs within the villages.

Nevertheless, the migrant exchange rate shocks could also shape the district political contest if they lead to households voting for candidates who promise to build schools. To examine this pathway, I compile data on election platforms for historical district head candidates in five provinces and their electoral outcomes, with further details described in the Appendix. Among those with retrievable campaign platforms in the dataset, 55% of candidates mentioned education. In other words, for a typical four-way election (mean candidates per contest: 3.5), two of them would have mentioned education-related terms. Most of these candidates do not campaign on specific promises but rather on generic appeals on the importance of education and health, or “improvements.” A few of them include free or subsidized education in their campaign, or generic facility improvements that are on par with messages on moral and religious education. This pattern underscores the lack of a programmatic campaign, which as Pier-skalla and Sacks (2020) argued, is not credible in Indonesia as the voters are mostly uninformed with a partisan system that is weakly differentiated among each other.

In Table A.29, regression analyses of total votes and winning indicators do not show consistent associations with campaign contents. Campaigns mentioning education quality or human capital improvements are associated with increases in total votes, but are uncorrelated with the indicator for winning the election. On the other hand, campaigns mentioning upper secondary education or health alongside education are positively associated with election wins, but uncorrelated with total votes. In these elections, election wins and total votes are more strongly influenced by party identifications: either the PDI-P party, Golkar, or any Islamic party.

### 6.3 Taxation

Taxation of economic activities transfers part of the economic gain to the local government, which may decide to use it to provide public goods to the population. 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 governments’ 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 the 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. I test the response on district revenues across four lags of the shocks. On the other hand, it is unlikely that the migrant exchange rate shock would influence the level of intergovernmental transfers such as the DAU base grant and the DAK special grant. Table 6, Columns 4-11 report the results.

I do not find supporting evidence that the governments collected higher tax revenues after positive migrant exchange rate shocks across four lags. The coefficients for revenue sharing from centrally collected taxes are imprecisely estimated in log IDR (Column 4), and so are the coefficients in the regressions with revenue from local taxes as the outcome. 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 10 percent level for the first lagged shock, while the share of locally collected taxes remains imprecisely estimated across four lags.<sup>33</sup> These results underscored the weak tax capacity of the

<sup>33</sup>These results preclude the direct applicability of theoretical models of remittances and governance. In Ponce Rodríguez,

Indonesian government in particular.<sup>34</sup>

## 7 Other Development Indicators

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 three measures: household expenditures, GDP per capita, and poverty indicators.

### 7.1 Household Expenditures

In general, transfers from abroad migrants can allow households to relax their budget constraints and increase their consumption. I test this relationship by estimating equation (5) on consumption outcomes. I look at two key consumption indicators: the monthly expenditure per capita for the average household and the household in the bottom quintile. Data for these indicators come from Dapoer, which aggregates household responses in *Susenans* to create district averages of household expenditures. The averages include both households with and without overseas migrants. Table 9 presents the results.

I find that foreign migrant income shocks increase household consumption, especially for those at the bottom of the expenditure distribution (Columns 1–2). 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 0.06 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. These increases are unlikely to be a mechanical response to rising prices. The household expenditure series is deflated using the base-2007 Consumer Price Index in the Dapoer database, and thus the increases are unlikely to be an artifact of mechanical responses to rising prices. As with previous analysis on enrollment and public good outcomes, these results are robust to the inclusion of trade shock exposures related to Indonesia’s main export commodities.

**Asset Ownership.** 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.30 shows that the migrant exchange rate shock increases ownership of vehicles, natural gas canisters, and refrigerators. In particular, 3 p.p. more households have motorcycles, 8 p.p. more households have refrigerators, and 4 p.p. more households use 12 kg gas canisters due to a one SD of shock. These results are consistent with the reported use of remittances from early descriptive work on migrants from East Nusa Tenggara (Sukamdi, Satriawan, and Haris, 2004), as well as remittances and cash transfers studies from other settings in the Philippines and Mexico (Yang, 2008; Gertler, Martinez, and Rubio-Codina, 2012).

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Rodríguez, and Guirado (2024), remittances influence local budgets through consumption taxes and electoral competition. Neither is supported with strong evidence in this context. Gautier and Vatsa (2023) posited that remittances lower corruption under low consumption of privately obtained public goods. Applying this model will require granular corruption data.

<sup>34</sup>Indonesia’s tax-to-GDP ratio was 14.9% in 2005, slightly more than a third of the typical number in high-income countries (UNU-WIDER, 2025). Generally, regional GDP per capita and taxes in Indonesian districts are not correlated.

## 7.2 Poverty

Ownership of durable assets can indicate an escape from poverty, and governments frequently determine poverty status using asset ownership. I examine three different measures of poverty indicators: the share of the district population living below the poverty line, the poverty gap, and the Gini coefficient. The poverty gap is a measure of poverty intensity, while the Gini coefficient serves as a measure of inequality. [Table 9](#), Columns 3–5 report 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 the district poverty rate. A one SD of shock reduces poverty by 2–3 p.p., roughly one-fifth of the mean poverty rate of 15 percent. It also reduces the poverty gap by 0.6–1 p.p., nearly halving the mean distance of 2.6 percent between the poor’s income and the poverty line. These results underscore the power of foreign migrant income 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 0.02. Foreign migrant income thus can be a powerful tool to alleviate poverty in migrant-sending areas.

## 7.3 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, Olivia, et al., 2021). GDP data is expressed in constant prices to account for inflation, 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](#), Columns 6–9 report 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 0.13 log points in the overall GDP per capita (Column 6, Panel D). It also leads to an increase in GDP per capita in the agriculture sector (0.14 log points, Column 7) and the service sector (0.12 log points, Column 8). In [Appendix Table A.31](#), analysis of sectors comprising the service sectors (trade, financial services, transport and communication, and other services) shows positive estimates for all sectors, with the biggest magnitudes for “other service” sectors and the trade, hotel, and restaurant sector.<sup>35</sup> The impact on the GDP per capita in the manufacturing sector one year after the shock is not precisely estimated. This result bears similarities with Malawi, where women shifted into retail jobs in response to migrant capital (Dinkelman, Kumchulesi, and Mariotti, 2024). However, the service sector in Indonesia expands along with the agriculture sector. In the years after my study period, Makovec et al. (2018) found that the agriculture sector absorbed the prospective migrant workers unable to migrate due to government restrictions. This policy could have led to the diverging results between the two contexts.

**Benchmarking Local Multipliers.** We can benchmark the magnitude of the effects on the aggregate level of economic activity by estimating its local multiplier and comparing it with other forms of liquidity

<sup>35</sup>The category “other services” covers community services (e.g., education and medical services), household services (e.g., housekeeping and repairs), and amusement services (e.g., theatres, radio broadcasts), as well as general government services.

injections. In the Indonesian context, I obtain a mean multiplier estimate of 2.62 from three approaches: (i) comparing the district GDP with the district migrant income shock using a district with a one standard deviation of shock and another at the mean, (ii) using the per capita quantities for the same comparison, and (iii) comparing the district GDP effect with an imputed remittance from the regional central bank report (a full calculation is presented in the Appendix).

To compare this estimate, I turn to studies of liquidity injections in other settings. In Kenya, Egger et al. (2022) estimated a local multiplier of 2.5 due to the cash transfer program, but generally, estimates vary even within a study depending on the assumptions and approaches used. Estimates of transfer multiplier in Brazil due to an increase in cash transfer beneficiaries using local GDP data resulted in a range of 4.99-7.16, with different methods resulting in estimates of 1.46–3.65 and 1.80–20.9 (Gerard, Naritomi, and Silva, 2025; Gerard, Naritomi, and Silva, 2021, see summary in Table A.32). Other studies produced estimates in the range of 1.36–3.10 (Brazil federal-to-municipality transfers: Corbi, Papaioannou, and Surico, 2019), 1.5–2.6 (Mexico NAFTA compensatory transfers: Sadoulet, De Janvry, and Davis, 2001), and 2.9 (Indian microfinance removal: Breza and Kinnan, 2021).

My mean estimate of the local multiplier is lower than the estimates from Breza and Kinnan (2021) in India, overlaps with the range in Brazil (Corbi, Papaioannou, and Surico, 2019), and is slightly higher than the estimates from Egger et al. (2022) in Kenya. In general, these estimates are observed to be larger than fiscal multiplier estimates from developed countries such as the US. There are several reasons already highlighted by the authors in these studies, including by Khanna, Murathanoglu, et al. (2026): the local economy in these settings is relatively closed due to their rural or island geography, and there is a large share of hand-to-mouth consumers with binding liquidity constraints. Both of these also apply to the Indonesian context. Additionally, migrant households' requests to their members abroad for funds indicate that these households may have a higher marginal utility from consuming the transferred resources. All of these factors may contribute to estimated output multipliers larger than unity.

**Long-term effects.** Given the migrant exchange rate shock's short-term effects on schooling investment, it is possible that there will be a long-term effect. To explore whether the shock leaves an effect in the long-term, I analyze educational attainments 9–15 years after the shock and compare its Mincerian return. Using the 2021 Labor Force Survey, I split districts into two groups: districts with above- and below-median sum of total migrant income shocks between 2006 and 2012. I group the respondents into three cohorts: control cohorts who would have been too old to benefit from the migrant income shocks (i.e., those born in 1987 or earlier would have been 19 years or older in 2006), fully treated cohorts born in 1994 or later, and partially treated cohorts. These definitions allow me to run a difference-in-difference estimation similar to Dinkelman and Mariotti (2016) and Duflo (2001).

Table A.33, Panel A shows that treated cohorts in high migrant income districts have 0.55-0.68 more years of education. The estimates for men are higher than those for women, and analysis with only the fully treated cohort produces higher estimates than one that includes partially treated cohorts. The estimates for secondary education completion and college education are 4.8 p.p. and 0.8 p.p., respectively. Compared to the long-run Philippines study, the estimate on college education is of the same order of magnitude (0.4 p.p., see Khanna, Murathanoglu, et al., 2026). In comparison with estimates from the Malawi temporary migration context, the absolute values are higher (0.12–0.18 years), but in relative terms, both the Malawi and Indonesia estimates are aligned at roughly 6-8% more education compared to the baseline years of education (Dinkelman and Mariotti, 2016).

To obtain the estimated returns in the labor market for the treated population, I combine the estimates in extra educational attainment with the estimated Mincerian return in Panel C. Mincerian regressions in this dataset produced an estimated 6.4–9% return rate for each additional year of schooling. Therefore, we arrive at an estimate of 3.5–6.1% higher returns in the labor market for the treated population 15 years after the shocks. Regressions using the wage data in the survey in Panel D provide estimates in

line—if slightly lower—with the aforementioned calculation for the male sample, but not the female sample. Cameron, Suarez, and Setyonaluri (2026) noted that the female labor force participation in Indonesia has been stagnating at 50%, possibly contributing to this observed gap. Compared to the Philippines study, Khanna, Murathanoglu, et al. (2026) found global income rises by 7.5% and domestic income rises by 6.5% after 18 years. These are slightly higher than the naive Indonesian estimates of the Mincerian-return-times-years-of-education-impact, and double the estimated impact on wage for male waged workers.

## 8 Alternative Explanations

In this section, I consider several alternative explanations for foreign migrant income, including differential regional trends and foreign direct investments. I also test for robustness against correlated shocks, alternative data sources, and alternative constructions of the explanatory variables.

### 8.1 Correlated Shocks

Many of the countries where Indonesian migrants work use currencies that are pegged to the US dollar, causing coupled movements with one another. The estimates may then inherit bias from global macroeconomic factors that simultaneously move currencies together. To test whether the estimated effects are robust to this concern, I re-estimate the regressions after dropping one currency at a time for three major destinations: USD-pegged currencies, Malaysia, and Singapore. Table A.34 reports estimates from this exercise. In general, the estimated coefficients retain their sign, magnitudes, and precision level.

I also account for the possibility that the shocks are correlated across districts due to similarities in the migration patterns between districts. I construct two alternative clusterings, 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 constructs, 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.35 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 in standard errors by up to 11%.

### 8.2 Foreign Direct Investment

I investigate whether 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 that are disaggregated by countries of origin. Nevertheless, from aggregate statistics, we see that the list of top countries where FDI in Indonesia originated has little overlap with top migration destinations (Appendix Table A.36). At the country level, FDI in the current year or in the next year is 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.37).

More generally, the lack of association between foreign investment flow and migration is similar to Indonesia's export-import pattern, which is also uncorrelated with migration flow. Top Indonesian trading partners such as the USA, China, and the EU are not the countries where many Indonesian migrants work (Appendix Table A.36). Generally, the number of migrants in a country is not correlated with the value of Indonesian commodities exported to the country. With regard to the production of the

two primary commodities, Appendix Table A.38 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. These relationships suggest that investment shocks or trade shocks are unlikely to be an underlying driver of public service delivery change that I associate with foreign migrant income in this paper.

### 8.3 Destination Shifts and Sorting Bias

New and prospective migrants can choose to change their migration destinations in the later years of my study period in response to the exchange rate shocks. The destination switches could add measurement errors that introduce attenuation bias to the estimated coefficients. I analyze this possibility with two exercises. First, I report the estimated coefficient of interest adding contemporaneous migrant placements as a control, and also adding its interaction with the destination-specific exchange rates. Table A.39 reports the results of this exercise, with Panel II showing the regressions controlling for the interaction of contemporaneous migration with Saudi riyal (i.e., also applicable to US dollar-pegged currencies in Hong Kong, UAE, and other countries). In general, the re-estimated coefficients show little variation in magnitude from the main reported specifications. Similar exercises using the interaction of Malaysian ringgit, the Singapore dollar, and the Taiwan dollar produce similar results (omitted for brevity). Second, I instrument the migrant exchange rate shock proxy with a similarly constructed proxy from migrant distributions with a three-year lag. Table A.40 presents the results for public goods outcomes, which show somewhat bigger effects with a similar level of precision.

### 8.4 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 control for regional trends.

Table A.41 reports the results with the inclusion of regional trends. The regressions reported in this table add island-year interaction terms that flexibly account for potential differential trajectories in outcome variables between districts in different islands. The migrant exchange rate shock coefficients are stable compared to the main specifications. All indicators maintain their statistical precision and magnitudes.

### 8.5 Other Robustness Checks

I conduct several additional robustness checks using alternative data and the 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.42, 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 surveys 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.43 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 contracts 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.

## 9 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 both household and district levels that I document using a migrant panel and regional remittances reports. Causal analysis at the district level shows that the migrant exchange rate shock leads to an increase in the provision of public goods. In particular, education facilities for elementary and junior high schools increase over time.

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.

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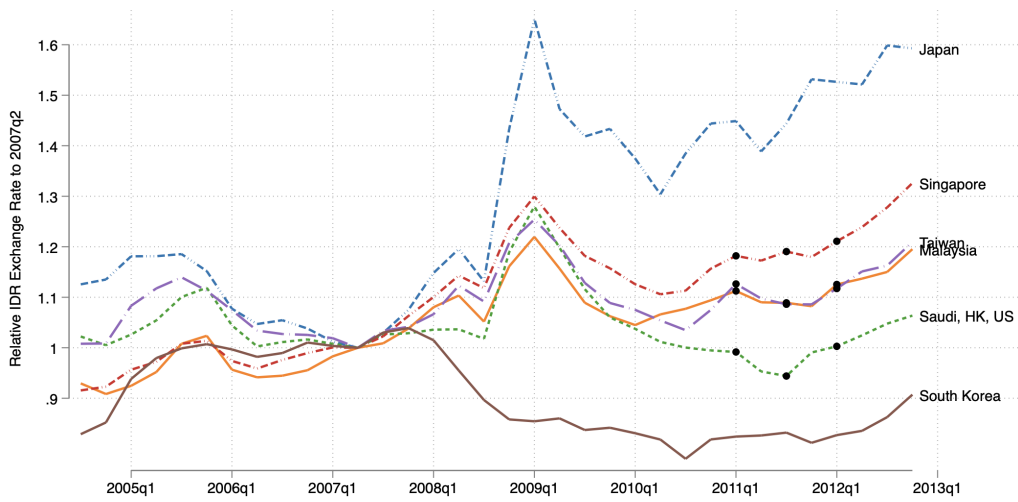
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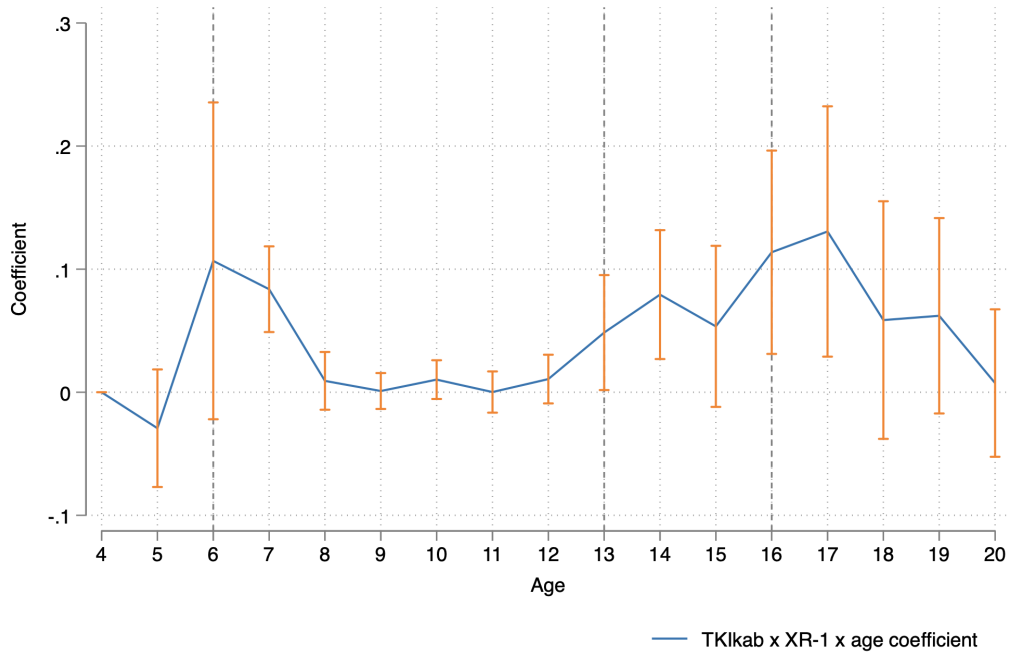
# Figures

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: 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.

## Tables

Table 1: Exchange Rate Shocks and Remittances

	Migrant Panel		Monthly		Quarterly
	Remit. (1)	Remit. (2)	Remit. (3)	Remit. (4)	Remit. (5)
XR Change	1.518** (0.762)	0.417** (0.176)	1.082*** (0.279)	2.058*** (0.499)	
Migration × XR Change					0.014** (0.006)
Sample	All abroad	Remitters	Tulungagung District		East Java
Coverage	2011–2012		2016–2020		2007, 2008, 2012
Fixed effect 1	Household	Household	Quarter	Qtr-by-Year	Quarter
Fixed effect 2	Survey	Survey	Year	-	Year
Reported units	IDR	IDR	million IDR	million IDR	billion IDR
Dep. var. mean	9.82	15.27	9.81	9.81	4.27
Observations	757	418	60	60	53

*Notes:* Regression of remittance data on migrant income shock or exchange rate with controls and fixed effects in various specifications. Data for columns 1-2 are from Doi, McKenzie, and Zia (2014). Data for columns 3-4 are from BPS Tulungagung. Data for column 5 are from Kediri central bank report and Antara report. Full details are in the Data appendix. Regression in column 1 uses all abroad migrants, and column 2 restrict to regular remitters, i.e., those who send remittances more than once. Columns 1–2 report clustered standard errors by household. Columns 3–5 report robust standard errors in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 2: Education Expenditures and District-level Enrollment

	<b>A. Household Education Expenditure</b>		
	All	No 6-18 yo.	Has 6-18 yo.
	households	children	children
	(1)	(2)	(3)
$Mig_d \times XRshock_{t-1}$	0.280**	-0.109	0.430**
	(0.135)	(0.107)	(0.188)
Dep. var. mean	5.261	1.173	7.986
Dep. var. sd	4.464	3.170	2.820
Observations	1009761	403855	605906
	<b>B. District-level enrollment</b>		
	Elementary	Jr. Secondary	Sr. Secondary
	(4)	(5)	(6)
	(4)	(5)	(6)
1. District and Year FEs only			
Migration $\times$ XRShock $_{t-1}$	2.957***	5.394***	8.601***
	(0.874)	(2.043)	(2.216)
2. Baseline control interacted with year FEs			
Migration $\times$ XRShock $_{t-1}$	2.062**	3.623*	7.052***
	(0.866)	(2.032)	(2.220)
3. Export commodity XR shock controls (Oil & Gas, Palm Oil)			
Migration $\times$ XRShock $_{t-1}$	2.473***	5.912***	8.906***
	(0.879)	(2.074)	(2.216)
4. Commodity controls and baseline $\times$ Year			
Migration $\times$ XRShock $_{t-1}$	1.705*	4.338**	7.531***
	(0.872)	(2.065)	(2.196)
Dep. var. mean	88.96	66.60	46.49
Dep. var. sd	3.81	9.86	12.73
Observations	2413	2413	2413
	<b>C. Cohort enrollment, Present Migrant HHs</b>		
	Elementary	Jr. Sec	Sr. Sec
	(6-12 yo.)	(13-15 yo.)	(16-18 yo.)
	(7)	(8)	(9)
$CohortTreat_i \times Mig_h \times XRshock_{dt-1}$	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 presents estimates from regressions of outcome variables on migrant exchange rate shocks at the household or district level. The migrant exchange rate shock is lagged by one period. Panel A uses monthly education expenditure per capita from the *Susenas* survey. Column 1 uses all households, column 2 restricts to households without school-age children, and column 3 restricts to households with at least one school-age child. The outcome variables are expressed in log IDR, deflated to account for inflation using CPI in the year 2007 base. The regressions include district and year fixed effects, and a suite of controls of household characteristics and head of household characteristics. The household characteristics are the number of individuals living in the household and the number of school-age children in the household. The head of household controls are age, gender, education indicators for finishing primary, junior secondary, senior secondary, or university (no schooling as the omitted category), literacy indicator, and whether the head of household is working. Panel B uses district-level enrollment and presents four different specifications. Panel C uses enrollment status of individuals in the households from the *Susenas* survey. Standard errors in parentheses for Panels A and B are clustered by districts. Standard errors in Panel C are clustered at the household level. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.1$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table 3: Migrant Exchange Rate Shocks and Public Service Provisions

	Elementary Schools (Grades 1-6) (1)	Jr. Sec Schools (Grades 7-9) (2)	Sr. Sec Schools (Grades 10-12) (3)	Community Health Centers (4)	Household Electricity (5)	Household Piped Water (6)	Villages with Asphalt Roads (7)
1. District and Year FEs only							
Migration $\times$ XRShock <sub>t-1</sub>	0.409 (0.315)	0.338*** (0.127)	0.032 (0.036)	0.043 (0.070)	0.061** (0.026)	0.060*** (0.020)	0.054** (0.024)
2. Baseline control interacted with year FEs							
Migration $\times$ XRShock <sub>t-1</sub>	0.424 (0.293)	0.250** (0.107)	0.025 (0.032)	0.048 (0.061)	0.042** (0.019)	0.048** (0.020)	0.040* (0.022)
3. Export commodity XR shock controls (Oil & Gas, Palm Oil)							
Migration $\times$ XRShock <sub>t-1</sub>	0.385 (0.330)	0.315*** (0.121)	0.027 (0.035)	0.036 (0.071)	0.052** (0.026)	0.065*** (0.021)	0.055** (0.024)
4. Commodity controls and baseline $\times$ Year							
Migration $\times$ XRShock <sub>t-1</sub>	0.386 (0.303)	0.256** (0.107)	0.027 (0.032)	0.041 (0.062)	0.037* (0.020)	0.050** (0.020)	0.040* (0.022)
Dep. var. mean	6.49	1.19	0.32	0.43	0.89	0.16	0.69
Dep. var. sd	3.09	0.86	0.25	0.26	0.15	0.15	0.24
Observations	2424	2424	2424	1522	2186	2423	2149

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shock is lagged by one period. Standard errors in parentheses are clustered by districts. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t1}$  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 is the ratio between the total migrants in the district from the 2005 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table 4: Public Service Provisions and Migrant Income Shocks with Distributed Lags

	Elementary Schools (Grades 1-6) (1)	Jr. Sec Schools (Grades 7-9) (2)	Sr. Sec Schools (Grades 10-12) (3)	Community Health Centers (4)	Household Electricity (5)	Household Piped Water (6)	Villages with Asphalt Roads (7)
Migration $\times$ XRShock <sub>t-1</sub>	0.154 (0.174)	0.073 (0.058)	-0.014 (0.017)	0.015 (0.045)	0.010 (0.021)	0.042* (0.023)	0.016 (0.027)
Migration $\times$ XRShock <sub>t-2</sub>	0.412** (0.161)	0.175*** (0.059)	0.023 (0.024)	0.025 (0.037)	-0.004 (0.013)	0.014 (0.019)	0.028 (0.051)
Migration $\times$ XRShock <sub>t-3</sub>	0.778*** (0.176)	0.295*** (0.107)	0.026 (0.036)	0.101* (0.056)	-0.023 (0.022)	0.020 (0.027)	0.006 (0.089)
Migration $\times$ XRShock <sub>t-4</sub>	0.073 (0.258)	0.115 (0.089)	0.022 (0.023)	0.068 (0.092)	0.016 (0.019)	-0.045 (0.028)	0.016 (0.036)
p-value L3 = L4 = 0	0.00	0.01	0.51	0.11	0.47	0.22	0.68
p-value L2 = L3 = L4 = 0	0.00	0.01	0.60	0.21	0.67	0.25	0.70
Sum All Lag coefs.	1.417** (0.603)	0.658*** (0.240)	0.058 (0.065)	0.208 (0.215)	-0.001 (0.044)	0.032 (0.056)	0.065 (0.112)
Dep. var. mean	6.16	1.16	0.31	0.41	0.91	0.15	0.73
Dep. var. sd	2.90	0.83	0.24	0.23	0.13	0.14	0.23
Observations	1346	1346	1346	861	1338	1346	1081

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shocks are included with lags of up to four periods. Standard errors in parentheses are clustered by districts. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable *Migration*  $\times$  *XRShock* 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 is the ratio between the total migrants in the district from the 2005 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \* p  $\leq$  0.10, \*\* p  $\leq$  0.05, \*\*\* p  $\leq$  0.01.

Table 5: Migrant Exchange Rate Shocks and District Splits

	Elementary Schools (1)	Elementary Schools (2)	Elementary Schools (3)	Elementary Schools (4)	Jr. Sec Schools (5)	Jr. Sec Schools (6)	Jr. Sec Schools (7)	Jr. Sec Schools (8)
Sum All Lag coefs.	1.531*** (0.374)	1.319*** (0.391)	1.270*** (0.407)	1.216*** (0.410)	0.693*** (0.255)	0.592** (0.275)	0.585** (0.282)	0.571** (0.285)
Split <sub>t-1</sub> × Migration × XRShock <sub>t-1</sub>	0.042 (0.512)	0.489 (1.003)	0.856 (1.285)	0.273 (1.125)	0.033 (0.140)	0.278 (0.225)	0.642** (0.322)	0.537** (0.254)
Split <sub>t-2</sub> × Migration × XRShock <sub>t-2</sub>		0.677 (0.880)	0.564 (0.961)	1.201 (1.107)		0.594** (0.296)	0.688** (0.291)	0.829** (0.352)
Split <sub>t-3</sub> × Migration × XRShock <sub>t-3</sub>			0.448 (0.862)	-0.468 (0.949)			0.592*** (0.229)	0.407* (0.223)
Split <sub>t-4</sub> × Migration × XRShock <sub>t-4</sub>				2.095 (1.544)				0.423 (0.519)
Sum All Interacted Lag coefs.	0.042 (0.512)	1.167 (1.797)	1.868 (3.008)	3.101 (3.143)	0.033 (0.140)	0.872* (0.505)	1.922** (0.804)	2.195** (0.910)
Dep. var. mean	6.16	6.16	6.16	6.16	1.16	1.16	1.16	1.16
Dep. var. sd	2.90	2.90	2.90	2.90	0.83	0.83	0.83	0.83
Observations	1346	1346	1346	1346	1346	1346	1346	1346

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shocks are included with lags of up to four periods, interacted with a dummy variable for district splits. Standard errors in parentheses are clustered by districts. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t1}$  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 is the ratio between the total migrants in the district from the 2005 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table 6: District Finances and Migrant Exchange Rate Shocks with Distributed Lag

	Share of Total Budget (%)			Revenue Stream (log IDR)				Share of Total Revenue (%)			
	Capital	Goods	Personnel	Central Taxes (DBH)	Local Taxes (PAD)	Special Grant (DAK)	Base Grant (DAU)	Central Taxes (DBH)	Local Taxes (PAD)	Special Grant (DAK)	Base Grant (DAU)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Migration × XRShock <sub>t-1</sub>	0.006 (0.025)	-0.032** (0.014)	0.021 (0.024)	-0.913 (0.952)	-0.058 (0.092)	0.765 (1.355)	-0.270 (0.470)	-0.023* (0.014)	0.007 (0.009)	-0.006 (0.011)	0.015 (0.027)
Migration × XRShock <sub>t-2</sub>	0.051** (0.022)	-0.010 (0.014)	-0.052** (0.021)	-0.022 (0.204)	-0.026 (0.097)	0.653 (0.741)	0.142 (0.304)	0.010 (0.008)	-0.005 (0.008)	0.002 (0.007)	-0.066*** (0.020)
Migration × XRShock <sub>t-3</sub>	0.025 (0.033)	-0.013 (0.021)	0.004 (0.039)	-0.428 (0.458)	-0.216 (0.164)	0.960 (0.887)	-0.217 (0.688)	0.016 (0.016)	-0.009 (0.015)	0.022 (0.015)	0.000 (0.032)
Migration × XRShock <sub>t-4</sub>	0.042 (0.031)	-0.054** (0.022)	0.008 (0.043)	0.253 (0.352)	0.119 (0.185)	-0.812 (0.758)	-0.006 (0.599)	-0.002 (0.015)	-0.011 (0.016)	-0.016 (0.017)	-0.011 (0.032)
Sum All Lag coefs.	0.124** (0.062)	-0.108** (0.049)	-0.019 (0.062)	-1.110 (1.211)	-0.181 (0.225)	1.567 (1.725)	-0.351 (1.881)	0.001 (0.029)	-0.019 (0.025)	0.001 (0.026)	-0.062 (0.058)
Dep. var mean	0.21	0.16	0.54	24.42	24.52	24.31	26.63	0.07	0.07	0.07	0.59
Dep. var SD	0.09	0.04	0.10	1.56	0.96	2.35	1.92	0.05	0.06	0.04	0.15
Observations	1321	1321	1321	1309	1309	1309	1309	1309	1309	1309	1309

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shocks are included with lags of up to four periods. Standard errors in parentheses are clustered by districts. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t1}$  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 is the ratio between the total migrants in the district from the 2005 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table 7: Migrant Exchange Rate Shocks and Capital Spending

	Elementary Schools (1)	Elementary Schools (2)	Elementary Schools (3)	Elementary Schools (4)	Jr. Sec Schools (5)	Jr. Sec Schools (6)	Jr. Sec Schools (7)	Jr. Sec Schools (8)
Migration $\times$ XRShock $_{t-1}$ $\times$ CapitalBudget $_{t-1}$	1.937* (1.098)	2.026 (1.899)	3.371 (3.688)	6.894*** (2.455)	-0.247 (0.349)	-0.186 (0.502)	0.557 (1.013)	1.924 (1.273)
Migration $\times$ XRShock $_{t-2}$ $\times$ CapitalBudget $_{t-2}$		2.019 (1.777)	1.948 (4.090)	11.345*** (2.118)		0.616 (0.467)	1.040 (0.983)	2.449*** (0.857)
Migration $\times$ XRShock $_{t-3}$ $\times$ CapitalBudget $_{t-3}$			5.994* (3.289)	6.795*** (2.328)			2.063 (1.260)	2.188* (1.246)
Migration $\times$ XRShock $_{t-4}$ $\times$ CapitalBudget $_{t-4}$				13.639*** (3.217)				1.708 (1.300)
Sum All Lag coefs.	0.265 (0.630)	-0.342 (0.707)	-2.392** (1.206)	-6.934*** (1.567)	0.626** (0.262)	0.399 (0.272)	-0.273 (0.606)	-0.304 (1.137)
Sum All Interacted Lag coefs.	1.937* (1.098)	4.045 (3.448)	11.313 (10.722)	38.673*** (7.941)	-0.247 (0.349)	0.430 (0.870)	3.660 (3.052)	8.270** (3.886)
Dep. var. mean	6.25	6.23	6.19	6.16	1.17	1.16	1.15	1.15
Dep. var. sd	2.86	2.84	2.83	2.83	0.83	0.83	0.82	0.83
Observations	1319	1291	1236	988	1319	1291	1236	988

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shocks are included with lags of up to four periods, interacted with the variable for the share of district budgets classified as capital spending. Standard errors in parentheses are clustered by districts. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t1}$  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 is the ratio between the total migrants in the district from the 2005 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table 8: Migrant Exchange Rate Shocks and Election

	Elementary Schools (1)	Elementary Schools (2)	Elementary Schools (3)	Elementary Schools (4)	Jr. Sec Schools (5)	Jr. Sec Schools (6)	Jr. Sec Schools (7)	Jr. Sec Schools (8)
Sum All Lag coefs.	0.901 (0.707)	0.743 (0.710)	0.599 (0.774)	0.568 (0.810)	0.610** (0.258)	0.620** (0.297)	0.627* (0.337)	0.622* (0.340)
Election <sub>t-1</sub> × Migration × XRShock <sub>t-1</sub>	-4.195 (3.018)	-3.823 (2.964)	-4.071 (3.170)	-3.603 (3.296)	-0.695 (0.600)	-0.643 (0.635)	-0.717 (0.713)	-0.667 (0.692)
Election <sub>t-2</sub> × Migration × XRShock <sub>t-2</sub>		1.081* (0.632)	1.386* (0.763)	1.530* (0.846)		0.250 (0.295)	0.266 (0.343)	0.287 (0.364)
Election <sub>t-3</sub> × Migration × XRShock <sub>t-3</sub>			0.833 (0.566)	0.928 (0.681)			0.080 (0.158)	0.094 (0.195)
Election <sub>t-4</sub> × Migration × XRShock <sub>t-4</sub>				0.398 (0.401)				0.050 (0.142)
Sum All Interacted Lag coefs.	-4.195 (3.018)	-2.742 (2.921)	-1.853 (2.649)	-0.746 (2.593)	-0.695 (0.600)	-0.393 (0.784)	-0.371 (0.862)	-0.236 (0.889)
Dep. var. mean	6.16	6.16	6.16	6.16	1.16	1.16	1.16	1.16
Dep. var. sd	2.90	2.90	2.90	2.90	0.83	0.83	0.83	0.83
Observations	1346	1346	1346	1346	1346	1346	1346	1346

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shocks are included with lags of up to four periods, interacted with a dummy variable for whether there is a local election in the district in the period. Standard errors in parentheses are clustered by districts. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t1}$  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 is the ratio between the total migrants in the district from the 2005 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table 9: Migrant Exchange Rate Shocks and Other Development Indicators

	Household Expenditure pc.		Poverty Indicators			GDP per capita			
	Average HH (1)	Bottom 20% HH (2)	Pov. Rate (3)	Pov. Gap (4)	Gini Coeff. (5)	Total Non-Oil (6)	Agriculture (7)	Service (8)	Industry (9)
1. District and Year FEs only									
Migration × XRShock <sub>t-1</sub>	0.027 (0.039)	0.059** (0.030)	-3.028*** (0.738)	-0.940*** (0.244)	-0.019** (0.009)	0.138*** (0.052)	0.166*** (0.063)	0.138*** (0.049)	0.069 (0.063)
2. Baseline control interacted with year FEs									
Migration × XRShock <sub>t-1</sub>	0.018 (0.037)	0.053* (0.030)	-1.855*** (0.610)	-0.642*** (0.213)	-0.018* (0.010)	0.142*** (0.049)	0.132** (0.052)	0.118*** (0.043)	0.052 (0.056)
3. Export commodity XR shock controls (Oil & Gas, Palm Oil)									
Migration × XRShock <sub>t-1</sub>	0.032 (0.039)	0.067** (0.030)	-3.273*** (0.750)	-1.003*** (0.247)	-0.020** (0.010)	0.129** (0.052)	0.168*** (0.062)	0.142*** (0.049)	0.054 (0.062)
4. Commodity controls and baseline × Year									
Migration × XRShock <sub>t-1</sub>	0.027 (0.038)	0.062** (0.031)	-2.115*** (0.608)	-0.707*** (0.215)	-0.019* (0.010)	0.130*** (0.048)	0.135** (0.052)	0.124*** (0.043)	0.047 (0.056)
Dep. var. mean	12.723	11.980	14.980	2.624	0.293	15.514	13.980	14.599	14.023
Dep. var. sd	0.358	0.292	7.726	1.758	0.053	0.643	1.040	0.704	1.204
Observations	2087	2087	2404	2404	1849	2407	2407	2407	2407

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shock is lagged by one period. Standard errors in parentheses are clustered by districts. The sample is a 2005–2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t1}$  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 is the ratio between the total migrants in the district from the 2005 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

# 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 ratio of the total migrant population in the district to the district's total population. Population denominator uses population estimates from Dapoer.

**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. 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.

## Outcome 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%), 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, DAK, DAU, oil and gas revenue). 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, and map each district to the closest data point as 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. I imputed values in the intervening year following Kis-Katos and Sjahrir (2017). For district finances, I create share variables out of the total budget or revenues.

**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 (6-12, 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 Ministry of Education. Dapodik covers the universe of schools in Indonesia. These include 166,257 publicly run schools and 52,888 privately run schools. School administrators submit information periodically to the database, which is required 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. 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>. **Community health centers.** Data for community health centers (*Puskesmas*) are compiled from the relevant tables in the annual publications of [*Province*] *Dalam Angka* by the respective BPS office in the provinces that are available online. I compile data from select provinces: provinces in Java, provinces in Sumatra with high population, Nusa Tenggara, and provinces in Sulawesi with high population.

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, e.g., 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 (Feb-Jun 2010) and households were re-interviewed during three follow-up surveys (Mar-Apr 2011, Sep-Oct 2011, Jan 2012). The same household members interviewed at baseline were interviewed during the follow-up surveys. I retained samples from the survey if the migrant was located abroad during more than one of the follow-up rounds. I excluded households that did not know in which country the migrant was working.

**SPKP data** (*Survei Pelayanan Kesehatan dan Pendidikan*) are a set of 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 to construct the shock.

**Other datasets:** **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 tabulate the cost of schooling by grade. **MCLE** (Mediation and Community Legal Empowerment) was a baseline survey for a pilot program in two provinces (Aceh and Maluku), covering 306 villages in 11 districts (World Bank, 2009). It contains a module on local government efforts and processes to provide public goods in the village. **PEKKA** survey (STRP/*Survei Rumah Tangga Pedesaan* or Rural Household Survey) was fielded as part of an evaluation of the PEKKA (*Perempuan Kepala Keluarga* or Female Head of Household) program (World Bank, 2011). The program initially focused on the welfare of poor widower in conflict-prone areas in Indonesia, with data collection targeting 24 villages in four provinces. Each village sample contains 100 households, capturing a rich data on household network. **Labor Force Survey** (*Sakernas*) is surveyed twice in a year by the Central Bureau of Statistics. I use the August 2021 data to obtain a dataset with samples that are representative at the district level (February survey is only representative at the province level). The **district remittance datasets** are compiled from several

sources, primarily *Kajian Ekonomi Regional Eks-Karesidenan Kediri 2008*, covering 2007Q1 to 2008Q4. Specifically, Figures 1.20 for Kediri, 1.36 for Madiun, 1.49 for Blitar, and 1.59 for Tulungagung. This data is supplemented with news reports from <https://jatim.antaranews.com> and <https://kominform.jatimprov.go.id> covering 2011Q4-2012Q4 for Kediri, Madiun, Blitar, Ponorogo, rest of the Karesidenan Kediri. The Tulungagung monthly series is retrieved from <http://tulungagungkab.bps.go.id>. The **mayoral election campaign dataset** covers district head elections in Java provinces (West, Central, East, Yogyakarta, and Banten), 2005-2024. Research assistants were tasked to collect information about the full roster of candidate pairs for each election (regent and vice regent candidates or mayor and vice mayor candidates). The information collected covered the total votes, supporting political parties, and the candidates' campaign programs. The research assistants compiled information using keywords such as "visi", "misi", or "kampanye" from publicly available election archives on the internet and on leading news portals (e.g., *Kompas*, *Tempo*, *Jawapos*, and *Detik*). In total, out of 1183 candidates, 36% has retrievable campaign platforms. These dataset covers 337 elections in 112 districts.

## B. Calculation of Multiplier

I use three approaches to obtain estimates of the local multipliers. I compare two districts: Karawang and Nganjuk. Karawang has a standardized shock of 1 in 2012 while Nganjuk has a standardized shock of 0 in 2009. Karawang's population is 2.2 million with 30 thousands migrants in 2005, while Nganjuk has 1 million population with 5 thousand migrants (migrant and total population are expressed in thousands). The exchange rate shocks in the year prior are 1.02 and 1.10 for the respective districts. The three approaches are as follows.

First, I calculate the ratio of 1-SD shock for  $\Delta$  GDP per capita over 1-SD migrant income shock per population. The quantities for the numerator is the regression coefficient for GDP times mean GDP per capita ( $0.138 \times \$545.86 = 75.32$ ). The denominator is the  $\Delta$  Migration income  $\times$  XR shock between Karawang and Nganjuk. Migrant income is defined as migration intensity  $\times$  monthly salary  $\times$  12 month ( $[30.75/2199.39 \times 1.02 - 5.08/1002.53 \times 1.10] \times \$213 \times 12 = 22.20$ ). Therefore the ratio is  $75.32/22.20=3.39$ .

Second, I calculate the ratio of 1-SD shock for  $\Delta$  district GDP over  $\Delta$  migrant income shock. The numerator is the  $\Delta$  of GDP per capita  $\times$  population  $\times$  regression coefficient ( $[2199.39-1022.53] \times 545.86 \times 0.138 = 90157$ ). The denominator is the  $\Delta$  of migrant  $\times$  monthly salary  $\times$  12  $\times$  XR shock ( $[30.75 \times 1.02 - 5.08 \times 1.10] \times \$213 \times 12 = 65886$ ). Therefore the ratio is  $90,157/65,886 = 1.37$ .

Third, I calculate the ratio of 1-SD shock for  $\Delta$  district GDP over  $\Delta$  remittance XR shock. Numerator is same with (ii). The denominator is remittances, i.e., migrants  $\times$  remittances per year  $\times$  XR shock ( $[30.75 \times 1.02 - 5.08 \times 1.10] \times 1124 = 28973.348$ ). The ratio is  $90,157/28,973 = 3.11$ . The mean over the three estimates is 2.62.

Note that the multiplier estimates are contingent on the assumed values for various quantities. Varying the exchange rate between USD and IDR to 12,041 [the highest rate during GFC] or 9,282 [the rate just prior the crisis] will shift the estimated average remittance amount, and thus the multipliers to 0.96–2.83 or 1.24–3.67, respectively. Using a different assumption for the migrant salary at US\$355 (median salary in Singapore) will shift the estimated multipliers to 0.69–2.03.

Table A.1: Major Migration Destination Countries

Country	2008-2010	2014 survey - Monthly Salary Abroad		
	Migrants Arrival (1)	Mean (USD) (2)	Median (USD) (3)	N (4)
1 Saudi	563,016	209.82	213.20	794
2 UAE	83,629	219.90	217.81	994
3 Kuwait	74,101	207.96	175.68	74
4 Malaysia	73,346	207.32	198.82	103
5 Taiwan	41,332	538.35	525.98	1,276
6 Singapore	32,096	350.81	355.26	385
7 Jordan	31,139	286.99	211.27	42
8 Oman	27,966	237.69	207.79	336
9 Qatar	25,373	219.94	219.67	521
10 Hong Kong	19,067	471.03	474.25	527
11 Syria	9,057	169.60	175.00	50
12 Bahrain	8,944	327.25	212.29	119
13 Brunei	5,755	213.16	197.37	25
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 Arrival/Total N	1,006,241			5,246
Top 20 subtotal	99%			

Note: Column (1) from BNP2TKI arrival data. Columns (2-4) from Bazzi, Cameron, et al. (2026), limiting to former migrant respondents with concordant country destination and currency code, and/or USD-denominated salary for former migrants working in Syria. Summary statistics are 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 countries with at least 25 migrant responses are reported for the salary data.

Table A.2: Summary Statistics

	Mean	SD	Min	Max	Obs.
A. District-level Regressors					
Migrants (Podes 2005)	3,080	6,411	0	38,367	365
Population	560,653	579,118	49,186	4,086,428	365
Migrants per one thousand people	5	8.3	0	55	365
Exchange rate shock (%)	1.07	0.07	0.86	1.31	2478
Migration $\times$ XRShock <sub>t-1</sub>	-0.00	1.00	-0.63	6.35	2478
B. District-level Outcomes					
Enrollment elementary level among 6-12 year olds (%)	88.98	3.85	70.54	99.00	2462
Enrollment junior secondary level among 13-15 year olds (%)	66.65	9.87	20.27	91.45	2462
Enrollment senior secondary level among 16-18 year olds (%)	46.65	12.74	1.21	86.62	2462
Public elementary schools per 10,000 people	6.49	3.08	0.02	17.62	2478
Public junior high schools per 10,000 people	1.20	0.87	0.00	6.56	2478
Public high schools per 10,000 people	0.32	0.25	0.00	1.83	2478
Community health centers per 10,000 people	0.43	0.27	0.03	2.53	1540
Households with electricity	0.89	0.15	0.10	1.00	2234
Household water from piped water	0.16	0.15	0.00	0.95	2472
Villages with asphalt road (%)	0.69	0.24	0.03	1.00	2194
Household per capita (p.c.) expenditure (log IDR)	12.73	0.36	11.80	14.06	2113
Household p.c. expenditure for poorest 20%	11.98	0.29	11.05	12.95	2113
Poor population (% of population)	15.11	7.81	1.52	45.18	2453
Poverty gap (index)	2.67	1.82	0.06	14.18	2453
Gini coefficient	0.29	0.05	0.16	0.60	1897
District GDP p.c. Excl. Oil & Gas (log IDR)	15.52	0.64	12.79	18.77	2460
Agriculture GDP p.c. (log IDR)	13.99	1.03	8.57	15.68	2460
Service GDP p.c. (log IDR)	14.41	2.34	-12.29	18.57	2478
Industry GDP p.c. (log IDR)	13.83	2.49	-12.29	18.94	2478
C. District Finances Outcomes					
Share of personnel expenditures out of total budget (%)	0.52	0.11	0.11	1.00	2378
Share of capital expenditures out of total budget (%)	0.23	0.10	0.00	0.69	2378
Share of goods and consumables expenditures out of total budget (%)	0.17	0.05	0.00	0.46	2378
Share central govt tax sharing out of total rev.	0.07	0.06	0.00	0.86	2381
Share of own revenues out of total rev.	0.07	0.06	0.00	1.00	2381
Share of special allocation grant out of total rev.	0.07	0.04	0.00	0.70	2381
Share of general allocation grant out of total rev.	0.61	0.16	0.00	1.00	2381
Tax sharing rev. with central govt (log IDR)	23.98	3.19	0.00	28.64	2385
Own district rev. (local taxes and fees, log IDR)	24.02	2.52	0.00	28.46	2385
Special allocation grant rev. (DAK, log IDR)	23.58	4.16	0.00	26.55	2385
Base/general allocation grant rev. (DAU, log IDR)	26.37	2.45	0.00	29.44	2385

Notes: This table reports the summary statistics from various variables. See Data Appendix for sources of variables.

Table A.3: 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, Malaysia, Singapore, Japan	Hong Kong, Malaysia, Singapore, Japan
World Bank (2010)	2008	3,368	USD 200	per transaction	N/A	N/A	Saudi Arabia and Malaysia	East Java, NTB, NTT
Doi, McKenzie, and Zia (2014)	2011	400	USD 1,119	since departure	4	USD 1,119	Hong Kong, Malaysia, Singapore, Taiwan	East Java
World Bank (2017)	2013	4,660	USD 82	monthly	N/A	USD 984	Middle East, Malaysia	15 Indonesian provinces
Bazzi, Cameron, et al. (2026)	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.4: Exchange Rate Shocks and Remittances

	Migrant Panel		Monthly		Quarterly
	Remit. (1)	Remit. (2)	Remit. (3)	Remit. (4)	Remit. (5)
XR Change	1.348*	0.448**	1.367***	2.471***	
	(0.768)	(0.179)	(0.347)	(0.620)	
Migration × XR Change					0.012* (0.007)
Sample	All abroad	Remitters	Tulungagung District		East Java
Coverage	2011–2012		2016–2020		2007, 2008, 2012
Fixed effect 1	Household	Household	Quarter	Qtr-by-Year	Quarter
Fixed effect 2	Survey	Survey	Year	-	Year
Observations	757	418	59	59	44

Notes: Regression of remittance data on migrant income shock or exchange rate with controls and fixed effects in various specifications. Data for Columns 1-2 are from Doi, McKenzie, and Zia (2014). Data for columns 3-4 are from BPS Tulungagung. Data for column 5 are from Kediri central bank report and Antara report. Controls for Columns 1-2 include time to the next led holiday and the length of abroad duration for the migrant. Controls for Columns 3-4 include indicators for led holidays and the previous period's remittances. Control for Column 5 includes the previous period's remittances. Regression in column 1 uses all abroad migrants, and column 2 restrict to regular remitters, i.e., those who send remittances more than once. Columns 1–2 report clustered standard errors by household. Columns 3–5 report robust standard errors in parentheses. \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

Table A.5: Effect of Currency Exchange Fluctuations on Remittances Frequency

	Remittances Frequency (1)	Remittances Frequency (2)	Remittances Frequency (3)	Remittances Frequency (4)
XR shock	0.896* (0.502)	0.903* (0.510)	0.925* (0.496)	0.929* (0.504)
Time abroad		-0.000 (0.001)		-0.000 (0.001)
Time to next Eid			0.480 (0.393)	0.478 (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. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.6: Subsequent Shocks and Past Outcomes

	Elementary Enrollment (6-12 yo.) (1)	Jr. Sec Enrollment (13-15 yo.) (2)	Sr. Sec Enrollment (16-18 yo.) (3)	Elementary Schools (Grades 1-6) (4)	Jr. Sec Schools (Grades 7-9) (5)	Sr. Sec Schools (Grades 10-12) (6)	Community Health Centers (7)	Household Electricity (8)	Household Piped Water (9)	Villages with Asphalt Roads (10)
Migration $\times$ XRShock $_{t+2}$	0.980 (0.968)	-0.629 (2.954)	2.738 (1.753)	0.359 (0.284)	0.091 (0.093)	0.033 (0.029)	0.067 (0.043)	-0.024 (0.018)	-0.017 (0.023)	0.042 (0.026)
Observations	2398	2398	2398	2424	2424	2424	1389	2059	2178	2370

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shock is shifted forward by two periods. Standard errors in parentheses are clustered by districts. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t1}$  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 is the ratio between the total migrants in the district from the 2005 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.7: Country-specific weights

Panel A. Top Rotemberg weight countries					
Countries	$\hat{\alpha}_k$	$g_k$	$\hat{\beta}_k$	95% CI	Mig. Share
Malaysia	0.428	0.159	1.073	(0.422,1.725)	0.073
Saudi Arabia	0.348	0.082	0.564	(0.013,1.115)	0.559
Singapore	0.094	0.234	-0.108	(-0.814,0.598)	0.038
Kuwait	0.045	0.082	1.838	(-36.596,40.273)	0.072
Hong Kong	0.022	0.085	3.098	(-9.896,16.092)	0.020
Taiwan	0.016	0.049	0.194	(-0.551,0.940)	0.043

Panel B. Correlations				
	$\hat{\alpha}_k$	$g_k$	$\hat{\beta}_k$	$\text{var}(z_k)$
$\hat{\alpha}_k$	1			
$g_k$	0.338	1		
$\hat{\beta}_k$	0.148	0.353	1	
$\text{var}(z_k)$	0.931	0.181	0.206	1

Panel C. Weight summary statistics					
	Sum	Mean	Share	$\alpha$ -weighted sum of $\beta$	Mean of $\beta$
Positive	1.004	0.077	0.929	0.822	0.063
Negative	-0.004	-0.004	0.071	0.005	0.005

*Notes:* This table reports statistics about the Rotemberg weight, following Goldsmith-Pinkham, Sorkin, and Swift (2020)'s summary statistics from the two settings that they considered. Here, the analogue to industry sectors they considered are the destination countries, and this analysis restrict to the fourteen countries with 98.99% of the total recorded migrants in the migrant terminal data. Panel A reports the values of weight for top weighted countries, the size of the exchange rate shocks between 2005-2009, the coefficient from regression with the migration intensity variable interacted with the lagged share of migrants from a district going to a destination and the lagged exchange rate shock to the destination as an instrument for the shift-share variable, 95% confidence interval, and the share of migrants in each country from the migrant terminal data. Panel B reports the correlations between the estimated weight, the shock, the coefficient, as well as the variance of the share of migrants going to each country across districts in the sample. Calculation of the weights restrict to districts with nonzero observations in the migrant data between 2006–2010. Calculations of weights and  $\beta$  use public junior secondary schools per 10,000 population as the outcome variable in lieu of the endogenous explanatory variable, sub-national remittances, which is not observed in my setting. Panel C reports the sum, mean, share,  $\alpha$ -weighted sum of  $\beta$ , and the mean of  $\beta$  over weights with positive and negative values. South Korea is the only country with a negative weight value, with less than 0.5% of total migrants in the migrant terminal data (a similar proportion with Podes 2005 data).

Table A.8: Correlates of Destination Shares in 2004

	share to Malaysia 2004 (1)	share to Saudi 2004 (2)	share to Singapore 2004 (3)	share to Kuwait 2004 (4)	share to Hong Kong 2004 (5)	share to Taiwan 2004 (6)
Urban	-0.096 (0.093)	0.162 (0.098)	-0.097 (0.091)	-0.008 (0.053)	-0.021 (0.049)	0.023 (0.019)
Land area (log)	-0.016 (0.024)	0.050 (0.032)	-0.027 (0.020)	-0.003 (0.019)	0.019 (0.020)	-0.008 (0.007)
Agri GDP pc (log)	0.014 (0.025)	-0.013 (0.029)	-0.010 (0.022)	0.007 (0.016)	-0.030 (0.023)	0.013 (0.010)
Oil GDP pc (log)	0.000 (0.003)	-0.002 (0.003)	0.001 (0.002)	-0.001 (0.002)	0.002 (0.002)	0.000 (0.000)
HH expenditure pc (log)	0.119 (0.115)	-0.004 (0.115)	0.012 (0.041)	-0.035 (0.075)	-0.010 (0.060)	-0.008 (0.014)
km to Dumai (log)	-0.246* (0.148)	0.249 (0.179)	-0.029 (0.090)	0.014 (0.059)	0.083 (0.062)	0.001 (0.012)
Muslim share	0.385 (0.772)	-0.052 (0.581)	-0.252 (0.228)	0.090 (0.378)	-0.251 (0.284)	-0.050 (0.122)
Catholic/Protestant share	1.236 (0.770)	-1.610*** (0.520)	-0.023 (0.223)	-0.295 (0.327)	0.145 (0.210)	0.039 (0.123)
Arab eth. share	-7.857 (12.581)	15.693 (16.210)	-6.507 (7.060)	13.976 (8.597)	-15.697 (13.370)	1.207 (2.439)
Chinese eth. share	0.228 (1.318)	-0.159 (1.389)	-0.841 (0.534)	0.335 (0.688)	-0.724* (0.404)	0.100 (0.236)
Java eth. majority	-0.074 (0.076)	-0.038 (0.076)	-0.012 (0.032)	-0.019 (0.022)	-0.010 (0.034)	0.016 (0.010)
Bugis eth. majority	0.035 (0.090)	-0.024 (0.165)	0.012 (0.020)	-0.114 (0.154)	0.004 (0.027)	0.003 (0.012)
Madura eth. majority	-0.010 (0.101)	0.137 (0.105)	-0.014 (0.042)	-0.122*** (0.045)	-0.109** (0.045)	0.000 (0.013)
Sunda eth. majority	-0.033 (0.046)	0.103 (0.093)	0.014 (0.036)	-0.040 (0.027)	-0.002 (0.022)	0.007 (0.011)
Population (log)	0.018 (0.035)	0.074 (0.050)	-0.012 (0.024)	-0.026 (0.030)	-0.060* (0.034)	0.000 (0.006)
Enrollment Primary	-0.010 (0.009)	-0.003 (0.008)	-0.001 (0.003)	0.000 (0.005)	0.007 (0.004)	0.004 (0.003)
Enrollment Jr. Sec	0.001 (0.002)	-0.001 (0.002)	0.001 (0.001)	-0.000 (0.001)	0.000 (0.001)	-0.000 (0.000)
R <sup>2</sup>	0.696	0.664	0.258	0.230	0.395	0.404
N	178	178	178	178	178	178

Note: This table presents coefficients from regressions of the share of migrants from a district going to top weighted destinations. 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.9: Monthly Returnees Processed and Exchange Rate Fluctuations

	(1)	(2)	(3)	(4)
	Returnees	Returnees	Returnees	Returnees
Panel A. All returnees				
XRshock <sub>m</sub>	-192.8 (289.9)			
XRshock <sub>m-1</sub>		-277.6 (277.2)		
XRshock <sub>m-2</sub>			-274.5 (225.4)	
XRshock <sub>m-3</sub>				-127.7 (248.8)
Observations	1145	1057	1020	980
Panel B. Returnees not at the end of contracts				
XRshock <sub>m</sub>	102.8 (99.63)			
XRshock <sub>m-1</sub>		141.1 (132.7)		
XRshock <sub>m-2</sub>			141.5 (132.4)	
XRshock <sub>m-3</sub>				213.0 (156.8)
Observations	929	808	780	759
Panel C. All returnees, quarterly				
XRshock <sub>q</sub>	1497.2 (1871.9)			
XRshock <sub>q-1</sub>		1157.6 (1938.4)		
XRshock <sub>q-2</sub>			590.4 (2062.1)	
XRshock <sub>q-3</sub>				-51.62 (2262.8)
Observations	978	943	908	873
Panel D. All returnees, half-yearly				
XRshock <sub>t</sub>	2782.6 (3426.1)			
XRshock <sub>t-1</sub>		797.9 (3838.5)		
XRshock <sub>t-2</sub>			-1055.9 (4676.9)	
XRshock <sub>t-3</sub>				-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 ≤ 0.10, \*\* p ≤ 0.05, \*\*\* p ≤ 0.01.

Table A.10: Macroeconomic Variables and Changes in Migrant Stock Abroad

	Return Mig (1)	Return Mig (2)	Return Mig (3)	Return Mig (4)	ΔMig Stock (5)	ΔMig Stock (6)	ΔMig Stock (7)	ΔMig Stock (8)
GDP growth	121.52 (159.95)				-0.16 (0.41)			
L.GDP growth		81.29 (159.09)				-0.01 (0.25)		
Unemployment			-552.00 (555.78)				0.51 (0.72)	
L.Unemployment				-526.25 (596.70)				1.04 (0.97)
Observations	502	393	356	274	393	393	288	274

Note: Columns 1–4 present regressions of migrant return flow as recorded by BNP2TKI migrant terminal data on various destination countries’ macroeconomic variables, either in contemporaneous year or lagged by one year. Columns 5–8 present regressions of Year-over-Year Changes in Migrant Stock Abroad by Country as reported by the Indonesian Central Bank (BI) SEKI statistics Table 5.30 on various destination countries’ macroeconomic variables, either in contemporaneous year or lagged by one year. Migrant stock is in thousands of migrants. Macroeconomic variables are from the World Bank’s World Development Indicators. Regressions include year fixed effects and country fixed effects. Standard errors are clustered by country. Regressions use data from 2006-2010. \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

Table A.11: Indonesian Migrant Stock, Exchange Rates, and Destination Migration Policy

	Δ XR (1)	Migrant stock abroad (BI) (2)	Imputed stock (BNP2TKI terminal) (3)
Skill restriction (Many to No Exclusion)	0.0838 (0.0570)	-14.39 (28.60)	-10765.6 (23778.9)
Recruitment (Prohibited to Govt-Assisted)	-0.0592 (0.121)	-60.02 (134.7)	-71975.5 (95917.0)
Migrant labor prohibition (Complete block to none)	0.713 (0.829)	-23.05 (52.99)	8447.8 (25813.3)
Quota (less than 0.25 pct annual to no cap)	0.0407 (0.0376)	6.588 (24.05)	3415.3 (8978.9)
Observations	59	64	64

Note: This table presents regression coefficients of various dependent variables on a destination country’s migration policy. Migration policy data are from Peters et al. (2024) as compiled by Demscore (<http://www.demscore.de>). Independent variables in the regressions uses variables from COMPLAB MIGPOL Historical Immigration Policies Database, which covers 31 countries until 2010. Regressions restrict on the sample of countries that overlaps with significant destinations for Indonesian migrants, 2006-2010. Skill restriction variable refers to a continuous (1-5) score from only highly-educated-high-income earners are allowed to immigrate, preference for high-skill workers but many opportunities for low-skilled workers, to no skill restrictions for any visas. Recruitment codes are scored from no special visa to recruit labor, few visa for special groups such as agricultural workers, few restrictions to obtain work visa, to government recruiting workers. Migrant labor prohibition scores range from immigrants completely blocked from labor market, to restriction from some occupation or 30-50 percent immigrant workers max in a firm, to no restrictions to immigrants on position except for national security positions. Quota scores range from less than 0.25% population to enter annually, to over 1%, to no quota cap. Regressions include country fixed effects and year fixed effects, standard errors clustered by country. \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

Table A.12: 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						

Notes: This table tabulates summary statistics reported by former migrants from Bazzi, Cameron, et al. (2026), 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. In IDR terms, the median values of salaries in Middle East and Malaysia are all within the range of 3.0-3.7 million IDR (US\$177-209). Singapore, Hong Kong, and Taiwan are considerably higher at 5.9, 7.9, and 8.3 million IDR, respectively (US\$351, US\$467, and US\$492).

Table A.13: Post Period Migration

	(1)	(2)	(3)	(4)	(5)
	Migrants	Migrants	Migrants	Migrants	Migrants
XRshock.t	-771.6 (2022.4)	-1626.2 (1988.0)			-3407.0 (6451.5)
XRshock.t-1			-1122.7 (2246.6)		1604.9 (9089.1)
XRshock.t-2				-651.5 (3093.5)	2172.6 (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. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.14: Reasons Reported by Former Migrants in Bazzi, Cameron, et al. (2026) for Selecting Migration Destination Countries

No.	Reasons for choosing destinations	Only 1 country			2-3 countries		Switchers		
		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.15: Migrant Exchange Rate Shocks and Enrollment Rates by Gender

	Elementary		Jr. Secondary		Sr. Secondary	
	Girls (1)	Boys (2)	Girls (3)	Boys (4)	Girls (5)	Boys (6)
1. District and Year FEs only						
Migration $\times$ XRShock $_{t-1}$	2.841*** (0.968)	2.693*** (0.951)	5.130* (2.744)	1.962 (2.247)	3.096 (3.080)	11.169*** (2.860)
2. Baseline control interacted with year FEs						
Migration $\times$ XRShock $_{t-1}$	2.620*** (0.955)	2.512*** (0.937)	5.355* (2.727)	1.731 (2.227)	2.683 (3.051)	10.759*** (2.953)
3. Export commodity XR shock controls (Oil & Gas, Palm Oil)						
Migration $\times$ XRShock $_{t-1}$	2.583*** (0.973)	2.068** (0.947)	5.824** (2.721)	2.258 (2.341)	3.708 (3.052)	11.096*** (2.874)
4. Commodity controls and baseline $\times$ Year						
Migration $\times$ XRShock $_{t-1}$	2.448** (0.960)	1.986** (0.937)	6.217** (2.712)	2.248 (2.302)	3.473 (3.018)	10.862*** (2.965)
Dep. var mean	89.039	88.917	67.888	65.468	47.180	45.972
Dep var sd	4.149	4.269	10.483	11.224	13.800	13.825
Observations	2441	2441	2441	2441	2441	2441

*Notes:* This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shock is lagged by one period. Standard errors in parentheses are clustered by districts. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t1}$  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 is the ratio between the total migrants in the district from the 2005 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.16: Migrant Exchange Rate Shocks and Enrollment Rates by Gender with Survey Weight

	Elementary		Jr. Secondary		Sr. Secondary	
	Girls	Boys	Girls	Boys	Girls	Boys
	(1)	(2)	(3)	(4)	(5)	(6)
1. District and Year FEs only						
Migration $\times$ XRShock $_{t-1}$	3.005*** (0.962)	2.556*** (0.944)	5.469* (2.835)	1.472 (2.171)	2.016 (2.776)	9.732*** (2.809)
2. Baseline control interacted with year FEs						
Migration $\times$ XRShock $_{t-1}$	2.758*** (0.961)	2.395** (0.938)	5.692** (2.828)	1.272 (2.138)	1.783 (2.780)	9.469*** (2.859)
3. Export commodity XR shock controls (Oil & Gas, Palm Oil)						
Migration $\times$ XRShock $_{t-1}$	2.753*** (0.966)	1.951** (0.947)	6.165** (2.818)	1.780 (2.263)	2.689 (2.764)	9.815*** (2.838)
4. Commodity controls and baseline $\times$ Year						
Migration $\times$ XRShock $_{t-1}$	2.609*** (0.966)	1.897** (0.942)	6.538** (2.813)	1.762 (2.213)	2.604 (2.756)	9.679*** (2.883)
Dep. var mean	89.040	88.933	67.899	65.480	46.897	45.751
Dep var sd	4.176	4.235	10.543	11.288	13.831	13.855
Observations	2441	2441	2441	2441	2441	2441

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shock is lagged by one period. Standard errors in parentheses are clustered by districts. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t1}$  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 is the ratio between the total migrants in the district from the 2005 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.17: Migrant Exchange Rate Shocks and Enrollment Rates for Placebo Cohort

	Elementary			Jr. Secondary			Sr. Secondary		
	All (1)	Girls (2)	Boys (3)	All (4)	Girls (5)	Boys (6)	All (7)	Girls (8)	Boys (9)
1. District and Year FEs only									
Migration × XRShock <sub>t-1</sub>	-0.012 (0.106)	0.025 (0.154)	-0.111 (0.090)	0.141 (0.127)	0.212 (0.174)	0.080 (0.199)	-0.031 (0.538)	0.036 (0.678)	-0.112 (0.794)
2. Baseline control interacted with year FEs									
Migration × XRShock <sub>t-1</sub>	-0.009 (0.107)	0.036 (0.157)	-0.116 (0.090)	0.138 (0.128)	0.210 (0.171)	0.071 (0.201)	-0.109 (0.566)	-0.049 (0.699)	-0.197 (0.809)
3. Export commodity XR shock controls (Oil & Gas, Palm Oil)									
Migration × XRShock <sub>t-1</sub>	-0.009 (0.105)	0.040 (0.149)	-0.113 (0.095)	0.130 (0.133)	0.239 (0.175)	0.032 (0.207)	-0.276 (0.554)	-0.307 (0.674)	-0.247 (0.794)
4. Commodity controls and baseline × Year									
Migration × XRShock <sub>t-1</sub>	-0.006 (0.106)	0.050 (0.151)	-0.119 (0.096)	0.119 (0.133)	0.229 (0.173)	0.018 (0.210)	-0.284 (0.573)	-0.304 (0.695)	-0.290 (0.806)
Dep. var mean	0.036	0.036	0.035	0.198	0.158	0.236	2.857	2.290	3.440
Dep var sd	0.254	0.290	0.347	0.413	0.457	0.583	2.028	2.239	2.604
Observations	2441	2441	2441	2441	2441	2441	2441	2441	2441

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shock is lagged by one period. Standard errors in parentheses are clustered by districts. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t1}$  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 is the ratio between the total migrants in the district from the 2005 village census data and the district population. The outcome variables are constructed for cohorts too old to still be in school. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.18: Effects on Village Informal Taxation

	(1)	(2)	(3)	(4)	(5)	(6)
	Household Manpower for Building Village	Household Contribute Money/ Goods for Building	Money/ Goods Contribution for Building (Log IDR)	Household Manpower for Maintenance in Village	Household Contribute Money/ Goods for Maintenance	Money/ Goods Contribution for Maintenance (Log IDR)
Migration × XRShock <sup>t-1</sup>	0.0341 (0.96)	0.0514** (2.23)	0.489** (2.06)	0.00852 (0.26)	0.0369 (1.59)	0.361 (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 is from the 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. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.19: Migrant Income Shocks and Water Access

	(1)	(2)	(3)	(4)
	Piped water	Bottled water	Well not protected	Borehole or protected well
Access type:	Public	Private	Private	Private
Estimated Cost (Nastiti et al. (2017))	\$135–\$177	\$35–\$208	\$50–\$250	\$250–\$1150
1. District and Year FEs				
Migration $\times$ XRShock <sub>t-1</sub>	0.060*** (0.020)	-0.114*** (0.025)	-0.019 (0.014)	0.071*** (0.022)
2. Baseline controls interacted with Year FEs				
Migration $\times$ XRShock <sub>t-1</sub>	0.048** (0.020)	-0.065** (0.027)	-0.016 (0.014)	0.036* (0.019)
3. Commodity controls and baseline $\times$ year				
Migration $\times$ XRShock <sub>t-1</sub>	0.050** (0.020)	-0.069*** (0.026)	-0.017 (0.014)	0.040** (0.019)
Dep. var. mean	0.158	0.103	0.107	0.404
Dep. var. sd	0.154	0.149	0.110	0.211
Observations	2423	2423	2423	2423

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shock is lagged by one period. Standard errors in parentheses are clustered by districts. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The outcome variables are various types of household drinking water source from the Susenas surveys. 'Piped water' refers to metered and retailed piped water; 'bottled water' refers to branded and refill waters; and 'well not protected' refers to unprotected wells or dug wells. Estimated cost data is from Nastiti et al. (2017), and refers to the sum of the capital cost and monthly cost for 12 months (cf. Table 2). Cost are expressed in US dollars, with an exchange rate of IDR10,000/USD. Ranges in the cost estimates uses the minimum and the maximum estimates from Nastiti et al. (2017). The interaction variable  $Migration \times XRShock_{t1}$  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 is the ratio between the total migrants in the district from the 2005 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.20: Public Service Provisions and Migrant Exchange Rate Shocks with Distributed Lag

	Jr. Sec attached to Elementary (1)	Classrooms per Jr. Sec Schools (2)	Teachers per Jr. Sec Schools (3)
Migration $\times$ XRShock <sub>t-1</sub>	0.010 (0.006)	0.149 (0.128)	0.219 (0.189)
Migration $\times$ XRShock <sub>t-2</sub>	0.021*** (0.007)	-0.181* (0.101)	-0.234 (0.153)
Migration $\times$ XRShock <sub>t-3</sub>	0.023 (0.014)	-0.265* (0.150)	-0.352* (0.199)
Migration $\times$ XRShock <sub>t-4</sub>	0.006 (0.014)	-0.033 (0.142)	-0.036 (0.203)
Sum All Lag coefs.	0.061*** (0.023)	-0.331 (0.321)	-0.403 (0.500)
Dep. var. mean	0.09	10.75	18.98
Dep. var. sd	0.11	3.06	5.56
Observations	1346	1346	1346

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shocks are included with lags of up to four periods. Standard errors in parentheses are clustered by districts. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t1}$  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 is the ratio between the total migrants in the district from the 2005 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.21: Migrant Income Shocks and School Quality

	Elementary Schools				Jr Secondary Schools			
	Teachers/school		Average Teacher Score		Teachers/school		Average Teacher Score	
	Public	Est. 2002+	Public	Est. 2002+	Public	Est. 2002+	Public	Est. 2002+
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Migration $\times$ XRShock $_{t-1}$	-0.06 (0.10)	0.15 (0.31)	-0.15 (0.10)	-0.36 (0.65)	-0.62* (0.35)	-0.22 (0.38)	-0.29 (0.31)	-1.32** (0.65)
Migration $\times$ XRShock $_{t-2}$	-0.30*** (0.11)	-0.45* (0.27)	-0.33*** (0.09)	-0.92* (0.54)	-0.71** (0.35)	-0.83** (0.39)	-0.44 (0.27)	-0.47 (0.63)
Migration $\times$ XRShock $_{t-3}$	0.02 (0.13)	-0.13 (0.39)	-0.34*** (0.11)	-0.49 (0.74)	-1.66*** (0.44)	-1.23*** (0.45)	-0.58* (0.35)	-0.95 (1.05)
Migration $\times$ XRShock $_{t-4}$	-0.35*** (0.13)	-1.06* (0.57)	-0.24** (0.11)	0.19 (0.74)	-0.72 (0.50)	-0.31 (0.56)	-0.58 (0.44)	-1.28 (1.27)
Sum All Lag coefs.	-0.69* (0.37)	-1.49* (0.89)	-1.06*** (0.31)	-1.58 (2.05)	-3.71*** (1.23)	-2.58** (1.16)	-1.89** (0.89)	-4.03* (2.33)
Dep var mean	8.00	7.44	52.86	53.34	15.88	8.79	57.31	57.19
Dep var sd	2.05	2.92	5.04	5.93	7.36	5.08	5.71	5.77
Observations	1334	1250	1334	1250	1332	1265	1332	1265

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shocks are included with lags of up to four periods. Standard errors in parentheses are clustered by districts. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The outcomes of interest are the number of teachers per school in the 2015 nationwide teacher competency exam (UKG) and the mean score of the teachers. The estimation panel was constructed from the UKG data, keeping only teachers with the start of their teaching date prior to the year of the panel under the assumptions that the teachers' schools are as observed in 2015. Teachers were graded in the UKG with a score that runs from 0-100. Columns (3) and (6) restricts to public schools that are established in 2002 or later, with establishment date determined using the Dapodik dataset with school number matching (NPSN). Columns (2) and (5) restrict to all public schools, and columns (1) and (4) use all schools in the district. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.22: Private Education Responses

	Private	Private	Private	Private	Private	Private
	Elementary Schools	Jr. Secondary Schools	Sr. Secondary Schools	Elementary <i>madrasa</i>	Jr. Secondary <i>madrasa</i>	Sr. Secondary <i>madrasa</i>
	(1)	(2)	(3)	(4)	(5)	(6)
Migration $\times$ XRShock $_{t-1}$	0.056* (0.033)	0.021 (0.022)	0.022 (0.014)	0.211*** (0.071)	0.081** (0.040)	0.030 (0.019)
Migration $\times$ XRShock $_{t-2}$	0.076** (0.030)	0.051** (0.022)	0.057*** (0.014)	0.118 (0.076)	0.057 (0.045)	0.037* (0.022)
Migration $\times$ XRShock $_{t-3}$	0.103** (0.044)	0.085*** (0.029)	0.081*** (0.020)	0.312*** (0.096)	0.174** (0.068)	0.060** (0.026)
Migration $\times$ XRShock $_{t-4}$	0.081* (0.044)	0.006 (0.033)	0.021 (0.021)	0.104 (0.084)	0.087* (0.046)	0.018 (0.025)
Sum All Lag coefs.	0.316*** (0.115)	0.163* (0.084)	0.181*** (0.049)	0.745*** (0.175)	0.399*** (0.124)	0.145** (0.068)
Dep. var. mean	0.67	0.45	0.31	0.57	0.38	0.19
Dep. var. sd	1.18	0.32	0.22	0.61	0.34	0.17
Observations	1346	1346	1346	1334	1334	1334

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shocks are included with lags of up to four periods. Standard errors in parentheses are clustered by districts. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t+1}$  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 is the ratio between the total migrants in the district from the 2005 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.23: Determinants of new schools in villages

	Elementary		Jr. Secondary	
	New school (1)	New school (2)	New school (3)	New school (4)
Village Split	0.008** (0.004)		-0.002 (0.004)	
Pre-2005 Village Split		0.013** (0.006)		0.016** (0.007)
Post-2005 Village Split		0.007 (0.004)		-0.009** (0.004)
Public elementary school in 2000	-0.011*** (0.003)	-0.011*** (0.003)	0.024*** (0.002)	0.024*** (0.002)
Public jr. secondary school in 2000	0.029*** (0.006)	0.029*** (0.006)	-0.076*** (0.004)	-0.076*** (0.004)
6-12 yo. School participation rate in 2000	-0.038*** (0.012)	-0.038*** (0.012)	0.088*** (0.016)	0.088*** (0.016)
13-15 yo. School participation rate in 2000			-0.179*** (0.014)	-0.179*** (0.014)
Dep. var. mean	0.057	0.057	0.080	0.080
Dep. var. sd	0.276	0.276	0.278	0.278
Observations	68,324	68,324	68,324	68,324

Notes: Regressions of the number of new public elementary schools (SD) in the village, built between 2005-2012. Regressions include district FEs. Observation units are villages from a merged dataset combining the village crosswalk dataset, *Dapodik*, and the 2000 population census, keeping only unique village matches. Villages are matched by its name, the name of its sub-district, and its district. Standard errors are clustered at the district level.  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.24: Village Heads' Perceived Challenges in Education

	Facility	Cost	Facility
	Inadequate (1)	Unaffordable (2)	Over Cost (3)
Migration $\times$ XRShock <sub>t-1</sub>	0.353 (0.373)	-0.506* (0.286)	0.206* (0.119)
Dep.Var Mean	0.791	0.365	0.244
Villages	572	572	572
Observations	6886	6886	6886

Notes: This table reports the estimates of equation (5) on the sample of Village Head Survey from Olken et al. (2014) and Cahyadi et al. (2020). The interaction variable Migration<sub>d</sub>  $\times$  XRShock<sub>t-1</sub> 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 ratio between the total migrant and total population from the 2005 village census. 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.25: Comparison of Public Service Requests from Villages, MCLE 2009 data

Public service requests	TKI	non-TKI	TKI	non-TKI
	villages	villages	Aceh	Aceh
	(1)	(2)	villages	villages
	(1)	(2)	(3)	(4)
# of projects asked in past 2 years	5.55	4.61	5.55	4.40
% Asked for road	0.86	0.72	0.88	0.69
% Received road	0.16	0.10	0.14	0.06
% Asked for worship houses	0.86	0.72	0.86	0.77
% Received worship houses	0.19	0.18	0.18	0.16
% Asked for water/sanitation	0.56	0.49	0.55	0.48
% Received water/sanitation	0.10	0.12	0.06	0.05
% Asked for irrigation	0.56	0.33	0.61	0.49
% Received irrigation	0.09	0.03	0.10	0.05
% Asked for health facilities	0.54	0.44	0.53	0.38
% Received health facilities	0.19	0.17	0.18	0.10
% Asked for education facilities	0.44	0.42	0.41	0.31
% Received education facilities	0.16	0.14	0.13	0.07
# project requests helped by MPs	0.74	0.64	0.78	0.67
# project requests helped by public employees	0.65	0.42	0.69	0.44
Number of villages	140	163	129	108

*Note:* Comparison of villages in subdistricts with TKI migrants from World Bank Mediation and Community Legal Empowerment (MCLE) 2009 data. N=303 villages in Aceh and Maluku. Villages are matched with Podes 2005 village names to retrieve TKI numbers, then aggregated to sub-district level. Villages are classified as TKI villages if the average number of TKI per surveyed village is above 1.45 (i.e., slightly above 1.2—the median for Aceh villages) and the number of surveyed villages in a subdistrict is more than 2. MCLE asked for 14 public goods. Other than the six detailed in the table, MCLE asked for bridges, public transportation, fishpond (*tambak*), market, village administrative building, training, legal services, and others. The overall share of villages asking for these non-listed goods are fewer than the share of villages asking for education facilities. Project requests helped by MPs are non-specified member of parliament, i.e., inclusive of district, province, or national parliament member (*Anggota Dewan*). Project requests help by public employees comprise help by sub-district head (*camat*), salaried government employees (PNS), District Education Office (*Dinas Pendidikan*) or teachers, District Health Office (*Dinas Kesehatan*) or a doctor/midwife/other medical personnel, etc.

Table A.26: Comparison of household networks and education attainment desire, PEKKA 2011 data

Household Characteristics	Abroad member		No abroad member	
	Mean	N	Mean	N
	(1)	(2)	(3)	(4)
Size of close network [0-6]	1.16	58	0.73	1061
Village leader is extended family or closer [0,1]	0.25	71	0.19	829
Sub-village leader is extended family or closer [0,1]	0.39	71	0.28	829
Desired school attainment for a boy is high school or college [0,1]	0.93	54	0.93	983
Desired school attainment for a girl is high school or college [0,1]	0.91	54	0.91	982
Same level desired school attainment for boys and girls [0,1]	0.96	54	0.90	982
Higher desired school attainment for boys than girls [0,1]	0.04	54	0.08	982
Agree that early childhood education important [0,1]	1.00	53	0.95	934

*Note:* Summary statistics using data from World Bank's Women-Headed Household Empowerment Program (PEKKA) Survey of Village Households (SRTP) study in 2011. The PEKKA study was fielded in four provinces: West Sumatera, Banten, DI Yogyakarta, and South Kalimantan in 24 villages in total, with 100 households in each village. Statistics in this tabulation are restricted in 9 villages where there are 71 households with members who reported that their spouse is abroad in a different country (74 individuals). Tabulation uses responses from Book 3 (whether village/sub-village leader is extended family or closer) and 5 (other characteristics) and the survey. Tabulation for Book 5 responses restricts to either the individual whose spouse is abroad (Abroad member group) or No abroad member group. The "no abroad member" group is defined as married individuals with co-habitant spouses age 21-60, residing in the same villages as abroad member group, and not part of the Abroad member group households (i.e., no one in the households report that their spouse is outside Indonesia).

Table A.27: Public Schools Provision, Regression with Interactions with Different Election Timing and Migrant Exchange Rate Shocks

	Elementary school (1)	Elementary school (2)	Elementary school (3)	Elementary school (4)	Jr. Sec school (5)	Jr. Sec school (6)	Jr. Sec school (7)	Jr. Sec school (8)
Sum Migration $\times$ XRSchock $_{t-1,t-2,t-3,t-4}$	-1.682 (1.427)	0.784 (0.777)	1.597*** (0.462)	0.106 (1.233)	0.405 (0.494)	0.545** (0.243)	0.707*** (0.239)	0.619 (0.406)
Sum Election $_{t+1}$ $\times$ Migration $\times$ XRShock $_{t-1,t-2,t-3,t-4}$	3.156 (3.815)				1.080 (1.037)			
Sum Election $_t$ $\times$ Migration $\times$ XRShock $_{t-1,t-2,t-3,t-4}$		-1.065 (1.212)				0.037 (0.424)		
Sum Election $_{t-1}$ $\times$ Migration $\times$ XRShock $_{t-1,t-2,t-3,t-4}$			-16.387* (9.492)				-2.697* (1.615)	
Sum Election $_{t-2}$ $\times$ Migration $\times$ XRShock $_{t-1,t-2,t-3,t-4}$				3.438 (2.139)				0.300 (0.577)
Observations	1089	1346	1346	1346	1089	1346	1346	1346

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shocks are included with lags of up to four periods, interacted with a dummy variable for whether there is a local election in the district up to four periods before. The variable  $Migration \times XRShock_{t1}$  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. Migration is the ratio between the total migrants in the district from the 2005 village census data and the district population. Standard errors in parentheses are clustered by districts. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.28: Effects on Voting Behavior

	(1) Presidential Election 2009	(2) District Election (past two years)	(3) Village Head Election (past two years)	(4) Complaints to Village Head about Anti- Poverty Programs
Migration $\times$ XRShock $^{t-1}$	-0.0162 (-0.95)	-0.0260** (-2.21)	-0.00250 (-0.15)	-0.0969* (-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. Regressions 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. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.29: Associations of Campaign Platform Contents and Local Election Outcomes

	Total votes (000)				Has most vote			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
# candidates	-45.74*** (9.45)	-46.35*** (9.82)	-44.85*** (9.02)	-44.66*** (9.44)	-0.04** (0.02)	-0.04** (0.02)	-0.04** (0.02)	-0.04* (0.02)
PDI-P	52.93*** (14.87)	52.49*** (15.27)	51.77*** (15.00)	51.85*** (15.27)	0.26*** (0.07)	0.26*** (0.07)	0.25*** (0.07)	0.25*** (0.07)
Golkar	69.62*** (15.26)	69.34*** (15.60)	74.23*** (15.90)	74.01*** (16.07)	0.14** (0.06)	0.13** (0.06)	0.14** (0.06)	0.14** (0.06)
Independent	-38.73 (24.54)	-38.32 (24.97)	-32.28 (24.03)	-32.65 (24.56)	0.03 (0.06)	0.01 (0.06)	0.04 (0.06)	0.03 (0.06)
Any Islamic party	61.52*** (19.50)	62.12*** (20.21)	63.99*** (19.25)	63.89*** (19.71)	0.20*** (0.06)	0.19*** (0.06)	0.20*** (0.06)	0.19*** (0.06)
Mentions SMA/SMK		-23.23 (27.07)		-10.82 (24.64)		0.15* (0.08)		0.18** (0.09)
Mentions free education			-31.17 (41.65)	-32.17 (38.19)			0.04 (0.09)	-0.03 (0.10)
Mentions ed. quality/human resources			49.42*** (18.15)	48.33*** (18.14)			0.07 (0.07)	0.07 (0.07)
Mentions ed. facilities			-34.69 (27.26)	-38.69 (25.00)			-0.08 (0.11)	-0.10 (0.10)
Mentions religious/moral ed.			64.48 (42.02)	58.20 (42.30)			0.20 (0.15)	0.16 (0.15)
Mentions health alongside education			16.10 (12.64)	16.71 (13.10)			0.13** (0.06)	0.14** (0.06)
R2	0.600	0.602	0.613	0.614	0.271	0.281	0.288	0.300
Observations	511	511	511	511	511	511	511	511

Notes: This table presents the estimated coefficients from regressions of election outcomes on election characteristics and candidates' campaign platforms. All regressions include district fixed effects, year fixed effects, indicators for Gerindra party, Demokrat party, and candidates' ballot number (not shown on table). Any Islamic party indicates that the candidate is supported by either PKS, PPP, PAN, or PKB. Mention of health alongside education indicates that the candidates' reference to health (*kesehatan*) is within a 30-character distance from their mention of education. Sample only includes candidates in elections with at least two candidates with retrievable campaign platforms. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ . Standard errors are clustered at the district level in parentheses.

Table A.30: Migrant Exchange Rate Shocks and Household Assets

	Asset Index (1)	Bicycles (2)	Motorcycles (3)	Cooking Gas (4)	Fridge (5)
1. District and Year FEs only					
Migration $\times$ XRShock $_{t-1}$	0.047*** (0.015)	0.027 (0.022)	0.023 (0.019)	0.052** (0.022)	0.087*** (0.021)
2. Baseline control interacted with year FEs					
Migration $\times$ XRShock $_{t-1}$	0.046*** (0.014)	0.020 (0.021)	0.037** (0.018)	0.043* (0.023)	0.082*** (0.020)
3. Export commodity XR shock controls (Oil & Gas, Palm Oil)					
Migration $\times$ XRShock $_{t-1}$	0.048*** (0.015)	0.033 (0.022)	0.018 (0.019)	0.052** (0.022)	0.090*** (0.022)
4. Commodity controls and baseline $\times$ Year					
Migration $\times$ XRShock $_{t-1}$	0.045*** (0.014)	0.024 (0.021)	0.031* (0.018)	0.043* (0.023)	0.083*** (0.020)
Dep. var. mean	0.35	0.35	0.59	0.14	0.32
Dep. var. sd	0.13	0.21	0.17	0.12	0.17
Observations	909	909	909	909	909

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shock is lagged by one period. Standard errors in parentheses are clustered by districts. The sample is a 2010-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t1}$  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 is the ratio between the total migrants in the district from the 2005 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.31: Migrant Exchange Rate Shocks and Sectoral GDP per Capita

	All services (1)	Trade, Hotel & Restaurant (2)	Financial & Business (3)	Transport & Communication (4)	Other services (5)
Migration $\times$ XRShock <sub>t-1</sub>	0.118*** (0.043)	0.134*** (0.043)	0.088* (0.051)	0.044 (0.059)	0.189** (0.078)
Observations	2407	2407	2407	2407	2407

*Notes:* This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shock is lagged by one period. Standard errors in parentheses are clustered by districts. The sample is a 2005–2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t-1}$  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 is the ratio between the total migrants in the district from the 2005 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.32: Selected Estimates of Output Multipliers from the Literature

Estimates	Notes
I. <b>Egger et al., 2022</b> (Kenya). Cash transfers from NGO GiveDirectly, USD 1000 to 10,500 households.	
2.47–2.58	The average of multipliers from expenditure- and income-based approaches (Table V and footnote 4).
II. <b>Corbi, Papaioannou, and Surico, 2019</b> (Brazil). Discontinuous increases in federal transfers (FPM) to municipalities.	
1.36–2.58	Transfer multiplier with only formal jobs (Table 8). The range of local income multiplier is centered around 2.1 with varying parameters for the share of capital and employment elasticity (footnote 29).
1.63–3.10	Transfer multiplier including informal sector jobs, under the assumption that 0.5 informal jobs are created for each formal sector job.
III. <b>Gerard, Naritomi, and Silva, 2025</b> (Brazil). An increase in the total beneficiaries of the <i>Bolsa Familia</i> (PBF).	
1.46–1.95	Transfer multiplier using Chodorow-Reich (2019) approach. The PBF expansion increased the number of private formal jobs in treated municipalities. From footnote 51: The multiplier would be 1.77–2.38 if new jobs were as productive as the average job, or 2.72–3.65 if new jobs were as productive as the average formal job in the economy.
4.99–7.16	Transfer multiplier using IBGE data. From Section 4.2: Using local GDP computed by IBGE yields a multiplier of 4.99. From Footnote 48: Using overall GDP, the point estimate is larger (7.16).
1.80–20.9	Transfer multiplier in the 2021 version of the manuscript, from footnote 34 in Gerard, Naritomi, and Silva (2021).
IV. <b>Khanna, Murathanoglu, et al., 2026</b> (the Philippines) Migrant income shock due to 1997 exchange rates.	
2.9	Multiplier used in discussion in Section V.C, from Breza and Kinnan (2021).
24.24–30.73	The estimated coefficients on global income per capita, from Table I, column (3) and Section IV.A–IV.B. A one-standard-deviation shock (0.093) increases global income per capita by 2,265 pesos in 2009–2015.
13.30–19.06	The estimated coefficients on expenditures per capita, from Table I, column (6) and Section IV.A–IV.B.
V. <b>Sadoulet, De Janvry, and Davis, 2001</b> (Mexico). PROCAMPO transfer to anticipate NAFTA effects on crop prices.	
1.5–2.6	Multiplier for households in the <i>ejido</i> sector, from Table 3 and Section 4.b.
VI. <b>Breza and Kinnan, 2021</b> (India). The removal of microfinance in Andhra Pradesh. The aggregate loan fell by \$1 billion.	
2.9	Multiplier on total consumption, from footnote 26. Another calculation in Section IV.D produces a lower bound estimate of 1.9.

Table A.33: Long-Run Estimates on Education Outcomes and Mincer Regression

	All (1)	Female (2)	Male (3)	All (4)	Female (5)	Male (6)
A. Years of Education						
	With 1988-1993 Cohorts			Without 1988-1993 Cohorts		
Above-median migration <sub>d</sub> × Treated Cohort <sub>y</sub>	0.551*** (0.073)	0.472*** (0.083)	0.611*** (0.072)	0.682*** (0.089)	0.616*** (0.101)	0.718*** (0.085)
Observations	448,717	226,085	222,632	391,075	196,096	194,979
B. Secondary and College Education						
	Secondary Education			College Education		
Above-median migration <sub>d</sub> × Treated Cohort <sub>y</sub>	0.048*** (0.008)	0.038*** (0.009)	0.054*** (0.009)	0.008** (0.003)	-0.002 (0.005)	0.016*** (0.004)
Observations	391,075	196,096	194,979	391,075	196,096	194,979
C. Mincer regression						
	With 1988-1993 Cohorts			Without 1988-1993 Cohorts		
Years of Education	0.064*** (0.001)	0.082*** (0.001)	0.056*** (0.001)	0.090*** (0.001)	0.110*** (0.001)	0.080*** (0.001)
Observations	402,921	139,864	263,057	350,073	120,818	229,255
D. Wage (log IDR)						
	With 1988-1993 Cohorts			Without 1988-1993 Cohorts		
Above-median migration <sub>d</sub> × Treated Cohort <sub>y</sub>	0.015 (0.015)	-0.009 (0.025)	0.027** (0.012)	0.032* (0.018)	0.020 (0.030)	0.037** (0.015)
Observations	279,654	98,846	180,808	244,095	86,348	157,747

*Notes:* This table presents the estimated coefficients using data from the 2021 Labor Force Survey, restricted to those not currently still in school. The samples are defined for all gender, female, and male. Panels A, B, and D present coefficients from regressions with a two-way fixed effects of outcomes on the interaction variable of a district-level indicator that its 2006-2012 migrant income shock is above the national median and a treatment cohort indicator. The fully treated cohort is defined as being born in 1994–2006 (i.e., age 0–12 in 2006; age 6–18 in 2012; age 15–27 in 2021), with the comparison group being cohorts born in 1960–1987 (i.e., age 19 or older in 2006; age 34–61 in 2021), with those who are born between 1988-1993 defined as partially treated. Panel C present coefficients on a Mincerian regression, controlling for gender and experience up to a quadratic term. Experience is calculated as the survey year, subtracted by seven and the years of completed education. Standard errors are clustered at the district level. \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

Table A.34: Migrant Exchange Rate Shocks Responses, Robustness to Dropping Specific Currencies

	I. Dropping USD			II Dropping MYR			III. Dropping SGD		
				A. School enrollment					
	Elem. School (1)	Jr. Sec School (2)	Sr. Sec School (3)	Elem. School (4)	Jr. Sec School (5)	Sr. Sec School (6)	Elem. School (7)	Jr. Sec School (8)	Sr. Sec School (9)
Migration $\times$ XRShock $_{t-1}$	1.848** (0.866)	4.303** (2.002)	7.404*** (2.146)	1.750** (0.820)	3.965** (1.886)	6.676*** (2.047)	1.732** (0.853)	4.070** (1.966)	7.077*** (2.080)
Dep. var. mean	88.96	66.60	46.49	88.96	66.60	46.49	88.96	66.60	46.49
Dep. var. sd	3.81	9.86	12.73	3.81	9.86	12.73	3.81	9.86	12.73
Observations	2413	2413	2413	2413	2413	2413	2413	2413	2413
	B. School infrastructure								
	Elem. School (10)	Jr. Sec School (11)	Sr. Sec School (12)	Elem. School (13)	Jr. Sec School (14)	Sr. Sec School (15)	Elem. School (16)	Jr. Sec School (17)	Sr. Sec School (18)
Sum All Lag coefs.	1.443** (0.614)	0.667*** (0.242)	0.068 (0.068)	1.329** (0.581)	0.599*** (0.230)	0.057 (0.064)	1.358** (0.584)	0.637*** (0.232)	0.056 (0.063)
Dep. var. mean	6.16	1.16	0.31	6.16	1.16	0.31	6.16	1.16	0.31
Dep. var. sd	2.90	0.83	0.24	2.90	0.83	0.24	2.90	0.83	0.24
Observations	1346	1346	1346	1346	1346	1346	1346	1346	1346
	C. Other public goods								
	Elec. HH (19)	Piped Water (20)	Asphalt Road (21)	Elec. HH (22)	Piped Water (23)	Asphalt Road (24)	Elec. HH (25)	Piped Water (26)	Asphalt Road (27)
Migration $\times$ XRShock $_{t-1}$	0.052*** (0.020)	0.056*** (0.019)	0.035 (0.022)	0.052*** (0.019)	0.051*** (0.018)	0.032 (0.021)	0.042** (0.020)	0.052*** (0.019)	0.036* (0.022)
Dep. var. mean	0.89	0.16	0.69	0.89	0.16	0.69	0.89	0.16	0.69
Dep. var. sd	0.15	0.15	0.24	0.15	0.15	0.24	0.15	0.15	0.24
Observations	2176	2413	2138	2176	2413	2138	2176	2413	2138

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shock is lagged by one period for Panels A and C, while Panel B includes lags of up to four periods. Standard errors in parentheses are clustered by districts. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t1}$  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, dropping XR for specific destinations. USD exclusion refers to exclusion of migrants stock in USA and other countries with USD-pegged currencies, i.e., Saudi, Hong Kong, UAE, Oman, Qatar, Lebanon, Macau; MYR exclusion refers to Malaysia, SGD exclusion refers to Singapore and Brunei. Migration is the ratio between the total migrants in the district from the 2005 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.35: Impact of Migrant Exchange Rate Shock with Alternative Clustering

A. District Enrollment				
	Elementary school (1)	Jr. Sec school (2)	Sr. Sec school (3)	
Migration $\times$ XRShock $_{t-1}$	1.705 (0.872)* [0.945]* {0.942}*	4.338 (2.065)** [2.293]* {2.305}*	7.530 (2.196)*** [2.363]*** {2.354}***	
Dep. Var. Mean	88.96	66.60	46.49	
Dep. Var. SD	3.81	9.86	12.73	
Observations	2413	2413	2413	
B. Schools and Health Centers				
	Elementary school (4)	Jr. Sec school (5)	Sr. Sec school (6)	Community health center (7)
Migration $\times$ XRShock $_{t-1}$	0.154 (0.174) [0.174] {0.180}	0.073 (0.058) [0.060] {0.060}	-0.014 (0.017) [0.017] {0.017}	0.015 (0.045) [0.045] {0.046}
Migration $\times$ XRShock $_{t-2}$	0.412 (0.161)** [0.160]** {0.160}**	0.175 (0.059)*** [0.061]*** {0.061}***	0.023 (0.024) [0.025] {0.025}	0.025 (0.037) [0.037] {0.037}
Migration $\times$ XRShock $_{t-3}$	0.778 (0.176)*** [0.172]*** {0.180}***	0.295 (0.107)*** [0.103]*** {0.104}***	0.026 (0.036) [0.034] {0.034}	0.101 (0.056)* [0.056]* {0.056}*
Migration $\times$ XRShock $_{t-4}$	0.073 (0.258) [0.258] {0.258}	0.115 (0.089) [0.083] {0.084}	0.022 (0.023) [0.020] {0.021}	0.068 (0.092) [0.092] {0.093}
Dep. Var. Mean	6.16	1.16	0.31	0.41
Dep. Var. SD	2.90	0.83	0.24	0.23
Observations	1346	1346	1346	861
C. Other Public Goods				
	Household electricity (8)	Household piped water (9)	Village asphalt road (10)	
Migration $\times$ XRShock $_{t-1}$	0.037 (0.020)* [0.020]* {0.020}*	0.050 (0.020)** [0.020]** {0.020}**	0.040 (0.022)* [0.021]* {0.022}*	
Dep. Var. Mean	0.89	0.16	0.69	
Dep. Var. SD	0.15	0.15	0.24	
Observations	2186	2423	2149	

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shock is lagged by one period for Panels A and C, while Panel B includes lags of up to four periods. Standard errors in parentheses are clustered by districts. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t1}$  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. 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. Migration is the ratio between the total migrants in the district from the 2005 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.36: 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	2,472
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.37: Foreign Direct Investment, Exchange Rates, and Migration

	(1)	(2)	(3)	(4)
	$\log FDI_t$	$\log FDI_{t+1}$	$\log FDI_t$	$\log FDI_{t+1}$
Currency Exchange Rate	-1.056 (1.129)	-0.762 (1.156)		
log(Migrants)			-0.00251 (0.0595)	-0.000633 (0.0381)
Constant	5.664*** (1.385)	5.334*** (1.402)	4.259*** (0.221)	4.585*** (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. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ . Standard errors are clustered by country in parentheses.

Table A.38: Correlation between Commodity Production and Migration

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

Notes: Cross-sectional regression between a district's oil and gas revenue or its palm oil area with the migration intensity. Columns 2 and 4 include province fixed effects. Standard errors are clustered at the province level in parentheses. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.39: Migrant Exchange Rate Shocks and District Outcomes, Controlling for Contemporaneous Migration interacted with XR Changes to Saudi and Malaysia

	I. current migration control			II. current migration $\times$ XR <sub>t</sub> <sup>SAR</sup>		
	A. Enrollment					
	Elementary School Enrollment (6-12 yo.) (1)	Jr. Sec School Enrollment (13-15 yo.) (2)	Sr. Sec School Enrollment (16-18 yo.) (3)	Elementary School Enrollment (6-12 yo.) (4)	Jr. Sec School Enrollment (13-15 yo.) (5)	Sr. Sec School Enrollment (16-18 yo.) (6)
Migration $\times$ XRShock <sub>t-1</sub>	1.703* (0.867)	4.457** (2.079)	7.530*** (2.197)	1.713** (0.868)	4.427** (2.071)	7.548*** (2.206)
Observations	2413	2413	2413	2413	2413	2413
B. Public Schools						
	Elementary School (7)	Jr. Sec School (8)	Sr. Sec School (9)	Elementary School (10)	Jr. Sec School (11)	Sr. Sec School (12)
Migration $\times$ XRShock <sub>t-1</sub>	0.427 (0.305)	0.261** (0.108)	0.027 (0.032)	0.425 (0.304)	0.260** (0.108)	0.026 (0.032)
Observations	2424	2424	2424	2424	2424	2424
C. Public Schools, Distributed Lag						
	Elementary School (13)	Jr. Sec School (14)	Sr. Sec School (15)	Elementary School (16)	Jr. Sec School (17)	Sr. Sec School (18)
Migration $\times$ XRShock <sub>t-1</sub>	0.195 (0.162)	0.071 (0.055)	-0.013 (0.017)	0.193 (0.161)	0.072 (0.055)	-0.014 (0.017)
Migration $\times$ XRShock <sub>t-2</sub>	0.302 (0.204)	0.179** (0.072)	0.022 (0.030)	0.281 (0.205)	0.185** (0.077)	0.016 (0.033)
Migration $\times$ XRShock <sub>t-3</sub>	0.734*** (0.186)	0.297*** (0.110)	0.026 (0.035)	0.728*** (0.187)	0.299*** (0.112)	0.024 (0.035)
Migration $\times$ XRShock <sub>t-4</sub>	0.052 (0.266)	0.115 (0.091)	0.022 (0.024)	0.072 (0.279)	0.109 (0.091)	0.028 (0.024)
Observations	1346	1346	1346	1346	1346	1346
D. Other Public Goods						
	Household with Electricity (19)	Household with Piped Water (20)	Villages with Asphalt Road (21)	Household with Electricity (22)	Household with Piped Water (23)	Villages with Asphalt Road (24)
Migration $\times$ XRShock <sub>t-1</sub>	0.036* (0.019)	0.051** (0.020)	0.039* (0.022)	0.036* (0.019)	0.050** (0.020)	0.039* (0.022)
Observations	2186	2423	2149	2186	2423	2149

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The regressions for this table includes the addition of contemporaneous migration rate or its interaction with the exchange rates to the Saudi Riyal. The contemporaneous migration rate is sourced from KP2MI dashboard. The migrant exchange rate shock is lagged by one period for Panels A, B and D, while Panel C includes lags of up to four periods. Standard errors in parentheses are clustered by districts. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t1}$  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 is the ratio between the total migrants in the district from the 2005 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.40: Migrant Exchange Rate Shocks and Various District-level Outcomes, Shock Instrumented Using Shares Three Year Earlier

	Elementary Sch. Enrollment (6-12 yo.) (1)	Jr. Sec. Sch. Enrollment (13-15 yo.) (2)	Sr. Sec. Sch. Enrollment (16-18 yo.) (3)	Elementary Schools (Grades 1-6) (4)	Jr. Sec Schools (Grades 7-9) (5)	Sr. Sec Schools (Grades 10-12) (6)
Migration $\times$ XRShock <sub>t-1</sub>	3.110*** (0.901)	3.509 (2.278)	6.229** (2.486)	0.428 (0.364)	0.338** (0.154)	0.0386 (0.0473)
Kleibergen-Paap F stat.	1013.4	1013.4	1013.4	1013.4	1013.4	1013.4
Obs	2419	2419	2419	2419	2419	2419
	Community Health Centers (7)	Household Electricity (8)	Household Piped Water (9)	Villages Asphalt Roads (10)	GDP per capita Total Excl. Oil (11)	Poverty Rate (12)
Migration $\times$ XRShock <sub>t-1</sub>	0.0534 (0.0774)	0.0780*** (0.0288)	0.0842*** (0.0227)	0.0584* (0.0307)	0.163*** (0.0511)	-3.118*** (0.819)
Kleibergen-Paap F stat.	1459.9	1181.1	1013.4	810.5	993.3	853.3
Obs	1521	2193	2419	2152	2407	2403

Notes: This table presents IV estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. This specification uses the district shares' of destinations from three years prior as an instrument to the migrant exchange rate shock proxy. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t1}$  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 is the ratio between total migrant in the district from the 2005 village census data and district population. Migration is the ratio between the total migrants in the district from the 2005 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.41: Impact of Migrant Exchange Rate Shock, Robustness with Island Trends

A. District Enrollment				
	Elementary school	Jr. Sec school	Sr. Sec school	
	(1)	(2)	(3)	
Migration $\times$ XRShock <sub>t-1</sub>	1.801** (0.911)	3.874* (2.118)	6.823*** (2.281)	
Dep. var. mean	88.960	66.597	46.486	
Dep var sd	3.809	9.855	12.733	
Observations	2413	2413	2413	
B. Schools and Health Centers				
	Elementary school	Jr. Sec school	Sr. Sec school	Community health center
	(4)	(5)	(6)	(7)
Migration $\times$ XRShock <sub>t-1</sub>	0.044 (0.191)	0.050 (0.061)	-0.015 (0.018)	-0.001 (0.043)
Migration $\times$ XRShock <sub>t-2</sub>	0.279 (0.180)	0.151** (0.061)	0.022 (0.026)	0.006 (0.038)
Migration $\times$ XRShock <sub>t-3</sub>	0.590*** (0.192)	0.253** (0.109)	0.022 (0.036)	0.070 (0.058)
Migration $\times$ XRShock <sub>t-4</sub>	-0.057 (0.280)	0.092 (0.089)	0.021 (0.024)	0.055 (0.091)
Dep. var. mean	6.161	1.156	0.307	0.411
Dep var sd	2.903	0.835	0.235	0.234
Observations	1346	1346	1346	861
C. Other Public Goods				
	Household electricity	Household piped water	Village asphalt road	
	(8)	(9)	(10)	
Migration $\times$ XRShock <sub>t-1</sub>	0.045** (0.019)	0.058*** (0.021)	0.045** (0.021)	
Dep. var. mean	0.889	0.158	0.692	
Dep var sd	0.149	0.154	0.242	
Observations	2186	2423	2149	

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The regressions for this table includes the addition of island-specific indicators interacted with the year variable. The migrant exchange rate shock is lagged by one period for Panels A and C, while Panel B includes lags of up to four periods. Standard errors in parentheses are clustered by districts. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t1}$  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 is the ratio between the total migrants in the district from the 2005 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

Table A.42: Impact of Migrant Exchange Rate Shock, Migrant Count in Podes 2005, 2008, 2011

A. District Enrollment				
	Elementary school	Jr. Sec school	Sr. Sec school	
	(1)	(2)	(3)	
Migration <sub>dt-1</sub> <sup>podes</sup> × XRShock <sub>dt-1</sub>	1.489 (0.963)	3.590* (2.171)	5.473** (2.429)	
Dep. var. mean	88.960	66.599	46.473	
Dep var sd	3.808	9.849	12.732	
Observations	2416	2416	2416	
B. Schools and Health Centers				
	Elementary school	Jr. Sec school	Sr. Sec school	Community health center
	(4)	(5)	(6)	(7)
Migration <sub>dt-1</sub> <sup>podes</sup> × XRShock <sub>dt-1</sub>	0.120 (0.132)	0.009 (0.051)	-0.010 (0.019)	0.060** (0.026)
Migration <sub>dt-1</sub> <sup>podes</sup> × XRShock <sub>dt-2</sub>	0.177** (0.078)	0.091*** (0.033)	0.003 (0.020)	0.026 (0.029)
Migration <sub>dt-1</sub> <sup>podes</sup> × XRShock <sub>dt-3</sub>	0.414*** (0.159)	0.143 (0.091)	0.009 (0.031)	0.108** (0.043)
Migration <sub>dt-1</sub> <sup>podes</sup> × XRShock <sub>dt-4</sub>	-0.096 (0.168)	0.026 (0.081)	0.003 (0.023)	0.062 (0.047)
Dep. var. mean	6.161	1.156	0.307	0.411
Dep var sd	2.903	0.835	0.235	0.234
Observations	1346	1346	1346	861
C. Other Public Goods				
	Household electricity	Household piped water	Village asphalt road	
	(8)	(9)	(10)	
Migration <sub>dt-1</sub> <sup>podes</sup> × XRShock <sub>dt-1</sub>	0.048** (0.023)	0.062*** (0.020)	0.055*** (0.021)	
Dep. var. mean	0.889	0.158	0.692	
Dep var sd	0.149	0.154	0.242	
Observations	2186	2423	2149	

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shock is lagged by one period for Panels A and C, while Panel B includes lags of up to four periods. Standard errors in parentheses are clustered by districts. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t1}$  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 is the ratio between the total migrants in the district from the 2005, 2008, and 2011 village census data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

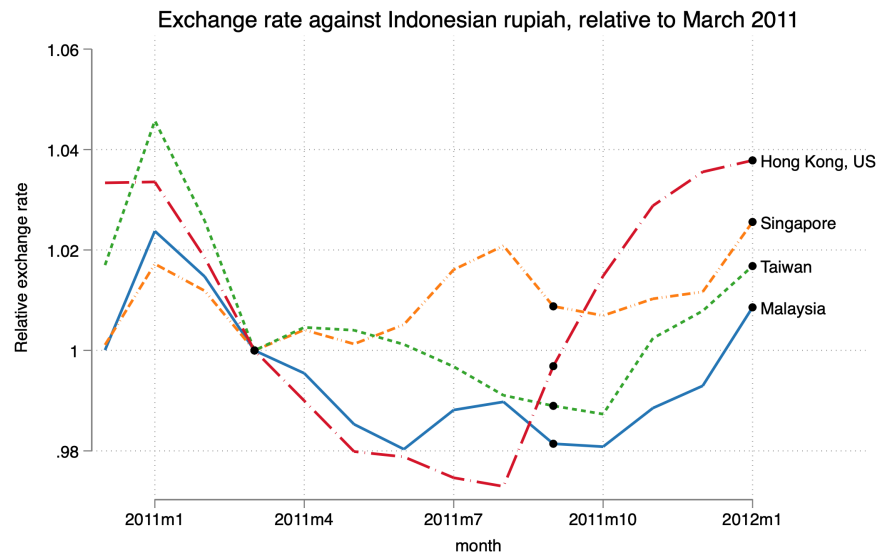
Table A.43: Impact of Migrant Exchange Rate Shock, Village Plurality Destinations in Podes 2005

A. District Enrollment				
	Elementary school	Jr. Sec school	Sr. Sec school	
	(1)	(2)	(3)	
Migration $\times$ XRShock $_{t-1}^{dest05}$	0.997 (1.047)	4.247* (2.234)	3.538 (2.254)	
Dep. var. mean	89.362	66.918	46.890	
Dep var sd	3.633	9.457	12.414	
Observations	2145	2145	2145	
B. Schools and Health Centers				
	Elementary school	Jr. Sec school	Sr. Sec school	Community health center
	(4)	(5)	(6)	(7)
Migration $\times$ XRShock $_{t-1}^{dest05}$	0.619*** (0.217)	0.140 (0.106)	0.013 (0.036)	0.019 (0.028)
Migration $\times$ XRShock $_{t-2}^{dest05}$	0.225 (0.215)	0.218* (0.125)	0.041 (0.038)	0.182* (0.110)
Migration $\times$ XRShock $_{t-3}^{dest05}$	1.234*** (0.389)	0.373** (0.179)	0.065 (0.048)	-0.134 (0.113)
Migration $\times$ XRShock $_{t-4}^{dest05}$	-0.073 (0.391)	0.226 (0.206)	-0.027 (0.077)	0.295** (0.141)
Dep. var. mean	6.412	1.271	0.344	0.438
Dep var sd	2.987	0.907	0.268	0.269
Observations	1246	1246	1246	753
C. Other Public Goods				
	Household electricity	Household piped water	Village asphalt road	
	(8)	(9)	(10)	
Migration $\times$ XRShock $_{t-1}^{dest05}$	0.021 (0.021)	0.061*** (0.023)	0.054* (0.031)	
Dep. var. mean	0.889	0.153	0.692	
Dep var sd	0.149	0.148	0.242	
Observations	2138	2155	1886	

Notes: This table presents estimates from regressions of outcome variables on migrant exchange rate shocks at the district level. The migrant exchange rate shock is lagged by one period for Panels A and C, while Panel B includes lags of up to four periods. Standard errors in parentheses are clustered by districts. The sample is a 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $Migration \times XRShock_{t1}$  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 village plurality destinations in the 2005 Podes data. Migration is the ratio between the total migrants in the district from the 2005 Podes data and the district population. Variable constructions are as in the text. Other data details are in the Appendix. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

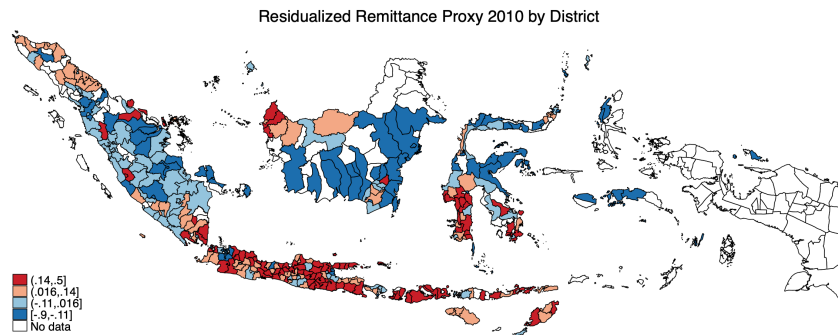
## Appendix Figure

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



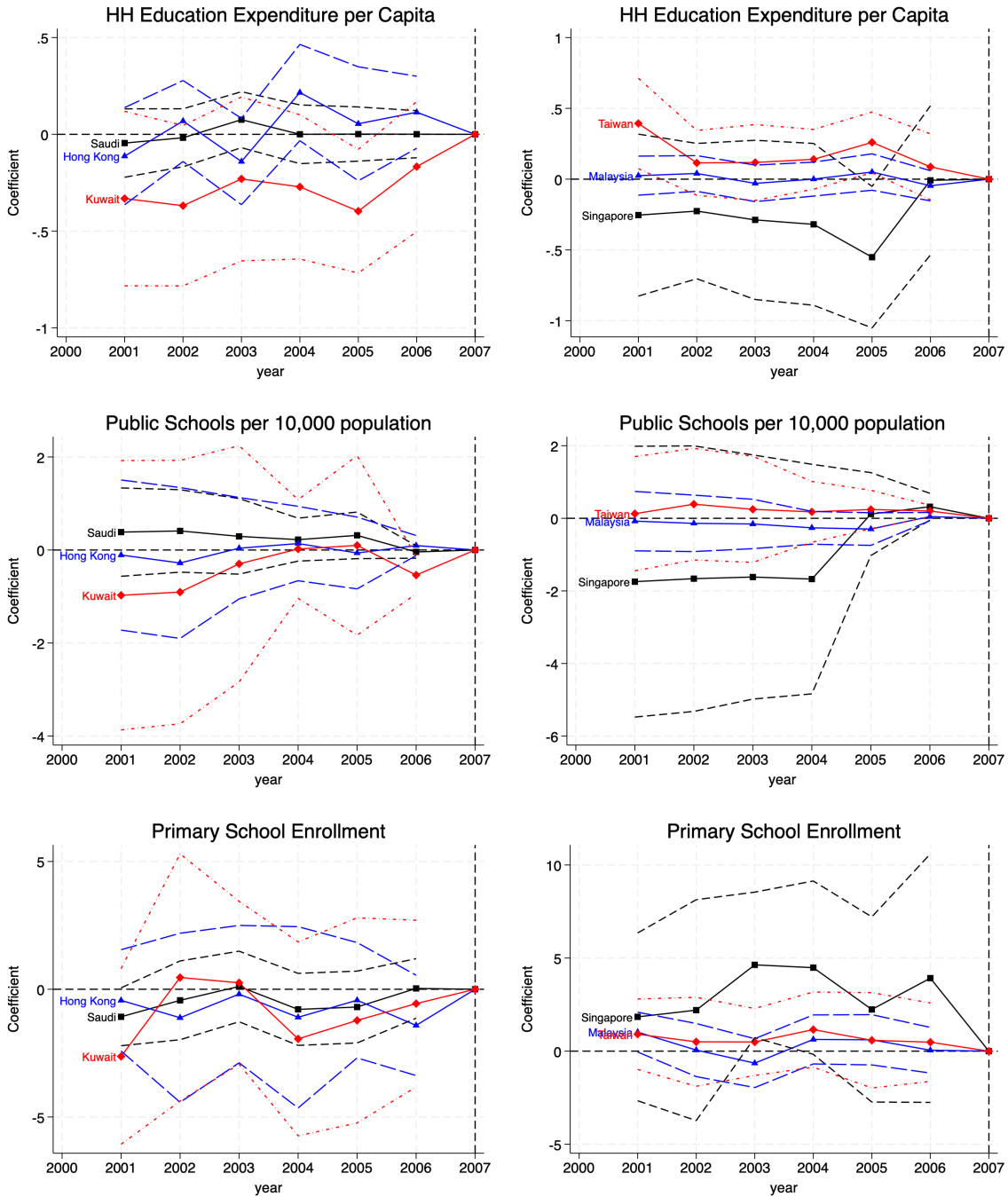
Note: Monthly exchange rate variation for 2011, by destination countries of migrants in the Doi et al. (2014) panel. Black dots denote when the follow up surveys were conducted. Data are from Refinitiv Datastream (2022).

Figure A.2: Spatial Distribution of Residualized Remittance Proxy in 2010



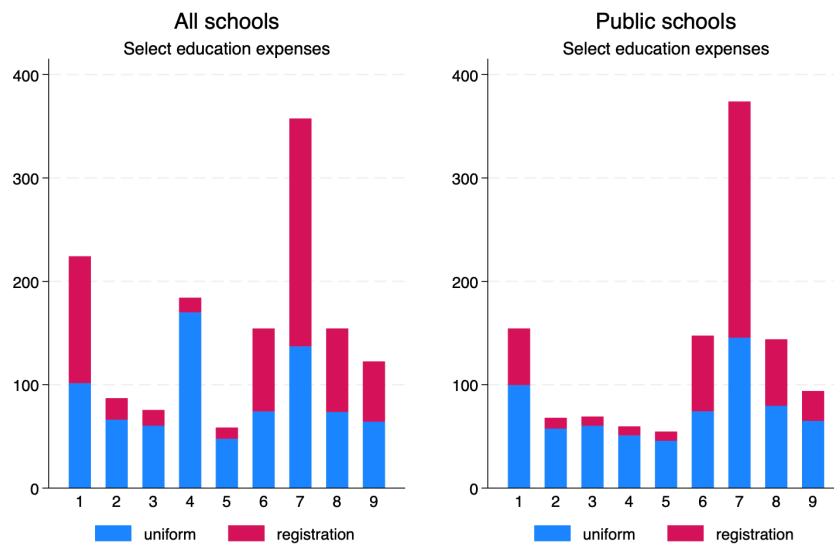
Note: This map displays Indonesian districts (*Kabupaten/Kota*) with the color indicating the magnitude of residualized remittance proxy in 2010. The residual term is from a regression of remittance proxy (interaction of migration intensity and exchange rate shock) on district and year fixed effects. 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 A.3: Trends of Selected Outcomes Pre-2008



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 major migration country 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 show the estimates from the share of migrants to Saudi Arabia (black squares), Hong Kong (blue triangle), and Kuwait (red diamonds). Plots right the left column show the estimates from the share of migrants to Singapore (black squares), Malaysia (blue triangle), and Taiwan (red diamonds). The outcomes, respectively, are the outcomes of household education expenditure per capita, the number of total public schools per 10,000 population, and primary school enrollment. 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.

Figure A.4: School cost, IFLS data



*Note:* Data from IFLS4 (2008) using the education cost module from Book 5, where respondents age 14 or younger are surveyed. Respondents are asked about their education cost in the previous academic year (2006-2007), so the cost are assigned to respondents' previous year's grades and not their current ones. Previous year's grades are inferred from current grade-1 or if students last graduated in 2007, the maximum grade of previous level. In case of mismatch between the main education module and the detailed education module, the detailed education module supersede the earlier response. Costs are in thousands of rupiahs (IDR).