Remittances, Economic Development, and Education Investment

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Abstract

Remittances, money sent by overseas migrants, hold great potential to spur development in their area of origin. However, remittances may have adverse effects if the state responds to the remittance flow by reducing public investments in the area of origin. Using arrival records of returning migrants and administrative data of school establishments, I identify the effects of remittances on development indicators and education investments in Indonesian districts. Remittances increase household consumption, reduce poverty, and stimulate growth. Households send more children to school, and district governments increase public schools at the primary and junior secondary levels. I observe consistent patterns for other public goods that complement household investments. These responses are not driven by electoral concern or the capture of economic gain through taxation. Instead, my results suggest the state's responses to remittances are influenced by their pre-existing policy commitments and changes in government accountability.

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1. Introduction

Remittances—money that migrants send to their home countries—are an important resource for many developing countries. Remittances bring in more resources than oil in Nigeria (The Economist, 2019), the Suez Canal in Egypt, and the export of IT services in India (Ratha et al., 2016). Estimated total remittances to low and middle-income countries reached US$554 billion in 2019, surpassing the flow of foreign aid (Ratha et al., 2020). For many small nations, remittances comprise significant portions of GDP. This is the case for countries as diverse as Tonga (39%), Tajikistan (27%), and El Salvador (24%) (World Bank, 2020). The sheer magnitude of the remittance flow holds great potential for development (World Bank, 2006, 2017).

Migrant remittances may influence how the state provides public goods. Remittances can finance various household investments, including substitutes for public services. In such cases, the state may respond to remittances by reducing public investments, leading to a "remittance curse." On the other hand, the state may make complementary investments if remittances increase the demand for public services. As the state demonstrates its investments through the provision of public goods, this can indicate how it responds to the remittance windfall. However, the link between remittances and the state's response is an underresearched topic, and the mechanisms through which the effects manifest remain unclear.

Empirically, the analysis of remittances' impact on public goods and local development faces multiple challenges. First, a positive correlation between remittances and local development could result from places with good outcomes facilitating higher remittances. Second, because only migrants remit, changes in migration policies will impact migration and remittances simultaneously. Remittances may influence the area of origin separately from migration, but their close link makes it hard to study them independently. Third, comprehensive data is rare. Migration and remittance data are often only available as country-level estimates, limiting their use to cross-country regressions. Causal analyses typically rely on instrumental variables that lack validity or have low statistical power (Clemens & McKenzie, 2018).

In this paper, I address these issues through an investigation of the effect of remittances on households and districts in Indonesia. I identify the effects of remittances by combining three sources of variation: the share of migration in different regions, their destination countries, and shifts in the currency exchange rates over time. Changes in exchange rates provide unanticipated shocks to the size of remittances that origin households receive at home, with variations in the size of the shock depending on the migration destination. The share of migration differs by region, giving variations at the district level. I thus estimate the reduced form effects of exchange rate shocks on outcomes in Indonesian districts, building on a similar strategy employed by Yang (2008) and Khanna et al. (2022) in the Philippines. While a 2SLS estimation of the effects of remittances on outcomes is also of interest, this approach requires data on actual remittances flow at the sub-national level, which is scarcely available.

Indonesia provides an excellent setting to study the impact of remittances on public goods provision. The country sends nearly one million international migrants abroad annually, and it

is the 14th largest remittance receiver in the world (World Bank, 2019). Indonesia also provides reliable subnational data series, making it possible to exploit variations in destination choices and migration scale across hundreds of districts to overcome endogeneity challenges. These districts operate in a common national environment, providing the opportunity to overcome the limitations of cross-country regressions, where unobserved variables may be correlated with remittances and public goods provision.

I start by showing that positive exchange rate changes increase remittances received by migrant households. I use a migrant household panel (Doi et al., 2014) for an out-of-sample analysis of the impact of exchange rates on remittances. I find that migrant households receive higher remittances when the Indonesian rupiah depreciates against the currency of the migrants' host country. This first stage result allows me to build a proxy measure for remittances through migrants' predetermined destination choices and exchange rate fluctuations during their time abroad.

Next, I leverage a unique dataset to construct a remittance proxy at the district level. I use an administrative record of more than one million migrant returnees. Using their destinations and origin addresses, I measure the district-level exposure to foreign currency shocks between 2005-2011. During this period, the global financial crisis led to sharp changes in the exchange rate against the Indonesian rupiah (IDR) with varying magnitudes. For example, the US dollar (USD) and Saudi riyal (SAR) exchange rate to the rupiah both rose by 23% between 2007-2009. By contrast, the Korean won (KRW) lost 9% in value.[1] I construct a remittance proxy using the interaction of migration intensity and currency fluctuations. Districts with many migrants going to countries with strongly appreciating currencies receive a positive remittance shock. In contrast, districts with few migrants whose destinations have weak currencies receive a negative remittance shock. I combine this measure with rich data from household surveys, school registries, and regional budget reports to estimate the effect of remittances.

I find that remittances improve development indicators. Remittances increase household expenditures, especially at the bottom quintile of the expenditure distribution. An increase in the remittance proxy by one standard deviation (SD), which corresponds to a back-of-the-envelope windfall of USD 250,000 to the economy in the district, raises poor households' consumption by USD 2 per month (a 10 percent increase). Households also report a higher asset index, reflecting acquisitions of various durable assets such as motorcycles, refrigerators, and cooking gas canisters. Remittances also reduce the share of households living below the poverty line, the poverty gap, and inequality as measured by the Gini coefficient. Using regional GDP per capita as an indicator of development, I find a one SD shock is associated with 0.09 log points higher total GDP per capita. This magnitude corresponds to a ∼USD 55 increase at the mean.

Households can use remittances to invest in education, and remittances lead to households sending more of their children to school. A one SD shock raises the enrollment rate by 3.7 p.p.

[1]The monthly average exchange rates changed from IDR8,827 (June 2007) to IDR10,900 (January 2009) per USD. The Saudi riyal is pegged to the US dollar at a rate of SAR3.75 per USD. The Korean won exchange rate changed from IDR9.51 to 8.65 per KRW in the same period (Refinitiv Datastream, 2021).

for children aged 6-18 years in primary and secondary education. At each level, remittances raise enrollment by 3 p.p., 4 p.p., and 7 p.p. for primary (grades 1-6), junior secondary (grades 7-9), and senior secondary levels (grades 10-12), respectively. Cohort-specific analysis shows children ages 6, 13, and 16 drive increased enrollment, highlighting the crucial ages when children start school at each level. These effects represent a meaningful gain toward achieving universal basic education. Particularly at the secondary level, enrollments have lagged behind the near-universal primary enrollment at 67% and 44%.

Households' education investments induce responses by the state: districts exposed to positive shocks of remittances provide more public schools. After the Soeharto regime fell, the Indonesian central government devolved the responsibility to provide education services to district-level governments. In response to a one SD shock in remittances, districts provide 0.87 more public elementary schools and 0.27 more public junior high schools per 10,000 population one year after the shock. The coefficient for public senior secondary schools is positive but not statistically different from zero. To build junior secondary schools, district governments rely on expansions of existing elementary schools, which allows new schools to be established rapidly with fewer classrooms and teachers. Because of the expansion, the increased enrollment, as reported by households, may include the effects of relaxing the supply constraint. The provision of other public goods under the purview of the district governments shows a consistent pattern, with the state expanding access to services that complement household investments.

What drives the supply-side responses to remittances? I consider two institutional contexts. First, districts are mandated by the constitution to allocate at least 20% of their budget for education expenditures. Education expenditure rose from 27% on average in 2006 to 41% in 2012. Second, the number of district governments increased from 440 to 514 in my study period due to the creation of smaller districts ("splitting") from existing district boundaries. Because split districts are smaller, the district center becomes closer to the average citizen (Bazzi & Gudgeon, 2021). This process could strengthen the government's accountability in providing public service.

I find that remittances influence the provision of local public goods in two ways: by complementing the state's existing policy commitments and strengthening its accountability. When the remittance shocks occur after the district government allocates a higher share of its budget for education expenditure, I observe higher expansions of public schools. Remittances complement commitments toward education, leading to increases in education investments. I also observe a positive interaction between remittances and an indicator of whether the district has split. This interaction suggests that remittances play an important role in districts where accountability channels have strengthened.

On the other hand, I do not find support for taxation- or election-driven responses. Suppose that the state captures part of the economic boom through taxes; it could use them to finance expansions in public goods. Remittances are not taxed, but the government collects income and property taxes. Part of the revenues collected in the district by the central tax authority is apportioned back to the district budget. Districts also collect local taxes, such as

hotel and vehicle taxes. Using budget reports from the Ministry of Finance, I find remittances did not lead to increased tax revenues for the district. It also appears that electoral concerns do not drive the response. There are no systematic differences in the provision of public goods during district election years when local politicians might build schools to win votes.

To address threats to causal identification, I consider potential violations of the identification assumption. First, I test the relationship between pre-period outcomes with subsequent remittances, and I find that future remittances do not predict past outcomes. Second, I account for differential trends by interacting year fixed effects with a set of indicators for island groups or baseline outcomes. The relationship between remittances and outcomes is robust to this check. Third, I construct a proxy for trade windfall from oil and gas and palm oil, Indonesia's primary export commodities. The coefficients for remittances did not change meaningfully with the inclusion of trade variables, indicating that commodity trade is unlikely to be the main driver of the observed results.

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. The existing literature has used cross-country analysis to establish the effect of remittances on household income and consumption but reached diverging conclusions on economic growth.[2] Yang (2008) and Khanna et al. (2022) take advantage of a natural experiment due to the 1997 exchange rate shock in the Philippines to provide compelling evidence on the short- and long-term effects of remittances on migrant households and origin areas. I use a similar strategy in Indonesia to show that remittances increase household consumption, reduce poverty, and stimulate growth.

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

Second, I investigate the mechanisms through which the state responds to remittances, made possible with rich data from Indonesia. My datasets enable investigations into the role

[2]The cross-country regression literature has shown evidence supporting opposing views of the effects of remittances on growth. Giuliano & Ruiz-Arranz (2009) and Catrinescu et al. (2009) show positive effects, while Chami et al. (2008) and Le (2009) show negative effects. Nevertheless, the cross-country analysis is more in agreement on the effects of remittances on poverty (Adams & Page, 2005; Gupta et al., 2009). For reviews of recent empirical evidence, see Yang (2011), Brown & Jimenez-Soto (2015), and Alpaslan et al. (2021)

of taxation, election, policy commitments, and decentralization in shaping the state's response to remittances and the patterns of public goods provision. Asatryan et al. (2017) find that remittances increase the likelihood of a VAT introduction. Pierskalla & Sacks (2018, 2020) have documented that government spending and hiring in Indonesia are influenced by election cycles. Marx (2018) shows that elections incentivized African leaders to complete visible development projects. Decentralization-led district splitting could also influence public goods provision (Lewis, 2017; Cassidy & Velayudhan, 2022). Banerjee et al. (2007) highlight cases in India and elsewhere where top-down interventions financed by public budgets have been central to public goods expansion. My results suggest that the state does not respond to remittances through taxation or election but through policy commitments and increased accountability.

My work also contributes to the literature on human capital and migration. Recent studies have evaluated interventions to stimulate remittances for education among Salvadoran and Philippine migrants (Ambler et al., 2015; de Arcangelis et al., 2015). These studies build on the literature that points to the positive effect of remittances on school enrollment (Edwards & Ureta, 2003; Yang, 2008; Amuedo-Dorantez & Pozo, 2010; Salas, 2014). Other studies have also linked migration opportunities to human capital investment (Dinkelman & Mariotti, 2016; Theoharides, 2018; Abarcar & Theoharides, 2021; Khanna & Morales, 2021). These studies focus on the response to education demand. Abarcar & 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. Similar to their paper, I measure changes in both the demand for and supply of education but focus on the effects of remittances from low-skill migrants. My results contribute to the brain drain debate with evidence that low-skilled migration can induce brain gain.

2. The Indonesian Context: Migrants, Remittances, and Public Administration

2.1. Migrant Remittances

The Indonesian Central Bank estimates that 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 agency for the placement and protection of Indonesian workers (BNP2TKI) recorded about half of them only graduated from primary education, and fewer have completed secondary or post-secondary education (BNP2TKI, 2014). The Indonesian government had intended to raise the educational requirement to work abroad (Law 39/2004 on Migrant Placement), but the Constitutional Court ruled it unconstitutional. With the ruling, six years of education in primary schools remains sufficient for Indonesians to seek work placement abroad. Correspondingly, most of Indonesian workers work as low-skill workers as housekeepers (61 percent), plantation workers (10 percent), or fisherman (5 percent, BNP2TKI, 2014). They come mainly from agricultural households: in 2007, over 60 percent of migrant worker households in rural areas relied on

agricultural activities for their income (Bazzi, 2017).

The main destination countries of Indonesian migrant workers include Saudi Arabia and other Gulf countries, Malaysia, Taiwan, and Singapore (Appendix Table A.2, see also BI, 2022). Village census data reveals that a village's ethnicity and religious composition strongly influenced the country of migration destination. Migrants from a village are more likely to go to Arab countries rather than Malaysia/Singapore as the share of ethnic Arabs in the village gets higher, while the likelihood of migration to Hong Kong and Taiwan is increasing in the share of ethnic Chinese in the village (Bazzi, 2012). With respect to religion, the share of Christians in the village is negatively correlated with the likelihood of its migrants working in Arab countries. Another key factor that influences a migrant worker's destination is the presence of recruiters/"sponsors" in the village. These recruiters connect prospective migrants to a placement agency, and they are commonly the prospective migrant's first point of contact in starting their migration journey (Bazzi et al., 2021).

Indonesian migrants typically work under a fixed-term contract of 2-3 years of work (Bazzi, 2012). They sign a contract prior to departure with an agency, who are then responsible for their training and preparation (Bazzi et al., 2021). The contracts stipulate the workers' salary, typically denominated in the destination country's currency (Bazzi et al., 2021). The salaries are fixed in the host currency rate for the duration of the contract. Nevertheless, because the Indonesian rupiah (IDR) uses a floating rate, in rupiah terms the salary fluctuates following the exchange rate between the destination country's currency to IDR.

Indonesian migrant workers remitted more than USD 11 billion in 2018, making Indonesia the 7th largest remittance receiver in Asia and the 14th largest in the world (World Bank, 2019). A survey of migrants in four Asian countries documented that Indonesian workers send remittances multiple times a year: workers in Hong Kong on average remit monthly while workers in Singapore send money on average every four months (ADB, 2006). Former female migrants surveyed in Bazzi et al. (2021) report they remitted USD 183 to their families on average 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 for the funds they receive (ADB, 2006). This suggests remittances may have the scope to influence education-seeking behavior at home.

Nearly all remittance recipients in the ADB study report receive remittances through banking institutions (ADB, 2006). Banks and Money Transfer Operators (MTOs) report transaction statistics to the Central Bank, who publishes national aggregate remittance data. Disaggregated data by region are not publicly available, although there are news reports covering important milestones in remittance transactions. For example, the Post Office in Cirebon reported remittances in the district reached USD 40 million (Tribun News, 2013).

Remittances to Indonesia are not taxed by the government. Nevertheless, the government is aware of the remittance flow. Officials have dubbed remitting workers as "foreign currency heroes", and made comments on the size of remittance flow exceeding the revenues from tax amnesty (Media Indonesia, 2017). More generally, the state has weak capacity to enforce

taxation: out of 255 million population, fewer than one million people are paying taxpayers (Bloomberg, 2016).

The Indonesian government recognized the worker's vulnerability to exploitation 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 TKI service post 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 3.3).

2.2. Local Public Administration

After the Soeharto regime fell in 1998, the Indonesian central government devolved the responsibility of frontline service provision to district-level governments. This policy environment underlies the selection my outcomes of interest to analyze the state's responses to remittances.

Education is a key service under the responsibility of local governments. Public schools comprise 76 percent of all schools under the purview of the Ministry of Education. Students progress through three levels of education: primary (grade 1-6 for children age 6-12 years), junior secondary (grade 7-9 for children age 13-15 years), and senior secondary (grade 10-12 for children age 16-18 years). The primary and junior secondary levels are compulsory, and public schools educate 83 percent of its total enrolled students (Bazzi et al., 2022). Enrollment is nearly universal at the primary level, but there is a high attrition rate at graduation from primary school: it drops to 67 percent at the junior secondary level and further drops to 42 percent at senior secondary level. Because of this, the junior secondary level presents the next bottleneck in ensuring education access for all.

Local governments also hold the purview to provide other types of public goods, including piped water, electricity, and roads. Piped water represents a public investment in clean water, and it is managed by district government-owned enterprises. These stand in contrast to other safe drinking water sources such as bottled water, protected wells, or boreholes, which households access through private investments. Electricity as infrastructure is provided similarly—through a state-owned enterprise—and the grid capacity is commonly the main constraint for households to access the service. Both electricity and piped water require complementary private investments in the form of a connection fee. Roads, a canonical example of a non-rivalrous and non-excludable goods, are also managed by the local government. High quality roads are paved with asphalt, although some villages may only have gravel and dirt roads. Nevertheless, improvements in village roads are often partly funded with informal taxation from the villagers in form of labor or goods (Olken & Singhal, 2011).

District mayors hold an important role in the local delivery of public service. Since 2005, mayors in Indonesian districts have been elected based popular votes every five years. Citizens directly vote for mayoral candidates in district elections, which were hold according to a different timeline than the presidential and legislative elections. Election timing varies across districts for two reasons: (1) appointed mayors by Soeharto before the direct election system

had idiosyncratic start years, which carried over when the direct election was introduced, and (2) a massive decentralization reform since 2000 led to the creation of new districts (splitting), where new mayors need to be elected but the timing were not synchronized to the election cycle (Martinez-Bravo et al., 2019; Pierskalla & Sacks, 2018, 2020).

The decentralization reform process has led to the creation of new, smaller districts within existing district boundaries–"district splits" (Bazzi & Gudgeon, 2021; Cassidy & Velayudhan, 2022). Between 2004-2012, splits in 57 districts created 131 smaller children districts, roughly a quarter of the total districts in my sample. Overall, it increased the number of districts from 440 to 514 districts. Most splits occurred outside Java, where the average district area is bigger, and the land is less densely populated. Nevertheless, eight new children districts were also created in Java in the same period. Proponents of district splits argue that the closer distance between district centers and citizen can improve governance.

To provide services, district governments operate based on a budget proposed by mayors and approved by the district parliament. The operations are financed through several revenue streams, in descending order by size: general DAU grants (61 percent), central tax revenue share (8 percent), special allocation DAK grants (7 percent), local taxes (6.5 percent), and natural resource revenue share (6 percent). The DAU grants are formulaic transfers that depend on mostly fixed characteristics of the district, e.g., its land area and population size (Brodjonegoro and Martinez-Vasquez 2005). The central government collects income taxes, property taxes, and tobacco excise and returns a portion of the revenue to district governments through a predetermined formula (12 percent for the income tax and 9 percent of the property tax). This revenue is reported as a Tax Revenue Share (DBH). The DAK grants are conditional, matching transfers provided by central government on a discretionary basis. Districts need to match at least 10 percent of the fund provided from the central government. Funds are earmarked for (physical) developments of education facilities and other types of infrastructure (see Cassidy 2021). Revenues from local taxes are classified as Own Source Revenue (PAD). This revenue stream collects local taxes and fees imposed by the district governments, such as vehicle and hotel taxes.

With respect to spending, districts are mandated by the constitution to spend 20 percent of its budget for education. Under government regulations, classifications of district expenditures for education cover teachers' salaries and benefits, asset purchases for education facilities, and social assistance/education scholarships (PMK 84/2009). Despite the mandate, the share of expenditure vary among districts, and the average district spend 35 percent on education.

3. Data and Methodology

3.1. Data

To analyze the effects of remittances, I combine district-level data from a collection of 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

where remittances induce effects on the outcomes of interest.

Migration datasets. My analysis draws from two main migration data sources: village survey data and administrative records of migrant arrivals. The Village Potential (Podes) surveys collect data from village heads every 2–3 years, which include the number of migrants from each village. The survey covers the universe of Indonesian villages, and I aggregate the village-level information to the district level. This granular data collection allows a complete estimation of the migration intensity from each district.

I use administrative records of migrant arrivals to obtain information on migration destinations. The records come from the "migrant terminal" at the Soekarno-Hatta International Airport. Located about 20 km from the capital, it is the primary embarkation point for workers leaving the country to work abroad. For returning migrants, officials at the migrant terminal recorded the migrant's gender, date of departure, date of arrival, country of work, and origin district. Between March 2008-2011, they recorded 1,006,241 migrants from 366 districts returning from 116 countries. 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 this with exchange rates from various currencies to IDR from Refinitiv Datastream (2021). I also use supplementary sources described in the Appendix for currencies without direct exchange rate information to IDR. Exchange rate observations are monthly and expressed as relative changes to the exchange rates in June 2007, one year before the exchange rates changed rapidly due to the 2008 Global Financial Crisis (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 budget from official statistics. It also compiles the district-level averages of household expenditures and district infrastructure from representative household surveys and the Podes village survey.

I measure school enrollment and asset ownership directly from the 2005-2012 National Socio-Economic Surveys (Susenas). Both measures capture household investment: durable assets can indicate improved living conditions, while school enrollment reflects migrants' oft-cited motivation to provide a better future for their families through education. The Susenas surveys are repeated cross-section household surveys with representative 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: 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, which interacts with households' investments. As the state is the dominant provider, I draw from the Dapodik school registry maintained by the Ministry of Education. Dapodik registry covers all operating primary, junior secondary, and senior secondary schools under the ministry's purview. It records each school's location, amenities, year of establishment, and an indicator

of whether the school is public or private. I describe these datasets in further detail in the Data Appendix.

Supplementary datasets. I use other datasets with more limited geographic or temporal coverage to supplement my district-level analysis. These are household or village surveys designed for other studies that provide more detailed information on migration, remittances, or variables relevant to my outcomes of interest.

I use migrant panel data from Doi et al. (2014) to test the effect of exchange rates on remittances. This data is from a panel of 400 households with a member migrating to work in other Asian countries from East Java. Households are selected into the sample based on their eligibility to receive pre-departure financial literacy training. Respondents were followed up in three waves between 2011-2012, collecting information on remittances received by the household at home. This data provides rarely collected panel information on remittances receipt but with a limited geographical and temporal scope.

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

3.2. Remittances and Exchange Rate Shocks

Remittance flows between countries are estimated based on the share of migrants in different countries and the host countries' characteristics (IMF, 2009; KNOMAD, 2017; Ratha & Shaw, 2007). These characteristics include changes in the exchange rate in host countries, although the effects are ex-ante ambiguous. When the currency of the host country appreciates relative to the sending country, transfers in a fixed amount of the host country's currency will increase remittances (Yang, 2008). However, if migrants want their families to receive a fixed sum, exchange rate fluctuations will have no effect on the remittances received.

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

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

I define the exchange rate shock as the appreciation or depreciation of migrant i's host country currency c to Indonesian Rupiah (IDR) at time t, relative to a reference period o. Each migrant faces a fluctuating exchange rate to IDR when they are sending remittances home.

The panel data of migrant households from Doi et al. (2014) allows me to add mi-

grant fixed effects, addressing self-selection bias in cross-sectional estimation of remittances (Funkhouser, 2012). I estimate the following equation:

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

$Remittances_{it}$ is the amount received by migrant i's family in the area of origin at time t. The coefficient of interest is β, which expresses changes in remittances due to the change in the relative exchange rate to IDR, $XRShock$. Both $Remittances$ and $XRShock$ are normalized to have a mean zero and a standard deviation of one. The migrant fixed effect term, θ_i, adjusts for time-invariant characteristics of the household and the household member who migrates. Effects from unobserved invariant characteristics of the migrant will also be absorbed by the migrant fixed effects. The survey wave fixed effect term, ϕ_t, controls for time effects common to all respondents in each survey wave. The X_{it} vector adjusts for other time-varying characteristics. Standard errors are clustered at the household level.

I argue that the exchange rate shock that each migrant receive 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 move the exchange rate, ruling out reverse causality. Furthermore, changes in the exchange rate are unanticipated by migrant families.[3]

I also include control variables that could drive variations in remittances: migrant's time abroad and time to the next religious holiday (Eid al-Fitr). Time abroad proxies for the migrant's experience, which may help them find a better remittance service with a cheaper fee or a better exchange rate. Migrants may also be more likely to remit money to celebrate religious holidays. For Muslims, who comprise the majority of the Indonesian population, Eid al-Fitr is the biggest annual religious holiday. Overseas migrants facing costly travels are less likely to return home, especially if they work in non-Muslim environments. In such cases, migrants might send more remittances to their families to help defray the cost of the festivities.

I reanalyze the Doi et al. (2014) data and focus on a subsample of migrant households receiving remittances. This definition leaves 418 observations in my sample from 183 households with migrants working in Taiwan, Hongkong, Malaysia, or Singapore (see Appendix for details). The surveys were administered in three follow-ups between 2011-2012. In each follow-up, households were asked the IDR amount of remittances from the migrant. They reported an average of IDR9.5 million (USD1,119) total remittances since migrant departure. With an average transfer frequency of 4.5, this corresponds to a typical ∼USD250 per transfer.[4]

[3]Two descriptive statistics lend support to this argument. First, 60% of remitters in Doi et al. (2014) survey stated at baseline that they have either never heard of the term "exchange rate" or they do not understand the meaning. Second, a survey of 5,564 former migrants from Bazzi et al. (2021) shows that only 2% of respondents have their contracts state their salary in Indonesian rupiah. The majority had their contracts denominated in dollars, dinars, or riyals. Their remittances would be subject to the currency rate fluctuations if they were to send a fixed portion of their salary. From a different setting, a survey of Tongan migrants in New Zealand shows that 39% of respondents try to send a constant amount of NZ dollars each month (Gibson et al., 2006). In contrast, only 14% of remitters try to send a constant amount of Tongan pa'anga each month. The majority of respondents (48%) send remittances only for special occasions (Gibson et al., 2006).

[4]Gibson and McKenzie (2017) surveyed pairs of Tongan immigrants in New Zealand and their household in

Because the survey phrased the remittance question as the total remittances received since departure, I use total remittances in the first follow-up and the difference with 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 effects of the intervention are absorbed by the migrant fixed effect.[5] 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 have started working abroad. The time to the next Eid is calculated based on the 2011 and 2012 Eid al-Fitr dates.

Workers in Hong Kong observed an average exchange rate of IDR1,123 per Hong Kong dollar (HKD) in March 2011, and by January 2012, the rate had appreciated by 3.8% (Figure A.1; Refinitiv Datastream (2021)). At the same time, the exchange rate to Taiwan Dollar (TWD) appreciated by only 1.6% (IDR296.7/TWD to IDR301.7/TWD). In these two examples, the raw measure of exchange rate shock for Hong Kong and Taiwan are 1.038 and 1.016, respectively. Overall, the average raw exchange rate shock for migrants in my sample is 0.995 in the second follow-up and 1.029 in the last follow-up. Table 1 (Panel A) presents the summary statistics of the main outcome variable and the regressor variable for my estimation sample.

Results. Migrant households at home receive more remittances when the currency of their host country appreciates against the Indonesian rupiah. Table 2 presents the estimation results of equation (2), with progressive additions of control variables from columns 1-4. OLS correlation between exchange rate shock is positive, and with the inclusion of migrant and survey wave fixed effects, the estimated coefficient for a one standard deviation exchange rate shock rose to 0.38 standard deviation of remittances (Column 2). The magnitude is in line with the responses among Philippines migrants to the 1998 exchange rate shocks (0.6, see Yang, 2008). This relationship is robust to two additional variables that may influence the amount remitted: time abroad and time to the next religious holiday (columns 3-4).

These findings present one of the first systematic investigations that links remittance responses to exchange rate fluctuations using household panel data. Prior research has used aggregate data to argue that the resilience of remittances during the 2008 Financial Crisis is due to the depreciation of South Asian currencies against Gulf countries' currencies (Sirkeci et al., 2012). Remittances to Nepal rose by 28% in Q1 2009 (Riester, 2012; Mohapatra et al., 2012), and 94% of migrant households in South Asia reported regular remittances during the period (Rajan & Narayana, 2012). Researchers have argued that migrants are willing to absorb negative shocks to continue sending remittances, with reports of unskilled migrants in the Gulf sharing accommodations and reducing their consumption to save money to send home

Tonga, where remitters and receivers should be reporting the same remittance transactions. They found that the survey responses produce reliable estimates.

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

(Sirkeci et al., 2012).[6] In estimating remittances from from pre-World War I migration out of Europe, Esteves and Khoudour-Casteras (2010) described that "migrants often waited for the most favorable exchange rates before sending money [to Europe]."

The panel structure of the data that I use provides a way to mitigate self-selection bias among migrants and remitters in cross-sectional data (Funkhouser, 2012). Furthermore, the Doi et al. (2014) survey explicitly collected information on remittances to migrant households, which are rarely captured in general purpose household surveys fielded in developing countries.[7]

It is unlikely that Indonesian migrants are responding to exchange rate changes by changing jobs or industries. Because each migration spell is based on a fixed-term contract signed prior to departure, migrants can hardly adjust their employment while abroad. For my analysis sample, the positive relationship could be driven by an increased frequency of sending remittances. Appendix Table A.4 suggests remittance transactions increased with positive exchange rate shocks. If remittance transactions are costless, total remittances received at home will increase mechanically with the full amount of the additional transfer. However, migrant households at home do not receive the full amount as each transaction is subject to fees imposed by the banks and money transfer operations (MTOs) facilitating the transactions.

3.3. Constructing A Proxy Measure for District-Level Remittances and Regression Specification

Analyzing the effects of remittances on the area of origin necessitates sub-national remittance data. However, this data is scarcely available.[8] In the absence of direct observations, I construct a proxy for the remittance flow.

To construct the district-level proxy, I follow an approach analogous to constructions of bilateral remittance flow estimates (KNOMAD, 2017; Ratha & Shaw, 2007). 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:

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

Here, d indexes districts, c indexes destination countries, and t indexes time. The mig_{dct} is thus the number of migrants from a district d who are abroad in country c in period t. The last term denotes the relative appreciation or depreciation of the host country's currency for

[6] Researchers have also argued that currency depreciation causes increases in remittances using analysis of single country time series or cross-country regressions. Studies with single-country time series have used aggregate data from countries with a high ratio of remittances to GDP, such as Samoa (Chamon et al., 2005), Tonga (Lin, 2001), and Nepal (Pant and Budha, 2016). Effect sizes range from 1.17 in Nepal to 4.67 for remittances to non-profit organizations in Tonga.

[7] There are only 47 households reported receiving international remittances from 10,992 Indonesia Family Life Survey/IFLS panel (Cuecuecha and Adams, 2016). IFLS was not designed as a remittance survey.

[8] IMF guide for compilers and users of remittances note that, "options for direct measurement of remittance transactions are very limited (IMF 2009, p.46)." The Indonesian Central Bank (BI) publishes national remittance estimates aggregated from reports by commercial banks and money transfer operations (MTOs) to the central bank. Staff from one of Indonesia's biggest banks with knowledge of the bank's remittance desk operations described these reports as proprietary and confidential.

these migrants, relative to a reference period o. This is an average of foreign exchange rate shocks that districts face due to their migrants' locations, weighted by the share of its migrants in each destination. The $XRshock_{dt}$ represents the variation in remittances flow a district will receive due to the currency rate fluctuation from its destination mix in a given year.

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

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

The remittance proxy is the interaction between the exchange rate shock and migration intensity. I use it in the following regression:

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

where Y_{dt} is the outcome of interest, and we are interested in the β coefficient for the interaction term of migration intensity and exchange rate shock, which serves as the proxy for remittance flow to the district. 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 remittance proxy because the shock precedes any changes in the outcome of interest. The regression equation also includes the time-varying $XRshock_{dt-1}$ as control, also lagged by one year. The baseline district migration intensity is absorbed by the district fixed effect θ_d, which captures the variations in outcomes due to the time-invariant characteristics of the district. The θ_t term is the year fixed effects that capture common time effects shared across all districts. The term ε_{dt} is a mean-zero error term. Standard errors in this estimation are clustered at the district level.

The β coefficient could be interpreted as a reduced form estimate from a two-stage least square (2SLS) estimation. In the 2SLS framework, the first stage is the regression of remittances on the plausibly exogenous interaction term, and the second stage is the regression of the outcome variable on the predicted remittances. For the reduced form, a causal interpretation of β relies on the identification assumption that unobserved determinants of outcomes in the district must be unrelated to the interaction term conditional on control variables and fixed effects. The interaction term is plausibly exogenous, as omitted variables in the error term would need to be distributed in a similar manner as the district's migration intensity, its country destinations, and the fluctuations of its currency exchange rate simultaneously.

Using this construction, I find that there is considerable variation in the exchange rate shock that districts are exposed to, which is driven by the destination mix of their migrants. For example, compare the Purwakarta district in West Java and Pesawaran in Lampung: 95% of Purwakarta migrants worked in Saudi Arabia or Gulf countries, while only 70% of Pesawaran migrants worked in that region. At the same time, a much smaller proportion of Purwakarta migrants worked in Malaysia or Singapore (2%) than migrants from Pesawaran (21%). These differences in the destination mix channel different magnitudes of exchange rate shocks. Compared to June 2007, Purwakarta migrants on average saw their host country's currency appreciate by 5.6 p.p. in 2008, while Pesawaran migrants' average currency appreci-

ation was 10.1 p.p. due to its smaller exposure to Saudi Riyal (which is pegged to US dollar). One year later, Purwakarta migrants' average currency exchange rate rose steeply by 10.3 p.p. while Pesawaran migrants only rose by 1.5 p.p.

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

These variations are unlikely to merely capture an unobserved trend in the outcomes of interest, as future remittances are not correlated with past district outcomes. In Table 3, I report the coefficients from regressing equation (5), but with the right hand side variable shifted forward by three periods to capture future remittances. If the remittance variable is merely a proxy for an unobserved trend, we should see a statistically significant correlation between this "future" remittance and past outcomes. I regress this on my main outcomes, a set of outcomes on enrollment and public goods. Reassuringly, I find that the magnitude of the coefficients is small and statistically indistinguishable from zero.

How big is the windfall in aggregate? Summary statistics from the migrant panel survey suggest that districts with the normalized remittance proxy of one receive ∼USD 45,000 more remittances per 100,000 people compared to districts at the mean of remittance proxy distribution. With an average of 588,456 population size for districts in my sample, a back-of-the-envelope calculation suggests a windfall of the size of USD 260,000 to the district for one standard deviation of the remittance proxy shock. This figure is roughly half of the average district budget for social protection in 2008, underscoring the importance of the financial flow to the region.[9]

4. Development Impacts of Remittances

The remittance shocks provide extra resources to households, which they can consume and/or invest. In this section, I look at the effects on household expenditures and asset ownerships. At the aggregate level, I look into poverty outcomes and GDP per capita per sector.

[9]In comparison, Dinkelman et al. (2020) estimated that Malawi migrants working in South African mine created a capital flow of USD 115,000 on average per district in 1973.

4.1. Remittances Raise Consumption

Remittances are a direct way for migrants to support their families at home, and increased resources from remittances may allow them to increase their consumption. I test this relationship by estimating equation (5) on consumption outcomes. I look at key consumption indicators: monthly expenditure per capita for the average household and the household in the bottom quintile, and per capita expenditures for education. All variables are in log IDR unit. Data for these indicators come from Dapoer, which aggregates household responses in *Susenas* to create district averages. Table 4, Panel A presents the results.

I find that remittances increase household consumption, especially for those at the bottom of the expenditure distribution. They also increase education expenditure. For households in the lowest quintile, a one standard deviation (SD) of remittance proxy shock increases the average household expenditure per capita by 0.10 log points (column 2). This coefficient is more than twice the coefficient for the average household, which lacks the precision to be statistically significantly different from zero (column 1). The shock also increases the monthly per capita expenditure for education by 0.28 log points. These increases are unlikely to be a mechanical response to rising prices. In Column 4 I regress the core price index from 47 districts, benchmarked to 2007 price. I cannot reject the null hypothesis that remittances has no effect on price. Although the estimates is positive, it is smaller than the 7% average annual inflation rate in the 2005-2012 period and I can rule out effects larger than 6% (3.19×1.96). The increases I observe in household consumptions are thus unlikely to be an artifact of mechanical response to rising prices. I defer the discussion on the robustness of the results in this section and the next to section 6.

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

4.2. Remittances Raise Asset Ownerships and Reduce Poverty

Remittances may finance purchases of durable assets, often the preferred mode of investment among households in developing countries. I summarized household asset ownerships in the 2010-2012 Susenas surveys using an asset index.[10]

[10]This aggregation improves statistical power to detect effects that go in the same direction within a domain (Kling et al., 2007; see also a similar asset index in Martinez-Bravo et al., 2017). All individual asset variables share a common range of [0,1].

I find remittances increase the asset ownership index by 0.03 (Panel B, column 1). This value represents 16% of the dependent variable mean. The assets included are motorcycles, cars, bicycles, refrigerators, natural gas canisters, water heaters, air conditioners, cable TVs, and boats. Appendix Table A.7 presents the detailed breakdown for each asset. I estimate precise effects in vehicle ownerships, with 4-7 p.p. increases for motorcycles, cars, and bicycles. Motorcycles are the most common vehicles in my sample, with three-fifths of households owning a motorcycle, while cars are the least common, with less than one-fifth ownership rate. Households also appear to acquire refrigerators and natural gas canisters in response to the remittance proxy shock. 15 p.p. more households have refrigerators and 10 p.p. more households use 12 kg gas canisters due to a one SD remittance shock, up from an average ownership rate of 17% and 12%, respectively. These results are consistent with the reported use of remittances from the migrant panel data. Appendix Table A.8 reports the coefficients from regression of equation (2) with reported remittance use as the outcomes of interest. Households in the migrant panel data use the increased remittances to purchase electronics and durables.

These results track findings from the Philippines (Yang, 2008), although the responses to specific assets vary. Philippine migrant households benefiting from the 1998 shocks responded with increases in vehicle and radio ownerships. From a different context, Mexican households receiving cash from the Oportunidades program invested 25% of the transfer in productive assets (Gertler et al. 2012). Early descriptive work on Indonesian migrants from Java and East Nusa Tenggara described similar responses, reporting that migrant families used remittances to buy refrigerators, televisions, radios, motorcycles, and houses (Sukamdi et al., 2004).

More broadly, asset ownership can indicate an escape from poverty. Developing country governments frequently determine poverty status using asset-based proxy-means tests in the absence of complete household income data (Banerjee et al., 2020). Using three different measures, I examine the effect of remittances on poverty and inequality. I use the share of district population living below the poverty line, the poverty gap, and Gini coefficient. The poverty gap is a measure of poverty intensity; the Gini coefficient is a measure of inequality.

Remittances reduce poverty. With households in the bottom quintile showing the strongest gain in household expenditures due to remittances, it translates into reduction in district poverty rate. A one SD remittance proxy shock reduces poverty by nearly 4 p.p., roughly a quarter of the mean poverty rate of 15%. It also reduces the poverty gap by 1.3 p.p., nearly halving the mean distance of 2.7% between the poor's income with the poverty line. These results underscore the powerfulness of remittances as a poverty alleviation strategy. My findings echo results from the Phillipines, where remittance shocks due to 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 & Martinez, 2005). With the benefit of remittances mostly accruing to the poorer households, I also observed a reduction in Gini coefficient by 0.03, one-tenth of the mean dependent variable in the sample.

4.3. Remittances Lead to Economic Growth

In aggregate, the infusion of resources from remittances can stimulate growth. To measure growth, I use the district-level gross domestic product (GDP) from Indo-Dapoer, which is calculated from official reports issued by an independent statistical agency. Indonesia is one of the few developing countries with reliable regional GDP estimates, and it has been used to benchmark night light satellite data with economic growth measures (Gibson et al., 2021). GDP data is expressed in constant price, benchmarked to the year 2000. I divide the district GDP figure by population to obtain the GDP per capita value in IDR, then transform it with a natural logarithm. The figure is available by sector, grouped into three major sectors: agriculture, service, and manufacturing. Table 4, Panel C reports the results.

Remittances increase the overall GDP per capita in the district, and this increase is driven by the increase in the agriculture and service sector. A one SD remittance proxy shock leads to an increase of 0.09 log points of the overall GDP per capita (column 1). It also leads to an increase of GDP per capita in the agriculture sector (0.13 log points, column 2), the service sector (0.24 log points, column 3), and manufacturing sector (0.19 log points, column 4) one year after the shock. The coefficients are most precisely estimated for the agriculture sector, while the estimate for the manufacturing sector is not statistically significantly different from zero. At the mean, the increase is equivalent to higher total GDP per capita by IDR 507,571 or USD 55 at the 2010 exchange rate. This estimate is roughly one third the effects on the global income in the Philippines one decade after the 1998 exchange rate shocks (Khanna et al., 2022).

The increase in GDP per capita for agriculture possibly reflects the composition of the migrant workers, who predominantly come from agricultural households, while households' purchases of goods and use of financial institutions and other services may contribute to the boost in service GDP.[11]

5. Remittances and Education Investments

Education provides a path for development through investment in human capital. Remittances can relax the budget constraints that prevent households from investing in education. Because education services are commonly provided by the state, analysis of its policies can reveal the patterns of state responses to remittances.

5.1. Remittances Increase Enrollment

I investigate the effect of remittances on enrollment in Table 5. Net enrollment ratio expresses the total school-age students enrolled in schools as a percentage of the population of the same age group. Using age and enrollment information from *Susenas*, I estimate the effects for all children, and separately by gender.

[11] See Appendix Table A.21 for estimated effects on employment outcomes: remittances do not appear to change the sectoral composition of employment although it reduces the size of the total labor force.

Remittances increase school enrollments. A one SD shock is associated with 3.7 p.p increases in school enrollment among children aged 6-18 (Panel A, column 1). Enrollment rates increase for all education levels, with a 3 p.p. increase for elementary level, a 4.4 pp. increase for junior secondary level, and a 7.5 p.p. increase for senior secondary level. The smaller impact on the elementary level may reflects a smaller room for improvement, as enrollment at this level is already near-universal. However, the increase in secondary education enrollment is particularly noteworthy as the participation rates in post-primary education have lagged behind the primary level. The results are robust to an alternate estimation using individual survey weights (Appendix Table A.6).

The effects of remittances on school enrollments differ by gender for different education levels. Panel B and C of Table 5 present the effects of remittances on enrollments for boys and girls, respectively. At the elementary level, girls gain with 3.8 p.p. higher enrollment rate in response to a one SD shock, 50 percent higher than the estimate for boys at 2.5 p.p. However, the gains in secondary school enrollments mainly reflect the gains in enrollments for boys in junior secondary (6.3 p.p.) and senior secondary (12 p.p.). In contrast, the enrollment gain for girls is merely one-fourth to one-third of the effect sizes for boys. These gendered responses hint at the possibility that some girls forego secondary education to work as migrant workers. The windfall may send the message that only primary education is important as the remittances were sent by women with only primary school education.

5.1.1. Enrollments at School-Entry Age

To verify that the coefficients on remittance proxy from the regressions with enrollment rates as the outcome variable indeed 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 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 is an indicator whether the household has a member currently working abroad. Treatment cohort indicators are defined based on the appropriate school level, i.e. 6-12 for elementary, 13-15 for junior secondary, 16-18 for senior secondary, and 6-18 for the overall enrollment. I include the lower-term two-way interactions and fixed effects for districts and survey years. Our coefficient of interest is ϕ, which indicates the differential enrollment responses to remittances by cohort. I estimate this regression on individuals age 4–20 years in the Susenas surveys.

Table 6 reports the estimation results, providing support that the effects on enrollment are driven by individuals in the relevant school age brackets. Panel A uses district-level migration intensity variable. The coefficients could be interpreted as the differential effect of remittances

on enrollment by the relevant age cohort relative to the untreated cohort, i.e., cohorts that are too young or too old for each level. Overall, a one SD remittance shock raises enrollment at any level by 4.1 p.p. among school-age population (column 1). The enrollment effects are most pronounced for elementary school cohorts and senior secondary cohorts (7 p.p.). The estimated effect for junior secondary cohorts is also positive but smaller (3 p.p.).

Panel B of Table 6 hones in on the relative response of school-age cohorts between migrant and non-migrant households in the presence of the exchange rate shock. The sample for estimating this interaction is smaller because the indicator is only available for individuals surveyed between 2005-2007. Coefficient on the interaction of treated (school-age) cohorts, migrant households, and exchange rate shock are positive and statistically significantly different from zero for elementary and junior high school enrollment. For further contrast, in a placebo regression where I estimate the effects of remittances on school enrollment for the 19-24-year-old population, who are older than the normal primary and secondary school students, I do not observe any effect of remittances on this population (Appendix Table A.5).

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

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

Figure 4 plots the coefficients ϕ_a of the triple interaction term. The patterns of interaction are pronounced at age six, thirteen, and sixteen. These are the school entry ages for elementary, junior secondary, and senior secondary levels. When a child is about to enter a new school level, getting a realization of positive remittance shocks in the preceding year would be especially timely to encourage enrollment. In contrast, for children ages 8–11 and 14–15 years, the effect is not significantly different than zero. These ages are when children are continuing grades in elementary and junior high schools. These effects are consistent with Alatas (2011), who does not find an effect on school enrollment from a cash transfer program because its disbursal to beneficiary did not occur until it is past the school year. Son (2015) presents a complementary picture where negative income shocks are less likely to induce dropouts when the child are at the last grade in school due to sheepskin effects. With remittances, the positive shocks likely allow households to afford children's new school levels upfront expenses such as uniforms.

5.2. Public goods

Table 7 presents the estimation results of equation (5) to investigate the impact of a remittance shock on the publicly provided goods in the district and Figure 5 compares the effect on enrollment and school densities for different levels.

I find remittance shocks positively influence the provision of education facilities. A one SD shock leads to 0.87 more public elementary schools and 0.27 more public junior secondary schools per 10,000 population one year after the shock. The coefficient for public senior secondary school is also positive at 0.02, but it is smaller and not statistically significantly different

from zero. The coefficients for elementary and junior secondary school density amount to 13% of the mean density of elementary schools across districts (6.39 schools per 10,000 population) and 23% of the mean density of junior secondary schools (1.18 schools per 10,000 population). At 0.23-0.25 SD, this is a significant expansion of education facilities in support of universal basic education.

Panel B results for asphalt roads, electricity, and piped water access support an overall pattern that remittances improve the provision of public goods. For electricity and piped water, a one SD of remittance shocks increases the share of households with access by 5 and 9 p.p., respectively. This effect size for piped water is more than 50% of the mean share of household access to piped water (16 per cent), representing a meaningful expansion to service. The share of villages with asphalt roads in the district rises by 25 p.p., from a mean share of 70 per cent. The improvements in road quality in the district could reduce transportation costs for tens of thousands of villagers. Appendix table 18 presents evidence of informal tax to build roads and other village infrastructures from the SPKP survey data. Households in remittance-positive villages are more likely to report money or in-kind contribution to village building projects and with higher amounts.

6. Alternative Explanations: Commodities and Trends

Could the presented findings not actually be caused by remittances? I consider several alternative explanations: commodity trade, differential trends depending on baseline outcome, and differential regional trends.

6.1. Commodity Trade in Oil, Natural Gas, and Palm Oil

It is possible that the exchange rate shock mechanism actually works through a trade channel on various commodities. An appreciation in the trading partners' currency will make Indonesian commodities cheaper and more attractive in the international market, leading to a trade surplus that can finance public goods provision by the districts. If the exchange rate shocks are ordered in a similar distribution among migration destination partners and trading partners, this will undermine the attribution of effects to remittances I proposed in this paper. However, the foreign trade statistics aggregating export data reports from all ports of entry (Appendix Table A.9) show that only a few countries overlap as top migration destinations and export destinations. While some Southeast Asian neighbor countries are represented in both lists, other top Indonesian trading partners such as the USA, China, and the EU are markedly different destinations than the MENA countries where many more migrants work. Regressions at the country level of the export value and the number of migrants recorded in the migrant terminal data also do not show statistically significant correlation between the two variables (Appendix Table A.10).

To further corroborate the incompatibility of the trade channel with the estimated impact of remittances on public goods, I analyze two primary export commodities from Indonesia: oil

and natural gas and palm oil. Oil and natural gas is Indonesia's most valuable commodity, bringing in USD 22 billion in 2007 and making up nearly one-fifth of total Indonesian export that year. I construct a measure of districts' oil and gas production by using its oil and gas revenue share in 2005 based on an intuitive relation: the more intensive the oil production in a district, the higher its revenue share will be. From the foreign trade statistics, I also obtain the export destination countries for specific categories of oil and gas commodities: crude petroleum oil, condensate, other lubricating oil, liquid natural gas, liquid propane, liquid butanes, and liquid ethylene. For these countries, I then retrieve the currency rate fluctuations to construct a $XRshockOil_t$ variable, which I interact with the oil production intensity.

Similarly, palm oil is Indonesia's most valuable agricultural export commodity, with USD 7.9 billion worth of export in 2007. I obtain the export destination countries for crude palm oil and crude olein and construct $XRshockPalm_t$ variable.[12] I use the area of land used for oil palm plantation from the 2003 agricultural census/village census to obtain a measure of palm oil intensity at the district level and interact the two variables to obtain the trade shock exposure variable to palm oil.[13] I then include these trade shock variables to the regression equation 5.

Table 8 reports the results with the inclusion of commodity trade controls. In Panel A, I examine the coefficients of the remittance proxy on regression with development indicators as the outcome variables. Panel A1 reproduces the main estimates, and Panel A2 presents the coefficients including the two commodities as control. The magnitudes of the effects on the expenditures for households in the bottom quintile, asset index, and poverty rate did not vary more than 5% of the original estimates. Although as the effect for total GDP per capita is revised downward it loses statistical significance, the estimates in general change little. In Panel B, I examine the coefficients of the remittance proxy for education outcomes. Panel B2 presents the coefficients from regressions that include the two commodities as control. In comparison to the main estimates in Panel B1, the patterns are the same and the inclusion of controls raises the magnitudes of the coefficients by 6-18% of the main estimates. The most pronounced increase is in the effect of junior secondary school enrollment from 4.4 p.p. to 5.2 p.p. in response to a one SD remittance shocks. By and large, the coefficients on the oil and gas trade shock and the palm oil trade shock themselves are an order of magnitude smaller than the remittance coefficients (not shown).

These results are consistent with the estimates reported in Cassidy (2022), who ruled out changes in public service delivery due to the oil and gas grant. Edwards (2019) argues that the expansion of palm oil plantations since 2000 has led to a faster poverty reduction. His analysis focus on districts outside of Java, where comparatively fewer migrants originated. In an alternate specification, I interact the remittance shock directly with the pre-period revenue from oil and gas production or with the pre-period palm oil production to check if the remittance

[12] India is the single biggest buyer of Indonesia's crude palm oil, along with the Netherlands and other South Asian countries. Japan, South Korea, and China are the biggest buyers of Indonesian crude oil and LNG for oil and natural gas.

[13] Appendix Table A.11 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.

effects are systematically different in oil/gas-producing areas or in palm-oil producing area. In this specification, the magnitude of the interaction is roughly one-tenth of the remittance shock coefficients. In contrast, the effects of remittances on their own remain positive. Together, these results present evidence against trade shock being the underlying driver of public service delivery change that is associated with remittances in this paper.

6.2. Baseline Trends and Regional Trends

Another alternative account for the presented results concerns differential trends. If areas observed with high remittances have the inherent propensity to exhibit different development paths due to their characteristics, it would challenge the attribution of the effects to remittances. Two sources of trends are relevant: regional trends and differential trends based on their baseline outcomes. I test for the robustness of the effects of remittances with the inclusion of variables that flexibly controls for these trends.

Table 9 reports the results with the inclusion of regional trends. The regressions reported in this table add island-year interaction terms that flexibly accounts for potential differential trajectories in outcome variables between districts in different islands. Panel A1 and B1 reproduces the main estimates, while Panel A2 and B2 present the results with regional trends for various development indicators and education outcomes, respectively. The remittance proxy coefficient are stable across the two specifications both for development indicators and education outcomes. All development indicators but the total GDP per capita income maintain their precisions and magnitudes (Panel A2). In Panel B2, estimates on education outcomes largely maintain their statistical precision and magnitudes. For the density of senior secondary school, the estimated coefficient is nearly 50% larger, which improves the precision of the effect.

Table 10 reports the results with the inclusion of baseline trends. To account for potential differential responses to remittances in districts that depends on their pre-period outcome, I use two different sets of baseline trends. In Panel A, I include the 2004 agriculture GDP per capita interacted with year dummies as the baseline level-specific trend. My inclusion of the agriculture sector GDP per capita reflects the fact that it is the largest sector of employment in the country and that migrant households also predominantly come from agriculture households (Bazzi, 2017, Makovec et al., 2018). Comparison between Panel A2 and the main estimates in Panel A1 show that the main estimates are robust to the addition of trends specific to the level of agricultural GDP per capita prior to the shocks. In Panel B, I include the school densities in 2004 separately by levels (elementary, junior secondary, and senior secondary), interacted with year dummies. Inclusion of these variables would adjust for potential differential trends that could be due to the fact that the government simply decided to build more schools where there had been fewer schools to serve the school-age populations. Panel B2 shows that all estimates increased in magnitudes with the inclusion of these variables, and the statistical precision are maintained from the main estimates. The estimates for enrollment rates and basic education facility densities rise by 18-36% of the main specification (column 1-5).

6.3. Other Robustness Checks

I further test for several other robustness checks: construction of migration intensity using alternative counts, construction of exchange rate shock measure using alternative data source, and the inclusion of lagged outcome variables.

Because I use migrant count from the 2005 village survey as the measure of district migration intensity, one concern is that the number of migrants may have changed substantially by the end of my sample period. In Appendix Table A.13, I presents estimates from an alternate construction that addresses this concern using data from three waves of village survey (2005, 2008, 2011). I limit the use of 2005 migrant count to the year of 2006-2008, and I use the 2008 and 2011 survey to update the count for 2009-2011 and 2012, respectively. The results do not change substantially. The consistent results reflect the strong correlation between migrant counts in the three periods within a district.

Another possible concern is the destination inaccuracies from the migrant terminal dataset, which is recorded at migrants' return to Indonesia. These measurement errors in the true destination composition can bias the results. I address this using village-level plurality destination recorded in the 2005 village survey. This is the only year in which the village survey collects migrant destination information, and the answer details are limited to only the top 11 migrant destinations and only record one country per village, i.e., the country with the most migrants from the village. Using the same exchange rate data, I measure the shock and aggregate it to the district level. Appendix Table A.14 presents the estimation results. The main estimates are robust to a different information source of migration destinations.

The inclusion of lagged outcome variable as a regressor tests a concern that future outcomes are predicted by past outcomes. If past outcomes are correlated with the remittance proxy when it is omitted from the right hand side of equation (5), this will bias the coefficient upward. In Appendix Table A.15, I show that the results are also robust to the inclusion of lagged outcomes as a control variable.

Lastly, I test for the possibility that the errors are simultaneously correlated within region and within time (Cameron et al., 2010). I first note that the inclusion of year dummies have mitigated this concern somewhat as the fixed effects inclusion in practice reduces within cluster correlations (Cameron et al., 2010). Appendix Table A.16 presents the estimation results. The statistical precisions of the results are preserved most strongly for the public school densities and the poverty rate.

7. Mechanisms

What drives the government to provide public goods in the presence of positive remittances shock? Because remittances are private transfers between individuals, they may be invisible to local governments in the area of origin. In this way, we may not expect local governments to respond to it directly. Furthermore, the constructions of public facilities typically require significant investment, and governments in developing countries are often resource-strapped.

I investigate several pathways through which migrant remittances may influence public goods provision by local governments. First, remittances may influence government policies through interactions with pre-existing policy priorities. Second, governments may capture remittance windfall through taxation. Third, decentralization may put local governments in a better position to provide public goods for their population. Finally, electoral competition may induce politicians to provide public goods to win votes.

7.1. Pre-existing policy priorities

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

To test this mechanism, I proxy districts' commitment to education with the share of the district's expenditure for education out of its total expenditure, using district finance data from the Ministry of Finance. I estimate a regression of education facilities at time t on the interaction of remittance proxy at time $t-1$ and the district's share of education expenditure at time $t-2$. The two-period lag for the education expenditure variable helps guard against the contemporaneous effect of the remittances shock on the district's spending profile. The coefficient of the interaction term in this regression will inform our understanding of the relationship between remittances and districts' policy priorities.

The results in Table 11, Panel A suggests that remittances strengthen the provision of education facilities in districts with a stronger fiscal commitment to education. The interaction term between remittance proxy and share of education expenditure has positive and significant coefficients in estimations with elementary and junior secondary schools as the outcome. This finding suggests the marginal impact of remittance shocks on basic education facilities is increasing with the level of fiscal commitment to education by the district government.

Village Head Survey. How does government policy adaptation operate in practice? At the lowest level of government, village governments has the best vantage points as they frequently interact with both villagers and the service providers (teachers and school principals). In the SPKP survey, village heads in five provinces were asked to list the main challenges in education service provision in their villages. Frequent answers include inadequate facilities, or families not being able to afford educating their children. I use the survey responses and create indicators of whether the village heads mention facilities, cost concern, and whether they rank facilities concern higher than cost concern. I regress this on a modified equation (5), specifying the remittance proxy variable at the village level instead of the district level. Panel B, Table 11 reports the results.

Village heads are less likely to mention education cost concern in villages with remittance-positive shocks (column 2), consistent with the positive effects on household welfare I have

documented earlier. The coefficient for facility concern is positive, but it is not statistically significantly different than zero (column 1). In direct comparison between facility concern and cost concern, they are more likely to rank inadequate education infrastructure higher as the top three challenges than ranking inaffordability of school education as a top challenge (column 3). These would have made them more supportive of policies to increase and improve education facilities in their villages.

Junior High School constructions. One such policy to increase education facilities would be to build junior high schools through intensifying the use of existing resources. In the 1970s and 1980s, the Indonesian government built numerous public elementary schools across the country through the INPRES program (Duflo, 2001). This celebrated program provided an initial stock of land that the later government in the 2000s could use to expand junior secondary schooling.

I look into a program that allows the government to build junior high schools more cheaply, mainly by using existing elementary schools, building smaller schools, and providing fewer amenities. The district government can build junior high schools attached to existing elementary schools under a "One-Roof Policy", which expands an elementary school to serve students in the subsequent three grades normally served by junior high schools. The governments are still responsible for hiring new teachers for the newly created school, although in practice existing elementary school teachers or available educated locals may be asked to teach the students (Departemen Pendidikan Nasional, 2008). Similarly, the new junior high school may also borrow existing classrooms while constructions for new classrooms and facilities are underway. Because the junior high schools are attached to elementary schools, the elementary school principals are responsible for the joint management of both schools. This policy would also allow rapid school establishments, as the district governments do not need to first acquire land to locate the new schools.

I use detailed school-level characteristics from the Ministry of Education administrative data to examine this margin of response. I look into the following outcome variables: an indicator of whether a junior high school is attached to an elementary school, the average number of classrooms per junior high school in the district, and the average number of teachers per junior high school. When new schools are constructed with fewer amenities, as would typically happen under this program, they would bring the district average number down. Table 11, Panel C reports the results from estimation of equation (5) for these variables.

I find district governments economize on new school constructions to allow them to respond rapidly to the remittance shocks. In column 1, a one standard deviation shock in the remittance proxy variable results in 3 p.p. increases in the share of junior high schools that are attached to a primary school in the district. These newly created junior high schools also have fewer classrooms than "normal" junior high schools (column 2), and fewer teachers (column 3). Overall, these results point to the trade-off district governments made in the educational system to respond to the remittances shock. They created schools with less-than-perfect facilities, but these were instrumental in ensuring more children access secondary education.

7.2. Taxation

Taxation of economic activities transfers part of the economic gain to the government budget, which they may use to provide public goods. With an increase in local economic growth due to remittances, does it change government revenues through taxation? I test this pathway by estimating the effects of remittances on government's various revenue streams. I use data from the Ministry of Finance for this analysis, reporting the outcomes in the log IDR unit and as a share of the total revenues for the district.

Suppose the government is able to capture part of the economic growth in their districts through taxation. In that case, we should expect positive coefficients for the remittance shock on the regression of tax revenues from centrally or locally collected taxes using equation (5). We shall not expect remittances to alter neither the general DAU budget that comes from unconditional intergovernmental transfers nor the share from natural resources revenues. With respect to the DAK budget, the effects are ex-ante ambiguous. Table 12 reports the results.

I do not find supporting evidence for higher tax revenues collected by the government with a positive remittance shock. The coefficients for tax revenues and other revenue streams are imprecisely estimated in log IDR (Panel A). The 90% confidence intervals from estimation in columns (1-2) suggests I can rule out effects where remittances shock leads to the tax revenue increases in log IDR that are higher than 1 percent. Furthermore, when I look at the revenue streams as a share of total budget, the negative effect on revenue sharing from centrally collected taxes attains statistical significance at the 5% level (Panel B, column 1).

7.3. Decentralization and district splits

In the presence of a positive remittances shock, decentralized governance could facilitate better provisions of public goods by the government. I use a binary variable of district splitting to indicate regions where the governance accountability have changed due to decentralization. This district split indicator takes a value of 1 for parent districts and their children in the year the split happens/the children district is created and thereafter. On the other hand, the indicator takes a value of 0 for the following two scenarios: (i) districts that are never split and (ii) districts that eventually split before the split happened. I regress the public school density on the remittance proxy interacted with the district split indicator.

Table 13, Panel A reports the estimation results: some of the effects of remittances on public goods are driven by the creation of public schools in districts that had split as a result of governance decentralization. In a regression with public elementary schools per 10,000 population as the outcome, the interacted term has a coefficient roughly half the size of the remittance proxy coefficient in the main specification (column 1). For public junior high school density, the coefficient for the interaction is roughly a third of the coefficient in the main specification (column 2). For these outcomes, the coefficients for the remittance proxy remain precisely estimated. Taken together, these suggest the positive association between remittances and public goods is stronger in districts that underwent a splitting process.

7.4. Election

Politicians may provide public goods to bolster their chances of winning votes during elections. In election years, they may become sensitive to citizen demand for public goods as they campaign for public offices. As remittances increase the use of public facilities such as schools (section 5), mayoral candidates may intensify the construction of public goods in high remittance areas during the election period. Where the accountability mechanism between citizens and elected politicians is weak, the construction of public goods will slacken correspondingly outside of this period.

I test this mechanism by interacting the remittance proxy variable in equation (5) with a dummy for election years. I compile various public information to create a district-year election dummy, which takes a value of 1 if the district holds a direct election in that year and 0 otherwise. Suppose elections are the main mediator of the remittance effects on public goods. In that case, we should expect positive coefficients on the remittance and election interaction term, while the uninteracted remittance proxy variable loses precision. Table 13, Panel B presents the results where I estimate regressions with the same public goods outcomes (public schools) on the interaction between remittances and election.

I find it unlikely that electoral competition drives the local governments' responses to remittances. The interaction term coefficients in columns 1-3 suggest the responses on public goods provision are no different in election years than in non-election years. In contrast, the coefficients for the remittance proxy are largely unchanged.

Analysis of household responses in the SPKP panel suggests that remittances lead to lower turnout for elections, with statistically significant lower turnout in mayoral election (Appendix Table A.19). Villagers also complains less about the implementations of anti-poverty programs in the village to the village head. Despite the lower engagement in formal channel, villagers may still interact informally through various community groups. Remittances lead to heterogenous effects in different community group participations, with positive effect on credit and recreation groups and negative effects on production groups (Appendix Table A.20).

8. Conclusion

Do remittances lead to local development? Yes, when we look at the provision of public goods in education and infrastructure in migrant-origin districts in Indonesia. To isolate the causal effect of remittances, I leverage preexisting spatial variations in migration intensity 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 receipts at the household level that I document using a migrant panel survey. At the district level, I find that the remittance shock leads to an improved provision of public goods: increases in the density of elementary and junior high schools. An analysis of district revenue streams shows little apparent pass-through between remittances to households and the district budget.

This study provides new evidence on the link between remittances and development in

the area of origin. With a plausibly exogenous variation of remittances, I investigate the causal impact of remittances on local development. The variations allow me to obtain the effect of migrant incomes separately from the migration decision itself. 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 remittances might influence public goods provision.

Since remittances can be linked to public goods provision in sectors that are especially salient to migrant households, this is an empirical relationship that can be of interest to policymakers in the migrant-sending area. Stakeholders can direct capital crowd-in from public finance to take further advantage of the remittances windfall. Ultimately, more empirical research will be necessary to provide a full understanding of the pathways between remittances, migration, and development.

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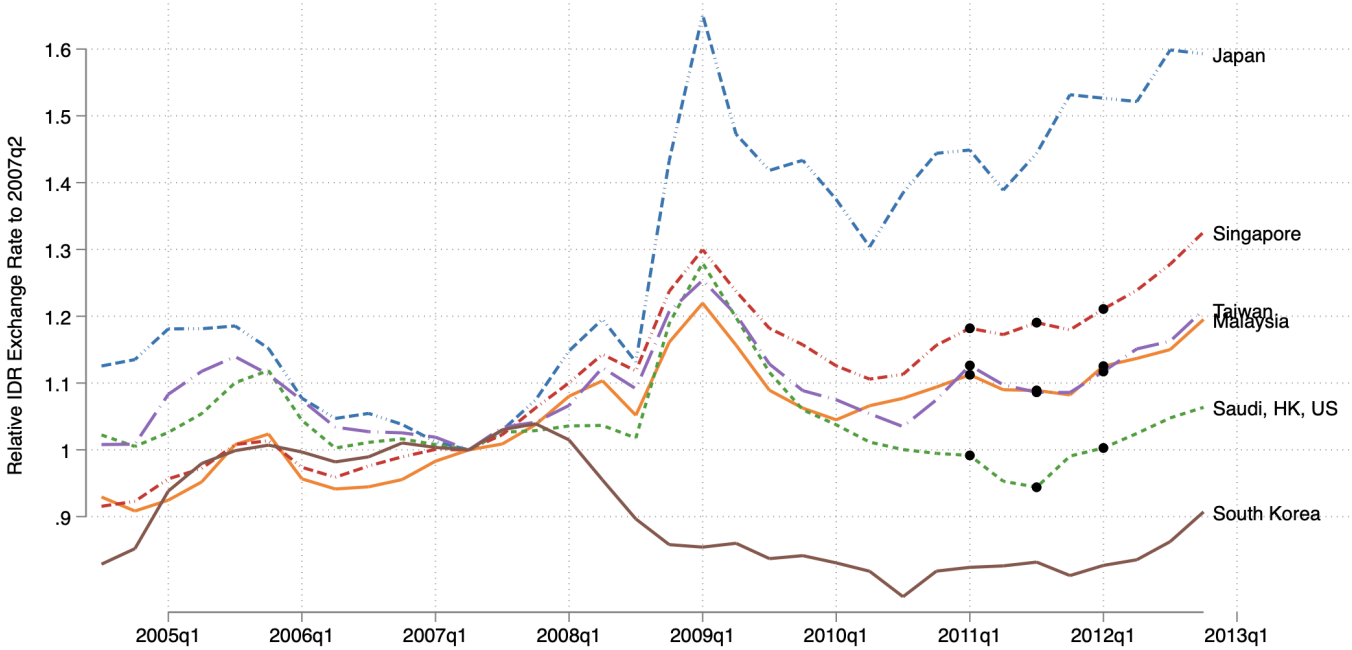
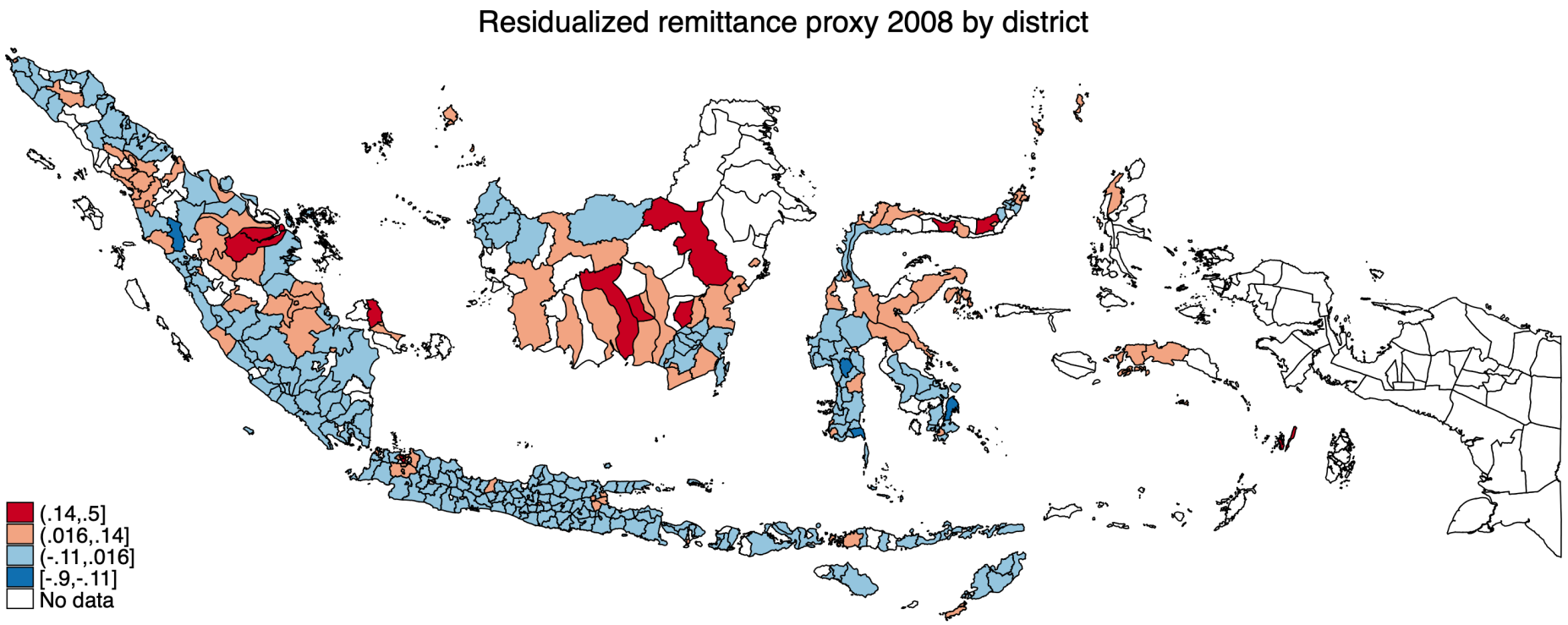
Figures and Tables

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



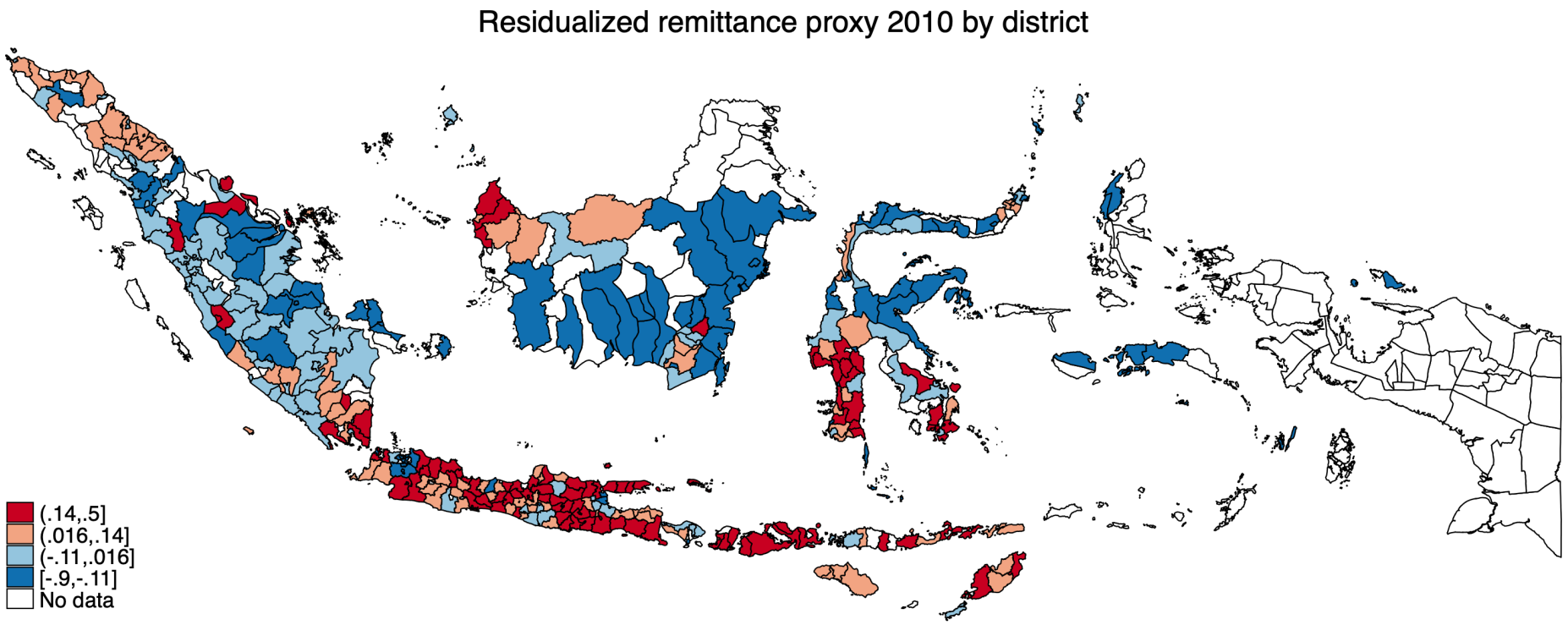
Note: Exchange rates plotted are relative exchange rates to the prevailing exchange rate in Q2-2007. Countries selected are major migration destination countries. Quarterly data averaged from monthly exchange rates provided by Refinitiv Datastream (2021). Black dots denote quarters where Doi et al. (2014)'s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

Figure 2: Spatial distribution of residualized remittance proxy in 2008



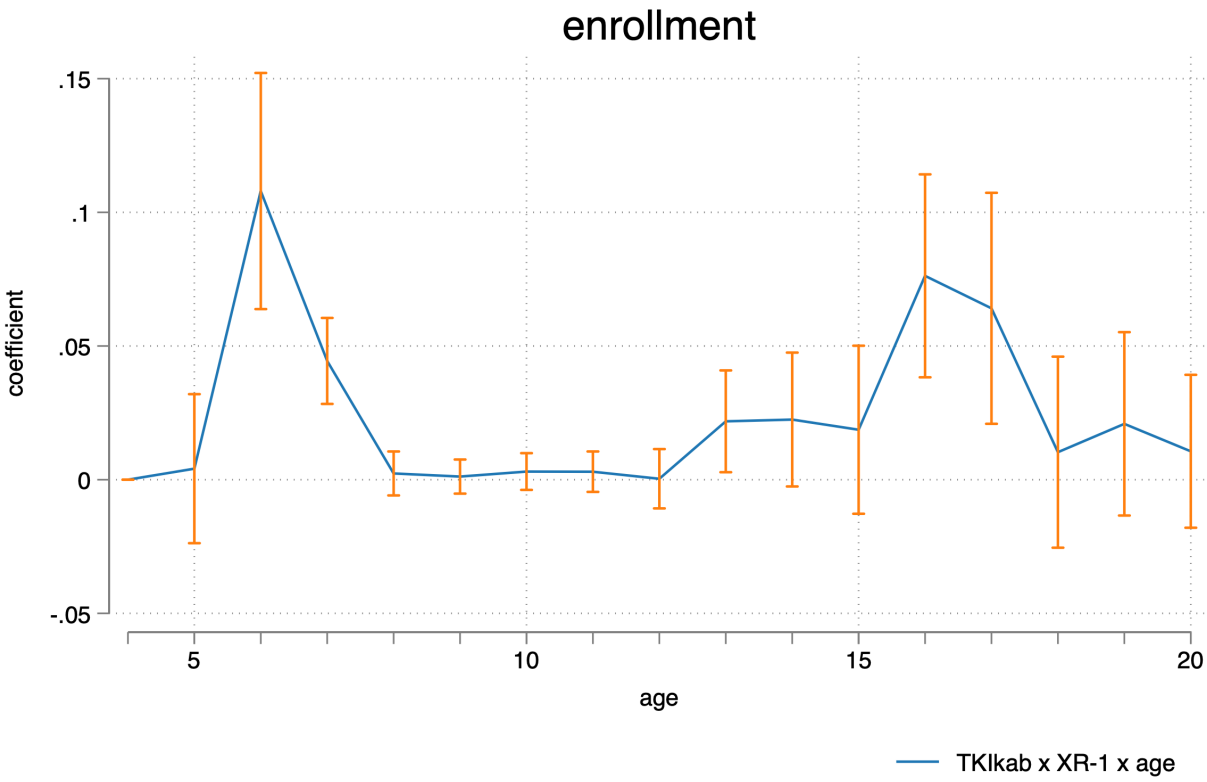
Note: Map displays Indonesian districts (*Kabupaten/Kota*) with color indicating the magnitude of residualized remittance proxy in 2008. Residual term from regression of remittance proxy (interaction of migration intensity and exchange rate shock) on district fixed effects and year fixed effects. Map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

Figure 3: Spatial distribution of residualized remittance proxy in 2010



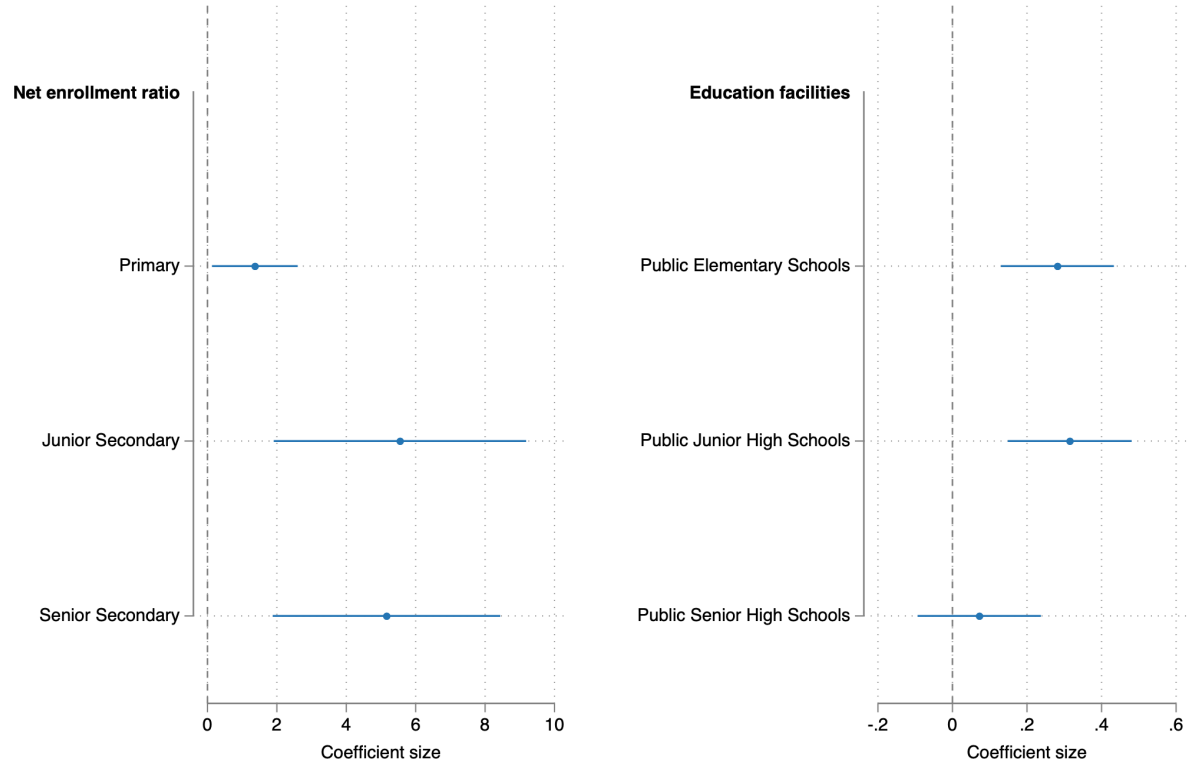
Note: Map displays Indonesian districts (*Kabupaten/Kota*) with color indicating the magnitude of residualized remittance proxy in 2010. Residual term from regression of remittance proxy (interaction of migration intensity and exchange rate shock) on district fixed effects and year fixed effects. Map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

Figure 4: Age-specific responses to remittance shocks



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

Figure 5: Effects of remittance shocks on education participation and public good provision



Note: Plot shows coefficients of the remittance proxy variable from the regressions of outcome variables on the vertical axes using equation (5). Each outcome in right panel is expressed in per 10,000 population and standardized. Plot shows point estimates and 90% confidence intervals. Data sources for each regressions are described in text.

Table 1: Summary statistics

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

Table 2: Effect of currency exchange fluctuations on remittances

	(1) Remittance	(2) Remittance	(3) Remittance	(4) Remittance
XR shock	0.050	0.378**	0.410**	0.406**
	(0.048)	(0.159)	(0.162)	(0.163)
Time abroad			-0.001	-0.001
			(0.000)	(0.000)
Time to next Eid				-0.069
				(0.192)
mean(y)	-0.0	-0.0	-0.0	-0.0
FE		hh wave	hh wave	hh wave
HH	183	183	183	183
Observations	418	418	418	418

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

Table 3: Correlations between Subsequent Remittances and Past Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)
	A. GDP per capita and household consumption expenditure (log IDR)					
	Household Expenditure	Household exp bottom 20%	GDP Total	GDP Agriculture	GDP Service	GDP Industry
$\text{Migration}_d^o \times \text{XRShock}_{dt+2}$	0.01	-0.00	-0.00	-0.00	0.23	0.20
	(0.02)	(0.02)	(0.02)	(0.02)	(0.16)	(0.16)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.45	11.77	15.40	13.94	14.23	13.68
Districts	341	341	350	350	353	353
Observations	1522	1522	1907	1907	1924	1924
	B. Net Enrollment Rate (%) and Education Facilities (per 10,000 people)					
	Elementary enrollment (age 6-12)	Junior Secondary enrollment (age 13-15)	Senior Secondary enrollment (age 16-18)	Elementary school (grade 1-6)	Junior Secondary school (grade 7-9)	Senior Secondary school (grade 10-12)
$\text{Migration}_d^o \times \text{XRShock}_{dt+2}$	-0.49	0.51	1.48	0.16	-0.00	0.01
	(0.48)	(1.41)	(1.02)	(0.10)	(0.04)	(0.01)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	88.63	65.73	44.24	6.59	1.11	0.29
Districts	350	350	350	353	353	353
Observations	1590	1590	1590	1924	1924	1924

Notes: This table reports estimates of a modified version of equation (5), where the exchange rate shock variable (XRShock) is shifted forward by two periods. Sample is 2005-2012 panel of Indonesian districts in Indo-Dapoer dataset with recorded returnees from airport arrival data. Interaction variable $\text{Migration}_d \times \text{XRShock}_{t+2}$ proxies for remittances, and is standardized to have mean zero and standard deviation of one. XRShock is district-level yearly average of migrant-weighted foreign currency exchange rate between host country currency and Indonesian rupiah, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration (intensity) is the natural log of ratio between the total migrant and total population from the 2005 village census. GDP per capita are expressed in log of 2010 Indonesian rupiah. Other outcomes data sources and details as described in Appendix A.1. * $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$. Standard errors clustered at the district level in parentheses.

Table 4: Effects of Remittances on Development Indicators

	(1)	(2)	(3)	(4)
	A. Household Expenditures per capita (log IDR)			
	Average Household	Bottom 20% Household	Education Expenditures	Core Price Index
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	0.04	0.10***	0.28***	1.90
	(0.04)	(0.03)	(0.09)	(3.19)
District FE, Year FE	✓	✓	✓	✓
Dep. Var. Mean	12.83	12.08	9.62	113.76
Districts	350	350	350	47
Observations	2060	2060	2060	330
	B. Asset and Poverty			
	Asset Index	Poverty Rate	Poverty Gap	Gini Coefficient
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	0.03***	-3.93***	-1.29***	-0.03**
	(0.01)	(0.76)	(0.23)	(0.01)
District FE, Year FE	✓	✓	✓	✓
Dep. Var. Mean	0.19	15.13	2.66	0.29
Districts	327	350	350	319
Observations	907	2392	2392	1844
	C. GDP per capita (log IDR)			
	GDP Total	GDP Agriculture	GDP Service	GDP Industry
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	0.09*	0.13***	0.24*	0.19
	(0.05)	(0.04)	(0.14)	(0.14)
District FE, Year FE	✓	✓	✓	✓
Dep. Var. Mean	15.50	13.98	14.40	13.81
Districts	350	350	353	353
Observations	2399	2399	2417	2417

Notes: This table reports estimates of equation (5). Sample is 2005-2012 panel of Indonesian districts in Indo-Dapoer dataset with recorded returnees from airport arrival data. Interaction variable $\text{Migration}_d \times \text{XRShock}_{t-1}$ proxies for remittances, and is standardized to have mean zero and standard deviation of one. XRShock is district-level yearly average of migrant-weighted foreign currency exchange rate between host country currency and Indonesian rupiah, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration (intensity) is the natural log of ratio between the total migrant and total population from the 2005 village census. GDP per capita are expressed in log of 2010 Indonesian rupiah. Other outcomes data sources and details as described in Appendix A.1. * $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$. Standard errors clustered at the district level in parentheses.

Table 5: Effects on School Enrollment

	(1) School Enrollment All Levels Among 6-18 yo.	(2) Elementary School Enrollment Among 6-12 yo.	(3) Jun Sec School Enrollment Among 13-15 yo.	(4) Sen Sec School Enrollment Among 16-18 yo.
	A. Boys and Girls			
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	3.73***	3.17***	4.37**	7.48***
	(0.81)	(0.76)	(2.14)	(2.21)
District FE, Year FE	✓	✓	✓	✓
Dep. Var. Mean	83.80	88.98	66.76	46.55
Districts	353	353	353	353
Observations	2411	2411	2411	2411
	B. Boys			
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	4.43***	2.47**	6.29***	11.95***
	(1.00)	(1.00)	(2.34)	(2.74)
District FE, Year FE	✓	✓	✓	✓
Dep. Var. Mean	83.19	88.92	65.61	46.01
Districts	353	353	353	353
Observations	2411	2411	2411	2411
	C. Girls			
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	2.92***	3.84***	1.87	2.82
	(0.89)	(0.88)	(2.86)	(2.78)
District FE, Year FE	✓	✓	✓	✓
Dep. Var. Mean	84.46	89.04	68.01	47.20
Districts	353	353	353	353
Observations	2411	2411	2411	2411

Notes: This table reports estimates of equation (5). Sample is 2005-2012 panel of Indonesian districts in Indo-Dapoer dataset with recorded returnees from airport arrival data. Interaction variable $\text{Migration}_d \times \text{XRShock}_{t-1}$ proxies for remittances, and is standardized to have mean zero and standard deviation of one. XRShock is district-level yearly average of migrant-weighted foreign currency exchange rate between host country currency and Indonesian rupiah, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration (intensity) is the natural log of ratio between the total migrant and total population from the 2005 village census. Outcomes data from Susenas household surveys. Other outcomes data details as described in Appendix A.1. * $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$. Standard errors clustered at the district level in parentheses.

Table 6: Effects on Enrollment, Cohort-Specific Analysis

	(1)	(2)	(3)	(4)
	Enrollment All Levels	Enrollment Elementary	Enrollment Jun Sec	Enrollment Sen Sec
	A. District-level remittance proxy			
CohortTreat$\times Mig_d^o \times XRshock_{dt-1}$	0.041***	0.074***	0.027*	0.077***
	(0.010)	(0.006)	(0.014)	(0.015)
$Mig_d^o \times XRshock_{dt-1}$	0.006	-0.031***	-0.011***	0.029***
	(0.008)	(0.003)	(0.002)	(0.003)
CohortTreat	0.726***	0.851***	0.603***	0.370***
	(0.001)	(0.001)	(0.001)	(0.001)
Year FE, Kab FE	✓	✓	✓	✓
Dep. Var. Mean	0.675	0.417	0.138	0.092
Districts	962,605	962,605	962,605	962,605
Observations	1,826,794	1,826,794	1,826,794	1,826,794
	B. Present migrant household and XR shock			
$CohortTreat_i \times Mig_h \times XRshock_{dt-1}$	0.009	0.019**	0.051***	-0.004
	(0.010)	(0.008)	(0.017)	(0.018)
$CohortTreat_i \times XRshock_{dt-1}$	0.005***	0.023***	0.006***	-0.015***
	(0.001)	(0.001)	(0.002)	(0.002)
Age FE, Year FE, Kab FE	✓	✓	✓	✓
Dep. Var. Mean	0.659	0.409	0.143	0.094
Households	393,272	393,272	393,272	393,272
Observations	757,991	757,991	757,991	757,991

Notes: This table reports estimates of equation (5). Sample is 2005-2007 individuals aged 4-20 in Susenas survey. XRShock is district-level yearly average of migrant-weighted foreign currency exchange rate between host country currency and Indonesian rupiah, relative to June 2007. CohortTreat dummies are indicators for individuals in school age (6-18), primary school age (7-12), junior secondary age (13-15), and senior secondary age (16-18). * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors clustered at the household level in parentheses.

Table 7: Effects on Public Goods Provision

	(1)	(2)	(3)
	A. Public Schools (per 10,000 population)		
	Elementary (Grade 1-6)	Junior Secondary (Grade 7-9)	Senior Secondary (Grade 10-12)
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	0.85***	0.27***	0.02
	(0.28)	(0.09)	(0.03)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	6.39	1.18	0.31
Districts	353	353	353
Observations	2417	2417	2417
	B. Other Public Goods		
	Share Household with Electricity	Share Household with Piped Water	Share Villages with Asphalt Roads
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	0.05***	0.09***	0.25**
	(0.02)	(0.03)	(0.10)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	0.89	0.16	0.70
Districts	350	353	308
Observations	2175	2411	831

Notes: This table reports estimates of equation (5). Sample is 2005-2012 panel of Indonesian districts in Indo-Dapoer dataset with recorded returnees from airport arrival data. Interaction variable $\text{Migration}_d \times \text{XRShock}_{t-1}$ proxies for remittances, and is standardized to have mean zero and standard deviation of one. XRShock is district-level yearly average of migrant-weighted foreign currency exchange rate between host country currency and Indonesian rupiah, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration (intensity) is the natural log of ratio between the total migrant and total population from the 2005 village census. Outcomes data sources and details as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors clustered at the district level in parentheses.

Table 8: Effects on Development and Education Outcomes, Robustness with Main Trade Commodities

	(1)	(2)	(3)	(4)	(5)	(6)
	A. Development Indicators					
	Household Expenditure	Household exp bottom 20%	Asset Index	Poverty Rate	GDP Total	GDP Agriculture
A1. Main Estimates						
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	0.04	0.10***	0.03***	-3.93***	0.09*	0.13***
	(0.04)	(0.03)	(0.01)	(0.76)	(0.05)	(0.04)
A2. With Commodity Trade Controls (Oil and Natural Gas, Palm Oil)						
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	0.06	0.11***	0.03***	-4.14***	0.06	0.13***
	(0.04)	(0.03)	(0.01)	(0.75)	(0.05)	(0.04)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.83	12.08	0.19	15.13	15.50	13.98
Districts	350	350	327	350	350	350
Observations	2060	2060	907	2392	2399	2399
	B. Net Enrollment Rate (%) and Education Facilities (per 10,000 people)					
	Elementary enrollment (age 6-12)	Junior Secondary enrollment (age 13-15)	Senior Secondary enrollment (age 16-18)	Elementary school (grade 1-6)	Junior Secondary school (grade 7-9)	Senior Secondary school (grade 10-12)
B1. Main Estimates						
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	3.17***	4.37**	7.48***	0.85***	0.27***	0.02
	(0.76)	(2.14)	(2.21)	(0.28)	(0.09)	(0.03)
B2. With Commodity Trade Controls (Oil and Natural Gas, Palm Oil)						
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	3.17***	5.17**	8.00***	0.90***	0.31***	0.03
	(0.77)	(2.11)	(2.12)	(0.29)	(0.09)	(0.03)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	88.98	66.76	46.55	6.39	1.18	0.31
Districts	353	353	353	353	353	353
Observations	2411	2411	2411	2417	2417	2417

Notes: This table reports estimates of equation (5) with the addition of two control variables on the right hand side to account for commodity trades. The variables are $\text{OilGas}_d^0 \times \text{XROilGas}_{t-1}$ and $\text{PalmOil}_d^0 \times \text{XRPalmOil}_{t-1}$. Sample is 2005-2012 panel of Indonesian districts in Indo-Dapoer dataset with recorded returnees from airport arrival data. Interaction variable $\text{Migration}_d \times \text{XRShock}_{t-1}$ proxies for remittances, and is standardized to have mean zero and standard deviation of one. XRShock is district-level yearly average of migrant-weighted foreign currency exchange rate between host country currency and Indonesian rupiah, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration (intensity) is the natural log of ratio between the total migrant and total population from the 2005 village census. GDP per capita are expressed in log of 2010 Indonesian rupiah. Other outcomes data sources and details as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors clustered at the district level in parentheses.

Table 9: Effects on Development and Education Outcomes, Robustness with Island-specific Trends

	(1)	(2)	(3)	(4)	(5)	(6)
	A. Development Indicators					
	Household Expenditure	Household exp bottom 20%	Asset Index	Poverty Rate	GDP Total	GDP Agriculture
A1. Main Estimates						
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	0.04	0.10***	0.03***	-3.93***	0.09*	0.13***
	(0.04)	(0.03)	(0.01)	(0.76)	(0.05)	(0.04)
A2. With Island Trends						
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	0.05	0.11***	0.05***	-4.14***	0.05	0.13***
	(0.04)	(0.03)	(0.01)	(0.85)	(0.05)	(0.05)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.83	12.08	0.19	15.13	15.50	13.98
Districts	350	350	327	350	350	350
Observations	2060	2060	907	2392	2399	2399
	B. Net Enrollment Rate (%) and Education Facilities (per 10,000 people)					
	Elementary enrollment (age 6-12)	Junior Secondary enrollment (age 13-15)	Senior Secondary enrollment (age 16-18)	Elementary school (grade 1-6)	Junior Secondary school (grade 7-9)	Senior Secondary school (grade 10-12)
B1. Main Estimates						
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	3.17***	4.37**	7.48***	0.85***	0.27***	0.02
	(0.76)	(2.14)	(2.21)	(0.28)	(0.09)	(0.03)
B2. With Island Trends						
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	2.63***	5.03**	6.74***	0.66**	0.25***	0.04**
	(0.83)	(2.21)	(2.40)	(0.30)	(0.08)	(0.02)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	88.98	66.76	46.55	6.39	1.18	0.31
Districts	353	353	353	353	353	353
Observations	2411	2411	2411	2417	2417	2417

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

Table 10: Effects on Development and Education Outcomes, Robustness with Baseline Trends

	(1)	(2)	(3)	(4)	(5)	(6)
	A. Development Indicators					
	Household Expenditure	Household exp bottom 20%	Asset Index	Poverty Rate	GDP Total	GDP Agriculture
A1. Main Estimates						
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	0.04	0.10***	0.03***	-3.93***	0.09*	0.13***
	(0.04)	(0.03)	(0.01)	(0.76)	(0.05)	(0.04)
A2. With Baseline Trends – 2004 Agriculture GDP per capita						
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	0.01	0.09***	0.03**	-2.27***	0.11**	0.13***
	(0.04)	(0.03)	(0.01)	(0.82)	(0.05)	(0.05)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.83	12.08	0.19	15.13	15.50	13.98
Districts	350	350	327	350	350	350
Observations	2060	2060	907	2392	2399	2399
	B. Net Enrollment Rate (%) and Education Facilities (per 10,000 people)					
	Elementary enrollment (age 6-12)	Junior Secondary enrollment (age 13-15)	Senior Secondary enrollment (age 16-18)	Elementary school (grade 1-6)	Junior Secondary school (grade 7-9)	Senior Secondary school (grade 10-12)
B1. Main Estimates						
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	3.17***	4.37**	7.48***	0.85***	0.27***	0.02
	(0.76)	(2.14)	(2.21)	(0.28)	(0.09)	(0.03)
B2. With Baseline Trends – 2004 school density						
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	3.43***	5.16**	10.20***	1.03***	0.32***	0.03
	(0.76)	(2.27)	(2.01)	(0.31)	(0.10)	(0.03)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	88.98	66.76	46.55	6.39	1.18	0.31
Districts	353	353	353	353	353	353
Observations	2411	2411	2411	2417	2417	2417

Notes: This table reports estimates of equation (5) with the addition of baseline trends on the right hand side. In Panel A the baseline trend is the 2004 Agriculture GDP per capita interacted with a set of year dummies. In Panel B the baseline trend is 2004 public schools per 10,000 population interacted with a set of year dummies, each level of schooling added separately. Sample is 2005-2012 panel of Indonesian districts in Indo-Dapoer dataset with recorded returnees from airport arrival data. XRShock is district-level yearly average of migrant-weighted foreign currency exchange rate between host country currency and Indonesian rupiah, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration (intensity) is the natural log of ratio between the total migrant and total population from the 2005 village census. GDP per capita are expressed in log of 2010 Indonesian rupiah. Other outcomes data sources and details as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors clustered at the district level in parentheses.

Table 11: Effects of Remittances on Education Supply

	(1)	(2)	(3)
	A. Public Schools (per 10,000 population)		
	Elementary (Grade 1-6)	Junior Secondary (Grade 7-9)	Senior Secondary (Grade 10-12)
Migration × XRShock_{t-1}	0.65**	0.28***	0.03
	(0.31)	(0.10)	(0.03)
Migration × XRShock_{t-1} × $EduBudget_{t-2}$	0.45*	0.13*	0.00
	(0.26)	(0.08)	(0.03)
District FE, Year FE	✓	✓	✓
Dep.Var Mean	6.45	1.20	0.32
Districts	341	341	341
Observations	1999	1999	1999
	B. Challenges in Jr Secondary Education		
	Facility Inadequate	Cost Unaffordable	Facility over cost
Migration x $XRShock_{t-1}$	0.353	-0.506*	0.206*
	(0.373)	(0.286)	(0.119)
Village FE, Survey FE	✓	✓	✓
mean(y)	0.791	0.365	0.244
Villages	572	572	572
Observations	6886	6886	6886
	C. Jr. Secondary Type and Facilities		
	Jr Sec Attached to Elementary	Classrooms per Jr Sec School	Teachers per Jr Sec School
Migration_d^o × XRShock_{dt-1}	0.03***	-0.45***	-0.57**
	(0.01)	(0.15)	(0.27)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	0.08	10.91	19.43
Districts	353	353	353
Observations	2417	2417	2417

Notes: This table reports estimates of equation (5). Panel A include interaction terms with lagged education expenditure budget as a share of total expenditures. Sample Panel A and C are 2005-2012 panel of Indonesian districts in Indo-Dapoer dataset with recorded returnees from airport arrival data. Interaction variable Migration_d×XRShock_{t-1} proxies for remittances, and is standardized to have mean zero and standard deviation of one. XRShock is district-level yearly average of migrant-weighted foreign currency exchange rate between host country currency and Indonesian rupiah, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration (intensity) is the natural log of ratio between the total migrant and total population from the 2005 village census. Sample Panel B is Village Head Survey from Olken et al. (2014) and Cahyadi et al. (2020). Other outcomes data sources and details as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors clustered at the district level in parentheses.

Table 12: Effects on District Revenue Streams

	(1)	(2)	(3)	(4)	(5)
	Central Taxes (DBH)	Local Taxes (PAD)	Natural Resources	Special Grant (DAK)	Formulaic Base Grant (DAU)
	A. District Revenue Streams (log IDR)				
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	-1.58	-1.21	-0.23	0.57	1.82
	(1.15)	(0.74)	(2.20)	(1.71)	(1.26)
District FE, Year FE	✓	✓	✓	✓	✓
Dep. Var. Mean	23.98	24.01	21.01	23.60	26.38
Districts	345	345	345	345	345
Observations	2324	2324	2324	2324	2324
	B. Revenues as share of total (%)				
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	-0.05**	-0.01	0.03	0.03***	-0.01
	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)
District FE, Year FE	✓	✓	✓	✓	✓
Dep. Var. Mean	0.07	0.07	0.06	0.07	0.62
Districts	345	345	345	345	345
Observations	2320	2320	2320	2320	2320

Notes: This table reports estimates of equation (5). Sample is 2005-2012 panel of Indonesian districts in Indo-Dapoer dataset with recorded returnees from airport arrival data. Interaction variable $\text{Migration}_d \times \text{XRShock}_{t-1}$ proxies for remittances, and is standardized to have mean zero and standard deviation of one. XRShock is district-level yearly average of migrant-weighted foreign currency exchange rate between host country currency and Indonesian rupiah, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration (intensity) is the natural log of ratio between the total migrant and total population from the 2005 village census. Outcomes data sources and details as described in Appendix A.1. * $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$. Standard errors clustered at the district level in parentheses.

Table 13: Effects of Remittances, Interaction with District Split and Election Indicators

	(1) Public Elementary (Grade 1-6)	(2) Public Junior Secondary (Grade 7-9)	(3) Public Senior Secondary (Grade 10-12)
	A. District Splitting		
Migration × XRShock_{t-1}	0.52***	0.18**	0.1
	(0.18)	(0.07)	(0.02)
Migration × $\text{XRShock}_{t-1} \times 1[Split]_t$	0.41**	0.094*	-0.01
	(0.16)	(0.056)	(0.01)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	6.39	1.18	0.31
Districts	353	353	353
Observations	2417	2417	2417
	B. Election		
Migration × XRShock_{t-1}	0.87***	0.28***	0.02
	(0.28)	(0.09)	(0.03)
Migration × $\text{XRShock}_{t-1} \times 1[Election]_t$	-0.01	-0.00	-0.00
	(0.02)	(0.01)	(0.00)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	6.39	1.18	0.31
Districts	353	353	353
Observations	2417	2417	2417

Notes: This table reports estimates of equation (5). Panel A includes interaction terms with an indicator of whether the district has split into smaller districts, Panel B includes interaction terms with an indicator of whether there is a district-level election in the year. Sample are 2005-2012 panel of Indonesian districts in Indo-Dapoer dataset with recorded returnees from airport arrival data. Interaction variable $\text{Migration}_d \times \text{XRShock}_{t-1}$ proxies for remittances, and is standardized to have mean zero and standard deviation of one. XRShock is district-level yearly average of migrant-weighted foreign currency exchange rate between host country currency and Indonesian rupiah, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration (intensity) is the natural log of ratio between the total migrant and total population from the 2005 village census. Other outcomes data sources and details as described in Appendix A.1. * $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$. Standard errors clustered at the district level in parentheses.

Appendix

Data Sources and Constructions

Main Explanatory Variables

Migration Intensity data comes from Podes (*Potensi Desa*), a tri-annual survey of all villages in Indonesia (2005, 2008, 2011). Informations about the number of Overseas Indonesian Workers (TKI) were provided by village heads, and aggregated to the district level. Migration Intensity is expressed as the natural logarithm of the ratio of total migrant population in the district to total population in the district. Population denominator uses population estimate from Podes in the same year.

Migrant stock data are based on migrant terminal data collected between March 2008-March 2011, provided by BNP2TKI. Collects 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 of 25 months, the resulting dataset has 26,235,872 observations. I aggregate this to the district-destination-month level so each observation now contains the information of how many migrants from a given district in a given month are in each destination. I drop the outlier of long-staying migrants to create a dataset with in 215,072 observations 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 observations above are then merged on month and currency code with exchange rate data from Datastream (below). All exchange rates of foreign currencies to Indonesian rupiah are benchmarked to rate in June 2007. I drop information from migrants in Zimbabwe because of its economic volatility (0.2% of total migrants).

From the district-destination/currency-month level data, I aggregate it to district-year level, using the number of migrant in each destination and month as weight to create the average at the district-year level (N=2,463). This is not a balanced panel. 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 Indonesian Rupiah 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 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 Pacific Exchange Rate Service for Kuwait Dinar and Bahrain Dirham to Indonesian Rupiah, and Bloomberg Terminal for Syrian Pound and Solomon Islander Dollars to US Dollar.

Commodity data 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 to the country destination level. Commodities covered from palm oil: crude palm oil (SITC 42221) and crude olein (42229). Commodities covered from oil and natural gas: 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). Palm oil plantation area comes from Podes 2003 (Agricultural Census).

Election data are obtained from Sam Bazzi and Ben Marx, augmented with reports from Indonesian media for districts not covered in the dataset.

Outcomes Variables

Indo-Dapoer (Indonesia Database for Policy and Economic Research) is a compilation of Indonesian district-level indicators compiled by the World Bank from various sources. Unit of observations are districts as defined by the 2014 boundary. Observations of post-split district children are backcasted to years before the split. Most indicators are available yearly and I use data from 2005-2012. I use the following variables from Dapoer: household expenditures (average household, household in bottom 20%, education), GDP in constant price by sector, population, CPI/consumer price index (base 2002 and 2007), poverty rate, poverty gap, gini coefficient, share household with electricity, share of villages with asphalt road, education budget, revenue streams (DBH, PAD, DBH SDA, DAK, DAU, oil and gas revenue), employment (total labor force, employment, unemployment, underemployment, employment by sector). I do 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 Census 2000 and Census 2010, with population projection in intervening years from BPS. I rescale CPI base-2002 to CPI base-2007 to create a longer series. Price data is only available in 45 cities for 2002 base, 66 cities for 2007 base. Asphalt road only available every three years because it aggregates data from triannual Podes survey. For district budget and expenditures, I create share of each revenue streams out of total budget and share of education expenditures out ot total expenditures.

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

Dapodik (*Data Pokok Pendidikan*) is an administrative school registry maintained by the Ministry of Education, Culture, Research, and Technology. Dapodik covers the universe of schools under the purview of MOECRT in Indonesia. These include 166,257 publicly-run schools and 52,888 privately-run schools. School administrators submits information periodically to the database, a requirement 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 submission to the MOECRT system. I use the following information from Dapodik: whether a school is a public school, 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 district-year level to create count of schools existing at a given district at a given year. I further use the following information for junior secondary schools: name of school, number of teachers per school, number of classrooms per school, number of toilets per school. I create an indicator of whether the junior high school is a "One-Roof School" that share a location with an elementary school by extracting from its name string ("Satap" or "Satu Atap"). I aggregate this to district-year level.

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

District identifiers across datasets are merged with the help of a Kabupaten crosswalk, i.e., to merge Susenas, Podes, and Dapoer dataset. Other datasets are merged at the district level by name after standardization in spelling, i.e., for BNP2TKI terminal data and Dapodik.

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. The baseline was administered prior to their departure (February-June 2010) and households were re-interviewed in three follow-up surveys (March-April

2011, September-October 2011, January 2012). The same household members interviewed at baseline are the focal contact to be interviewed at the follow-up surveys. The recontact rates were 91-98% in the three follow-ups. I retain samples with the following characteristics from the survey: (1) the migrant was located abroad in more than one follow-up rounds, (2) they reported receiving international remittances, and (3) the migrant sent remittances after the last follow-up survey. On criteria (1) I exclude households who did not know which country the migrant was working in; on criteria (3) I use changes between follow-up surveys in the reported amount of remittances since the migrant's departure as an indicator of subsequent remittance transfers.

SPKP data (*Survei Pelayanan Kesehatan dan Pendidikan*) are a set of baseline and follow-up surveys conducted in 700 subdistricts across Indonesia to evaluate the impact of a household cash transfer program (PKH/*Program Keluarga Harapan*) and a community block grant program (Generasi, see: Alatas, 2011; Olken and Singhal, 2011; Olken et al., 2014; Cahyadi et al., 2020). The respondents are households, village heads, schools, health workers, and subdistrict heads. I analyzed data from four survey waves: 2007, 2008, 2009, 2014. Village and household samples are a mixture of cross-section and panel (i.e. some households/villages are only observed once). Sample sizes vary between survey waves, depending on survey purpose, e.g., 2008 was a midline only for Generasi block grant program. Area coverage: 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 to village head on anti-poverty programs. I code an indicator if the village head (unprompted) mention junior secondary education facility in the village is lacking/too far, or the infrastructure is inadequate. I also code an indicator for mentions of high education cost or insufficient financial assistance for school operation/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: participation indicator 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 is any in the past 2 years), and village head election (if there is any in the past 2 years). I use village codes to match SPKP villages with Podes dataset, constructing the remittance shock variable based on migrant count and village plurality destinations from Podes 2005. I match this with the exchange rate data (above) to construct the shock variable.

IFLS (Indonesia Family Life Survey) data is a series of panel survey of ∼40k households, first surveyed in 1993 to be representative of around eighty percent of the Indonesian population at the time of survey. My study period overlaps only with the fourth wave (2007), which I use to investigate the correlation between remittances and aspiration for children in the households.

Table A.1: Summary statistics – Supplementary

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

Table A.2: Major migration destination countries

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

Table A.3: Remittance Estimates from Survey Data

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

Table A.4: Effect of currency exchange fluctuations on remittances frequency

	(1) Remittances frequency	(2) Remittances frequency	(3) Remittances frequency	(4) Remittances frequency
XR shock	1.400***	0.896*	0.903*	0.929*
	(0.191)	(0.502)	(0.510)	(0.504)
Time abroad			-0.000	-0.000
			(0.001)	(0.001)
Time to next Eid				0.478
				(0.396)
mean(y)	4.5	4.5	4.5	4.5
FE		hh wave	hh wave	hh wave
HH	183	183	183	183
Observations	418	418	418	418

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

Table A.5: Placebo Effects on School Enrollment

	(1) Elementary School Enrollment Among 19-24 yo.	(2) Jun Sec School Enrollment Among 19-24 yo.	(3) Sen Sec School Enrollment Among 19-24 yo.
	A. Boys and Girls		
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	-0.12	-0.12	-0.79
	(0.09)	(0.18)	(0.79)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	0.03	0.20	2.86
Districts	353	353	353
Observations	2411	2411	2411
	B. Boys		
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	-0.10	0.11	-0.34
	(0.10)	(0.20)	(0.88)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	0.03	0.23	3.44
Districts	353	353	353
Observations	2411	2411	2411
	C. Girls		
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	-0.19	-0.36	-1.21
	(0.15)	(0.27)	(0.97)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	0.03	0.16	2.29
Districts	353	353	353
Observations	2411	2411	2411

Notes: This table reports estimates of equation (5). Sample is 2005-2012 panel of Indonesian districts in Indo-Dapoer dataset with recorded returnees from airport arrival data. Interaction variable $\text{Migration}_d \times \text{XRShock}_{t-1}$ proxies for remittances, and is standardized to have mean zero and standard deviation of one. XRShock is district-level yearly average of migrant-weighted foreign currency exchange rate between host country currency and Indonesian rupiah, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration (intensity) is the natural log of ratio between the total migrant and total population from the 2005 village census. Outcomes data from Susenas household surveys. Other outcomes data details as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors clustered at the district level in parentheses.

Table A.6: Effects on School Enrollment, with Survey Weight

	(1) School Enrollment among 7-18 yo. (weighted)	(2) Elem School Enrollment among 7-12 yo. (weighted)	(3) Jun Sec School Enrollment among 13-15 yo. (weighted)	(4) Sen Sec School Enrollment among 16-18 yo. (weighted)
	A. Boys and Girls			
Migration × XRShock$_{t-1}$	2.53***	1.02	4.57**	6.10***
	(0.76)	(0.69)	(2.19)	(2.05)
District FE, Year FE	✓	✓	✓	✓
mean(y) boys and girls	85.7	93.5	66.8	46.3
Clusters	353	353	353	353
Observations	2411	2411	2411	2411
	B. Boys			
Migration × XRShock$_{t-1}$	3.47***	0.12	5.91**	10.23***
	(0.94)	(0.88)	(2.43)	(2.61)
District FE, Year FE	✓	✓	✓	✓
Dep.Var. Mean	85.2	93.7	65.6	45.8
Districts	353	353	353	353
Observations	2411	2411	2411	2411
	C. Girls			
Migration × XRShock$_{t-1}$	1.50	1.92**	2.65	1.80
	(0.92)	(0.85)	(2.85)	(2.60)
District FE, Year FE	✓	✓	✓	✓
Dep.Var. Mean	86.3	93.4	68.0	46.9
Districts	353	353	353	353
Observations	2411	2411	2411	2411

Notes: This table reports estimates of equation (5). Sample is 2005-2012 panel of Indonesian districts in Indo-Dapoer dataset with recorded returnees from airport arrival data. Interaction variable Migration$_d$×XRShock$_{t-1}$ proxies for remittances, and is standardized to have mean zero and standard deviation of one. XRShock is district-level yearly average of migrant-weighted foreign currency exchange rate between host country currency and Indonesian rupiah, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration (intensity) is the natural log of ratio between the total migrant and total population from the 2005 village census. Outcomes data from Susenas household surveys. Other outcomes data details as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors clustered at the district level in parentheses.

Table A.7: Effects on Household Assets Ownership

	(1) Motorbike	(2) Car	(3) Bicycles	(4) Fridge	(5) LPG 12kg
Migration x $XRShock^{t-1}$	0.03**	0.04	0.07***	0.15***	0.10***
	(0.02)	(0.04)	(0.02)	(0.02)	(0.02)
mean(y)	0.59	0.07	0.35	0.31	0.14
Districts	327	253	327	327	327
Observations	907	506	907	907	907

Notes: Standard errors clustered at the kabupaten level in parentheses. Sample is 2005-2012 unbalanced panel of Indonesian districts in the World Bank Dapoer dataset with recorded returnees from airport arrival data. XRShock is district-level yearly average of migrant-weighted foreign currency exchange rate between host country currency and Indonesian rupiah, relative to June 2007. District-level migrant stock abroad is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration intensity is the natural log of ratio between the total migrant and total population from the 2005 village census. Outcomes data sources as described in Appendix A.1. All regressions include district and year fixed effects. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

Table A.8: Use of increased remittances

	(1) Electronics	(2) Durables	(3) Migration loan	(4) School	(5) Consumption	(6) Other
XR shock	0.58***	0.43**	0.44*	0.15	-0.10	0.96**
	(0.21)	(0.19)	(0.26)	(0.32)	(0.39)	(0.39)
mean(y)	1.0	0.7	2.4	4.8	7.6	5.8
FE	hh	hh	hh	hh	hh	hh
HH	183	183	183	183	183	183
Observations	418	418	418	418	418	418

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

Table A.9: Major trading partners for Indonesia

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

Table A.10: Migration destination and trade countries

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

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

Table A.11: Correlation between commodity production and migration

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

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

Table A.12: Effects on Development and Education Outcomes, Interaction with pre-period commodity production

	(1)	(2)	(3)	(4)	(5)	(6)
	A. Development Indicators					
	Household Expenditure	Household exp bottom 20%	Asset Index	Poverty Rate	GDP Total	GDP Agriculture
A1. With Oil and Gas Revenue Share 2005						
$Migration^o_d \times XRShock_{dt-1}$	0.16***	0.20***	0.02	-3.77***	0.06	0.13**
	(0.06)	(0.05)	(0.02)	(1.04)	(0.06)	(0.07)
$Migration^o_d \times XRShock_{dt-1} \times OilGas^o_d$	-0.01***	-0.01***	0.00	-0.02	0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.07)	(0.01)	(0.00)
A2. With Palm Oil Plantation 2003						
$Migration^o_d \times XRShock_{dt-1}$	0.05	0.10***	0.03**	-4.69***	0.11***	0.15***
	(0.04)	(0.03)	(0.01)	(0.77)	(0.04)	(0.04)
$Migration^o_d \times XRShock_{dt-1} \times PalmOil^o_d$	-0.00	0.01	0.01**	0.30	-0.01	-0.01
	(0.01)	(0.01)	(0.00)	(0.22)	(0.02)	(0.01)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.83	12.08	0.19	15.13	15.50	13.98
Districts	350	350	327	350	350	350
Observations	2060	2060	907	2392	2399	2399
	B. Net Enrollment Rate (%) and Education Facilities (per 10,000 people)					
	Elementary enrollment (age 7-12)	Junior Secondary enrollment (age 13-15)	Senior Secondary enrollment (age 16-18)	Elementary school (grade 1-6)	Junior Secondary school (grade 7-9)	Senior Secondary school (grade 10-12)
B1. With Oil and Gas Revenue Share 2005						
$Migration^o_d \times XRShock_{dt-1}$	0.77	6.47**	11.37***	1.33***	0.63***	0.05
	(0.95)	(2.90)	(2.77)	(0.46)	(0.13)	(0.04)
$Migration^o_d \times XRShock_{dt-1} \times OilGas^o_d$	0.01	-0.19	-0.36*	-0.04*	-0.03***	-0.00
	(0.06)	(0.18)	(0.19)	(0.02)	(0.01)	(0.00)
B2. With Palm Oil Plantation 2003						
$Migration^o_d \times XRShock_{dt-1}$	0.56	5.91**	9.38***	0.92***	0.32***	0.04
	(0.71)	(2.37)	(2.06)	(0.29)	(0.09)	(0.02)
$Migration^o_d \times XRShock_{dt-1} \times PalmOil^o_d$	0.19	-0.78*	-0.91*	-0.07	-0.03*	-0.01***
	(0.16)	(0.43)	(0.47)	(0.06)	(0.02)	(0.00)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	88.98	66.76	46.55	6.39	1.18	0.31
Districts	353	353	353	353	353	353
Observations	2411	2411	2411	2417	2417	2417

Notes: This table reports estimates of equation (5) with the addition of baseline trends on the right hand side. In Panel A the baseline trend is the 2004 Agriculture GDP per capita interacted with a set of year dummies. In Panel B the baseline trend is 2004 public schools per 10,000 population interacted with a set of year dummies, each level of schooling added separately. Sample is 2005-2012 panel of Indonesian districts in Indo-Dapoer dataset with recorded returnees from airport arrival data. XRShock is district-level yearly average of migrant-weighted foreign currency exchange rate between host country currency and Indonesian rupiah, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration (intensity) is the natural log of ratio between the total migrant and total population from the 2005 village census. GDP per capita are expressed in log of 2010 Indonesian rupiah. Other outcomes data sources and details as described in Appendix A.1. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01. Standard errors clustered at the district level in parentheses.

Table A.13: Effects on Development and Education Outcomes, Robustness Podes 2005, 2008, 2011 migrant count

	(1)	(2)	(3)	(4)	(5)	(6)
	A. Development Indicators					
	Household Expenditure	Household exp bottom 20%	Asset Index	Poverty Rate	GDP Total	GDP Agriculture
A1. Main Estimates - Podes 2005 migrant count only						
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	0.04	0.10***	0.03***	-3.93***	0.09*	0.13***
	(0.04)	(0.03)	(0.01)	(0.76)	(0.05)	(0.04)
A2. Podes 2005, 2008, 2011 migrant count						
$Migration_{dt-1} \times XRShock_{dt-1}$	0.06	0.10***	0.02*	-3.61***	0.13**	0.13***
	(0.04)	(0.03)	(0.01)	(0.83)	(0.06)	(0.05)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.83	12.08	0.19	15.13	15.50	13.98
Districts	350	350	327	350	350	350
Observations	2060	2060	907	2392	2399	2399
	B. Net Enrollment Rate (%) and Education Facilities (per 10,000 people)					
	Elementary enrollment (age 7-12)	Junior Secondary enrollment (age 13-15)	Senior Secondary enrollment (age 16-18)	Elementary school (grade 1-6)	Junior Secondary school (grade 7-9)	Senior Secondary school (grade 10-12)
B1. Main Estimates - Podes 2005 migrant count only						
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	3.17***	4.37**	7.48***	0.85***	0.27***	0.02
	(0.76)	(2.14)	(2.21)	(0.28)	(0.09)	(0.03)
B2. Podes 2005, 2008, 2011 migrant count						
$Migration_{dt-1} \times XRShock_{dt-1}$	0.93	4.67**	7.11***	0.74**	0.23**	0.02
	(0.70)	(2.14)	(2.42)	(0.30)	(0.09)	(0.03)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	88.98	66.76	46.55	6.39	1.18	0.31
Districts	353	353	353	353	353	353
Observations	2411	2411	2411	2417	2417	2417

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

Table A.14: Effects on Development and Education Outcomes, Robustness Podes 2005 village plurality destinations

	(1)	(2)	(3)	(4)	(5)	(6)
	A. Development Indicators					
	Household Expenditure	Household exp bottom 20%	Asset Index	Poverty Rate	GDP Total	GDP Agriculture
A1. Main Estimates - Migrant Terminal data for destination exposure						
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	0.04	0.10***	0.03***	-3.93***	0.09*	0.13***
	(0.04)	(0.03)	(0.01)	(0.76)	(0.05)	(0.04)
A2. Podes 2005 village plurality destination						
$Migration_{t-1} \times XRShock_{dt-1}^{2005dest}$	-0.01	0.05	0.04***	-4.50***	0.06	0.12**
	(0.04)	(0.04)	(0.02)	(0.98)	(0.05)	(0.05)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.83	12.08	0.19	15.13	15.50	13.98
Districts	350	350	327	350	350	350
Observations	2060	2060	907	2392	2399	2399
	B. Net Enrollment Rate (%) and Education Facilities (per 10,000 people)					
	Elementary enrollment (age 7-12)	Junior Secondary enrollment (age 13-15)	Senior Secondary enrollment (age 16-18)	Elementary school (grade 1-6)	Junior Secondary school (grade 7-9)	Senior Secondary school (grade 10-12)
B1. Main Estimates - Podes 2005 migrant count only						
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	3.17***	4.37**	7.48***	0.85***	0.27***	0.02
	(0.76)	(2.14)	(2.21)	(0.28)	(0.09)	(0.03)
B2. Podes 2005, 2008, 2011 migrant count						
$Migration_{t-1} \times XRShock_{dt-1}^{2005dest}$	0.52	5.89***	4.29*	0.67*	0.34***	-0.03
	(0.80)	(2.25)	(2.32)	(0.35)	(0.11)	(0.05)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	88.98	66.76	46.55	6.39	1.18	0.31
Districts	353	353	353	353	353	353
Observations	2411	2411	2411	2417	2417	2417

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

Table A.15: Effects on Development and Education Outcomes, Robustness with Lagged Outcome Variables

	(1)	(2)	(3)	(4)	(5)	(6)
	A. Development Indicators					
	Household Expenditure	Household exp bottom 20%	Asset Index	Poverty Rate	GDP Total	GDP Agriculture
A1. Main Estimates						
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	0.04	0.10***	0.03***	-3.93***	0.09*	0.13***
	(0.04)	(0.03)	(0.01)	(0.76)	(0.05)	(0.04)
A2. with Lagged Outcome Variables						
$Migration_d^o \times XRShock_{dt-1}$	0.05	0.11***	0.08*	-2.06***	0.10***	0.09***
	(0.04)	(0.03)	(0.04)	(0.33)	(0.03)	(0.03)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.83	12.08	0.19	15.13	15.50	13.98
Districts	350	350	327	350	350	350
Observations	2060	2060	907	2392	2399	2399
	B. Net Enrollment Rate (%) and Education Facilities (per 10,000 people)					
	Elementary enrollment (age 7-12)	Junior Secondary enrollment (age 13-15)	Senior Secondary enrollment (age 16-18)	Elementary school (grade 1-6)	Junior Secondary school (grade 7-9)	Senior Secondary school (grade 10-12)
B1. Main Estimates						
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	3.17***	4.37**	7.48***	0.85***	0.27***	0.02
	(0.76)	(2.14)	(2.21)	(0.28)	(0.09)	(0.03)
B2. with Lagged Outcome Variables						
$Migration_d^o \times XRShock_{dt-1}$	0.65	2.29	3.87*	0.81***	0.23***	0.03
	(0.73)	(2.08)	(2.08)	(0.21)	(0.07)	(0.02)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	88.98	66.76	46.55	6.39	1.18	0.31
Districts	353	353	353	353	353	353
Observations	2411	2411	2411	2417	2417	2417

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

Table A.16: Effects on Development and Education Outcomes, Two-way Clustering Checks

	(1)	(2)	(3)	(4)	(5)	(6)
	A. Development Indicators					
	Household Expenditure	Household exp bottom 20%	Asset Index	Poverty Rate	GDP Total	GDP Agriculture
A1. Main Estimates						
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	0.04	0.10***	0.03***	-3.93***	0.09*	0.13***
	(0.04)	(0.03)	(0.01)	(0.76)	(0.05)	(0.04)
A2. Two-way clustering at district and year						
$Migration_d^o \times XRShock_{dt-1}$	0.04	0.10	0.03	-3.93***	0.09	0.13
	(0.06)	(0.06)	(0.01)	(1.08)	(0.05)	(0.07)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.83	12.08	0.19	15.13	15.50	13.98
Districts	350	350	327	350	350	350
Observations	2060	2060	907	2392	2399	2399
	B. Net Enrollment Rate (%) and Education Facilities (per 10,000 people)					
	Elementary enrollment (age 7-12)	Junior Secondary enrollment (age 13-15)	Senior Secondary enrollment (age 16-18)	Elementary school (grade 1-6)	Junior Secondary school (grade 7-9)	Senior Secondary school (grade 10-12)
B1. Main Estimates						
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	3.17***	4.37**	7.48***	0.85***	0.27***	0.02
	(0.76)	(2.14)	(2.21)	(0.28)	(0.09)	(0.03)
B2. Two-way clustering at district and year						
$Migration_d^o \times XRShock_{dt-1}$	0.83	4.37	7.48*	0.85**	0.27**	0.02
	(0.89)	(2.85)	(3.48)	(0.30)	(0.09)	(0.02)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	88.98	66.76	46.55	6.39	1.18	0.31
Districts	353	353	353	353	353	353
Observations	2411	2411	2411	2417	2417	2417

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

Table A.17: Correlation between Transfers from Household Members Abroad and Expectations of Future Outcomes for Children in the Household

	(1) In school	(2) Years of education	(3) Better life
Abroad transfer (log IDR)	0.01	0.43**	0.03*
	(0.02)	(0.18)	(0.02)
Observations	170	92	170

Notes: Sample is household in Indonesia Family Life Survey (2007) panel who reported receiving non-zero transfer from parent(s)/child(ren) abroad in the past 12 months. Dependent variable is the average expectations for children 7-24 years old in the household in three dimensions. Expectation of better life is surveyed as a question with a five-point Likert scale and recoded as an indicator of slightly better or much better life. Years of education is surveyed as the expectation of the highest level of education completed and the highest grade. Expectation of years of education is only asked for children who are still/will be at school Transfer is expressed in log Indonesian rupiah. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

Table A.18: Effects of Remittances on Village Informal Taxation

	(1) Household manpower for building village	(2) Household contribute money/ goods for building	(3) Money/ goods contribution for building log(IDR)	(4) Household manpower for maintenance in village	(5) Household contribute money/ goods for maintenance	(6) Money/ goods contribution for maintenance log(IDR)
Migration x $XRShock^{t-1}$	0.0341	0.0514**	0.489**	0.00852	0.0369	0.361
	(0.96)	(2.23)	(2.06)	(0.26)	(1.59)	(1.60)
mean(y)	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: Data from Generasi SPKP survey (Olken et al, 2014). Respondents are household. Table presents regression coefficients of outcome variables on the remittance proxy, i.e., the interaction of migration intensity and currency exchange rate changes lagged by one year from migrant destinations recorded in Podes 2005. Outcomes are participation and contribution in building and maintenance activities in the village All regressions include village fixed effects, survey wave fixed effects, and subdistrict-trend terms. Standard errors are clustered at the subdistrict level. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

Table A.19: Effects of Remittances on Voting Behavior

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

Notes: Data from Generasi SPKP survey (Olken et al, 2014). Respondents are household for columns 1-3 and village head in column 4. Table presents regression coefficients of outcome variables on the remittance proxy, i.e., the interaction of migration intensity and currency exchange rate changes lagged by one year from migrant destinations recorded in Podes 2005. Outcomes are voting turnout in presidential, mayoral, and village head elections in columns 1-3, and complaint to village head about the implementations of anti-poverty programs in column 4. Presidential elections are cross-section regression in 2009 with subdistrict fixed effect. Regresssions of mayoral and village head elections use survey waves 2009 and 2013, using subdistrict fixed effects and survey wave fixed effects. Regression of complaints to village head use survey waves 2009 and 2013, using village fixed effects, survey wave fixed effects, and subdistrict-trend terms. Standard errors are clustered at the subdistrict level. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

Table A.20: Effects of Remittances on Household Participation in Community Groups

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

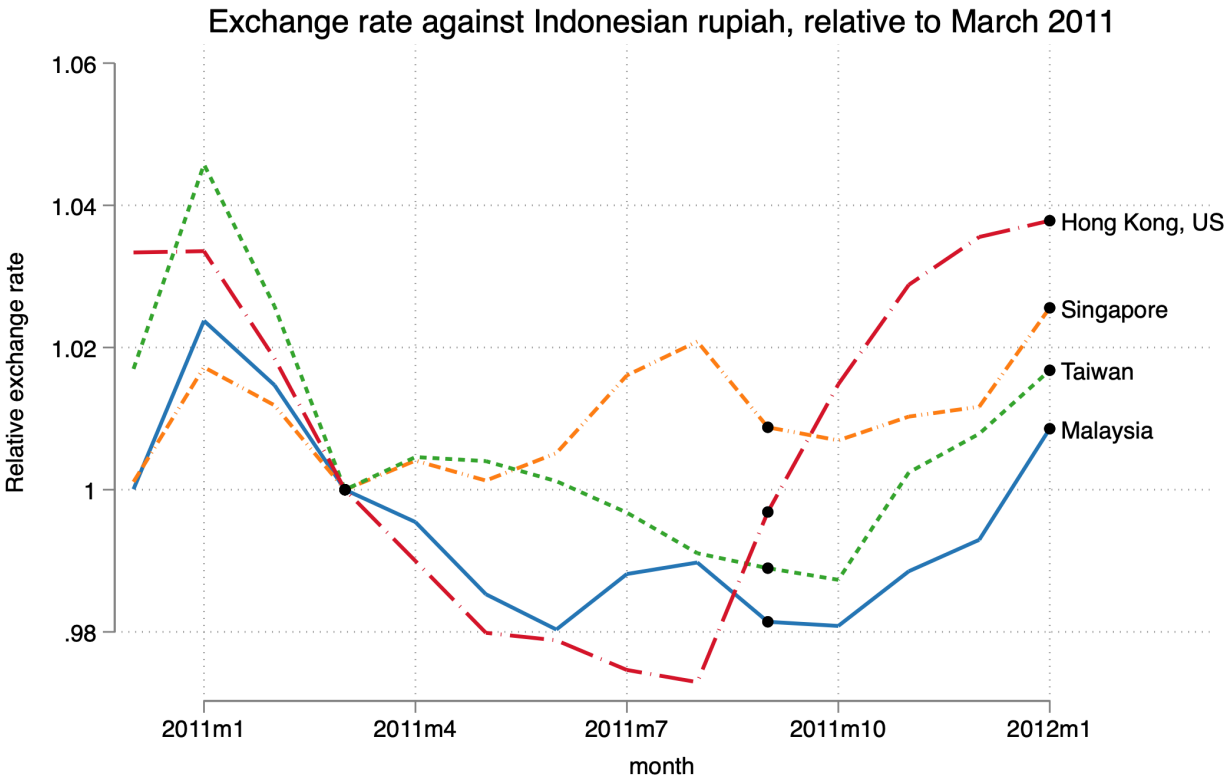
Notes: Data from Generasi SPKP survey (Olken et al, 2014). Respondents are household. Table presents regression coefficients of outcome variables on the remittance proxy, i.e., the interaction of migration intensity and currency exchange rate changes lagged by one year from migrant destinations recorded in Podes 2005. Outcomes are participation in various community groups. All regressions include village fixed effects, survey wave fixed effects, and subdistrict-trend terms. Standard errors are clustered at the subdistrict level. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

Table A.21: Impact on Employment Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	A. LFP and Employment Status						
	Total Labor Force (log)	Employed (log)	Unemployed (log)	Underemployed (log)	Employed (% TLF)	Unemployed (%TLF)	Underemployed (%TLF)
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	-0.17***	-0.17***	-0.38***	-0.03	0.00	-0.00	0.04**
	(0.05)	(0.05)	(0.10)	(0.08)	(0.01)	(0.01)	(0.02)
District FE, Year FE	✓	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.24	12.16	9.41	11.02	0.93	0.07	0.33
Districts	350	350	350	350	350	350	350
Observations	1905	1905	1905	1905	1905	1905	1905
	B. Sectoral employment (%)						
	Agriculture	Trade	Social	Industry	Transport	Construction	Finance
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	-0.04	-0.01	-0.03***	0.01	0.01	0.00	0.01**
	(0.03)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
District FE, Year FE	✓	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	0.46	0.18	0.14	0.09	0.05	0.05	0.01
Districts	350	350	350	350	350	350	347
Observations	1903	1901	1899	1881	1900	1892	1733
	C. Sectoral employment (log)						
	Agriculture	Trade	Social	Industry	Transport	Construction	Finance
$\text{Migration}_d^o \times \text{XRShock}_{dt-1}$	-0.17***	-0.17***	-0.38***	-0.03	0.00	-0.00	0.04**
	(0.05)	(0.05)	(0.10)	(0.08)	(0.01)	(0.01)	(0.02)
District FE, Year FE	✓	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	11.08	10.32	10.04	9.40	8.99	9.02	7.42
Districts	350	350	350	350	350	350	347
Observations	1902	1901	1899	1881	1900	1892	1733

Notes: This table reports estimates of equation (5). Sample is 2005-2012 panel of Indonesian districts in Indo-Dapoer dataset with recorded returnees from airport arrival data. Interaction variable $\text{Migration}_d \times \text{XRShock}_{t+2}$ proxies for remittances, and is standardized to have mean zero and standard deviation of one. XRShock is district-level yearly average of migrant-weighted foreign currency exchange rate between host country currency and Indonesian rupiah, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration (intensity) is the natural log of ratio between the total migrant and total population from the 2005 village census. Other outcomes data sources and details as described in Appendix A.1. * $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$. Standard errors clustered at the district level in parentheses.

Figure A.1: Monthly exchange rate variation for year 2011



Note: Monthly exchange rate variation for year 2011, by destination countries of migrants in Doi et al. (2014) panel. Black dots denote time of follow up surveys. Data are from Refinitiv Datastream (2021)