Remittances, Household Behavior, and Public Goods

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Abstract

Remittances, money sent by overseas migrants, hold great potential to spur development in their area of origin. However, whether remittances have adverse effects on the provision of public goods, a key aspect of development, remains an open question. I investigate the impact of remittances on the provision of public education facilities in Indonesian districts. I exploit variation in the share of migrants from each district, their destination countries, and shifts in the currency exchange rate of the Indonesian rupiah over time to obtain a plausibly exogenous proxy of remittances to migrant-sending regions. Using survey data of overseas Indonesian workers, I establish that the depreciation of the Indonesian rupiah increases remittances received by migrant households. At the district level, I find that districts with positive shocks of remittances have more public schools at the elementary and junior secondary level. These effects are likely to be a response to households sending more children to school. Government responses in the provision of public goods could be mediated by their preexisting commitment to education and governance decentralization. To finance the creation of new junior high schools, districts economize by utilizing existing elementary school facilities.

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1. Introduction

Remittances—money that migrants send to their home countries—are an important resource for many developing countries. In top recipient countries, remittances bring in more resources than oil in Nigeria (The Economist, 2019), than the Suez Canal in Egypt, and than 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, including countries as diverse as Tonga (39%), Tajikistan (27%), and El Salvador (24%) (World Bank, 2020).

Because of their sheer magnitude, remittances may exert substantial influence in the migrants' areas of origin on various aspects of development. However, evidence on the effects of remittances on the provision of public goods, a key aspect of development, is scarce. Some policymakers are optimistic about the potential of remittances to catalyze development in migrants' origin countries (World Bank, 2006, 2017), but others are skeptical. The skeptics believe that with the infusion of migrant income from abroad, the governments can get away with providing fewer public goods and services (Abdih et al., 2012; Ahmed, 2013; Chami et al., 2018).

Empirically, the analysis of remittances' impact on public goods and local development faces multiple challenges. First, because only migrants remit, it is hard to study the effects of remittances separately from migration. Reverse causality also poses a challenge: a positive correlation between remittances and local development could result from places with good outcomes facilitating higher remittances from the diaspora. Causal analysis using country-level estimates with cross-country regressions often has to rely on instrumental variables with uncertain validity or low statistical power (Clemens and 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 exploiting three sources of variation: the share of migration in different regions, their destination countries, and shifts in the currency exchange rates over time to obtain a plausibly exogenous instrument of remittances.[1] 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. In high-migration intensity districts where many migrants receive positive exchange rate shocks, the local governments may provide public goods differently in response to the effects of remittances. My identification strategy is related to a two-stage least square (2SLS) framework. The "first stage" is the regression of remittances on exchange rate shocks using migrant panel data, and the reduced form is the regression of outcomes of interest on the remittance instrument using district-level data.[2] In the reduced form, the identification assumption is that conditional on observables and fixed effects, changes in the instrument are uncorrelated to the unobserved error term that could drive the outcome of interest.

Indonesia provides an excellent setting to study the impact of remittances on public goods provision. The country is the source of more than one million international migrants (BPS, 2005), and it is one of the largest remittance receivers in the world (World Bank, 2019). The country also provides reliable subnational data series, making it possible to exploit spatial heterogeneity across hundreds of districts to overcome endogeneity challenges. These districts operate in a common national environment, providing the opportunity to overcome

[1] This empirical strategy builds on approaches by Yang (2008) and Khanna et al. (2022).

[2] While a second stage regression of outcomes on observed remittances is also of interest, remittance flow data at the sub-national level are scarcely available for public use.

the limitations of cross-country regressions where the provision of public goods varies between countries.

I start by showing that positive exchange rate changes increase remittances received by migrant households. I use migrant household panel data (Doi et al., 2014) and analyze the impact of currency fluctuations on remittance receipts using time-varying currency exchange rate to Indonesian rupiah and fixed effects. I find that migrant households receive higher remittances when the 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' country destinations and exchange rate fluctuations.

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 individual migrant returnees passing through Indonesia's biggest international airport. The dataset lists migrants coming home from 116 countries, with Middle Eastern, East Asian, and Southeast Asian countries dominating the list of top migration destinations. Because the dataset also records migrants' departure dates, arrival dates, and districts of origin, I can use this information to measure the exposure of each Indonesian district to international currency exchange fluctuations between 2005-2011. During this period, differential exposure to the global financial crisis in various migrant host countries led to sharp changes in the exchange rate against the Indonesian rupiah (IDR). 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 against the rupiah in the same period.[3] I construct a remittance proxy using the interaction of migration intensity and currency exchange fluctuations. Districts with many migrants going to countries with strongly appreciating currency receive a positive remittance shock, while districts with few migrants whose destinations have weak currencies receive a negative remittance shock. I combine this remittance proxy measure with rich data from household surveys, school registries, and regional budget reports to estimate the effect of remittances.

I find direct effects on household behaviors: with remittances, households send more of their children to school. School enrollment rates are higher in districts where the remittance shock exposure is positive. An increase in the remittance proxy by one standard deviation (SD) is associated with 5 p.p. higher enrolment rates for both junior and senior high school and a 1 p.p. higher rate for elementary schools. These effects at the secondary education level represent a meaningful gain towards achieving universal secondary education, given the average enrollment rates of 67% and 44% in 2006 for junior and senior high school. I also find positive effects of remittances on asset ownerships, expenditures among the poorest households, and overall poverty reduction, corroborating findings from the Philippines (Yang, 2008).

At the district level, I find that districts exposed to positive shocks of remittances provide more public schools. 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, is associated with 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 school is positive, but it is not statistically significantly different from zero. These effects could be a response to household behaviors, whose children drove the aggregate education participation rate.

I rule out an international commodity trade windfall as the primary driver of public school provision. I examine this possibility by looking into the distribution of Indonesia's most

[3]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).

important commodities, oil and gas, as well as its biggest agricultural export, palm oil, and their respective export destinations. I demonstrate the robustness of the relationship between remittances and public goods by including interaction terms between commodity production intensity and exchange rate fluctuations of commodity export destination countries for the two commodities. The coefficients for remittance shock change little with the inclusion of these proxies for natural resource trade windfall.

I further rule out two channels of interaction between remittances and governance: tax revenues and electoral competitions. In the first channel, district governments may try to capture the private remittance flows through taxation. Using district revenue data from the Ministry of Finance, I find that districts with positive remittance shocks did not collect higher revenue from income taxes, property taxes, and tobacco excise. This suggests that district governments have a limited ability to capture the flow of remittances. In the second channel, I do not detect differences in the public goods provision patterns by local electoral cycles. When I interact the remittance proxy with an indicator of whether there is a mayoral election in a district in a given year, the coefficients on the interaction terms are not statistically significantly different from zero, while the coefficients on the remittance proxy are largely unchanged.

In contrast, local government's commitment to education and governance decentralization are two likely mechanisms through which remittances have likely affected the provision of public goods. To proxy local government commitment to education, I use districts' education expenditure from the Ministry of Finance's district finance data and interact this measure with the remittance proxy. The positive interaction between the remittance proxy and the share of district expenditure for education suggests remittances strengthen the provision of public goods where districts have shown commitment to education. Separately, the ongoing governance decentralization process has increased the number of districts from 440 to 514 between 2004-2012, 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. To test the effect of decentralization, I interact the remittance proxy with an indicator of district split. My results suggest a stronger effect of remittances on public goods in districts where the distance to district centers has become closer.

Finally, district governments themselves need to use alternative strategies to provide improvements in the provision of public goods without an increase in tax revenue. I examine an unusual strategy that allows the government to build junior high schools with less cost: making use of existing primary schools. New classrooms are built on the same premises to house the junior high schools. These newly established junior high schools thus have fewer classrooms, teachers, and amenities.

Literature. This paper contributes to several strands of the literature. To the literature on the effects of remittances, I provide empirical links between remittances and the actual provision of public goods in a democratic setting. Some researchers analyzing cross-country regressions have proposed theoretical models arguing for the existence of a remittance curse, where governments respond to remittances with cutbacks on the provision of public goods leading to patronage and corruption (Abdih et al., 2012; Ahmed, 2013), which allows autocrats to remain in power (Ahmed, 2012). Other researchers have contested this idea: Desierto (2018) proposed the remittance curse model does not hold in a politically competitive setting, while Easton and Montinola (2017) found that remittances are more likely to increase government spending on education and health in democracies. 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 and Singer, 2015). Variations in governance structure across countries may also further hinder analysis of how

governments provide public goods. Studies that exploit subnational variations in Mexico find some support for the argument that remittances substitute for government provision of public goods, but the lack of variations in migration destinations other than to the US and other limitations in data availability constraints these studies to two-period comparisons (Adida and Girod, 2011; Ambrosius, 2019). By using rich datasets from various Indonesian ministries, I contribute to the literature with an analysis of the effect of remittances on public goods in a setting with a common governance structure and multiple time periods to show a credible positive link between remittances and the provision of public goods in the form of public education facilities.

Furthermore, I provide new empirical evidence on the broader effects of remittances on the economy, particularly on economic growth and household welfare. The existing literature has investigated the effects of remittances on growth through cross-country regressions to show both positive effects (Giuliano and Ruiz-Arranz, 2009; Catrinescu et al., 2009) and negative effects (Chami et al., 2008; Le, 2009). In contrast, evidence from cross-country analysis is more in agreement in evaluating the effects of remittances on poverty (Adams and Page, 2005; Gupta et al., 2009). Microdata from surveys has also provided household-level support on the effects of remittances on household welfare and behaviors, although researchers often face the trade-off between limited coverage in the survey sample and selection issues among remitters (Yang, 2011; Alpaslan et al., 2021). I expand the body of evidence with analysis using subnational data, which relies on plausibly exogenous variations to provide credible estimates on household outcomes and economic growth.

I also contribute to the literature on the determinants of remittances. Using migrant panel survey data, I link exchange rate fluctuations to variations in remittances. Migrants taking advantage of favorable exchange rates have been reported as early as the 19th century among migrants leaving Europe for the New World (Esteves & Khoudour-Casteras, 2009, 2011). My results also point to a possible driver of remittance countercyclicality that has been observed in national aggregate data (Ratha 2007; Frankel 2011). Furthermore, the relationship I document between currency fluctuations and remittances may bolster similar identification strategies for use in studies involving other migration corridors.

In the broader migration literature, I provide new empirical evidence on the effect of migration on the area of origin through migrant remittances. Rapoport et al. (2020) presents competing frameworks on the pathways through which migration affects origin countries. However, because the decision to migrate and to remit income is tightly linked, existing studies that rely on migration restrictions cannot identify the remittance effect separately (Dinkelman and Mariotti, 2016; Makovec et al., 2014; Theoharides, 2020). By exploiting unexpected foreign currency exchange fluctuations and variations in migration intensity, I estimate the effect of remittances separately from migration in Indonesia. In this regard, my paper is most closely related to studies investigating the effect of remittances to the Philippines after the 1997 Asian financial crisis (Yang, 2008; Khanna et al., 2022).

Lastly, this paper also contributes to the literature on the "flypaper effect" in public finance. Theoretical frameworks in public finance suggest that budget increases for the government and households should have equal effects on development. However, public economists have instead documented that equal-sized transfers to government and households produce different multipliers on development. Arthur Okun called it the flypaper effect, as "money seems to stick where it hits" (Inman, 2009). By investigating a household revenue shock in the form of migrant remittances, this paper complements studies of public spending that look at government revenue shocks (Olsson & Valsecchi, 2015). In doing so, I obtain a more detailed picture of the interaction between the government and households.

2. Context: Indonesian migrant workers

Survey data from the Indonesian Central Bureau of Statistics (BPS) indicates that more than a million Indonesian work abroad in 2005 and 2008 (BPS, 2005, 2008). The international migrants, known locally as TKI (*Tenaga Kerja Indonesia*), 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). Indonesian migrants typically work in low-skilled sectors such as household services, construction, or agriculture under a temporary contract and return after 2-3 years of work (Bazzi, 2012).

The main destination countries of Indonesian migrant workers include Saudi Arabia and other Gulf countries, Malaysia, Taiwan, and Singapore (Appendix Table A.3, see also BI, 2018). 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 migrant workers remitted more than USD 11 billion in 2018, making Indonesia the 14th largest remittance receiver 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 migrants surveyed in Bazzi et al. (2021) report they remitted USD 183 to their families on average per month. Remittance recipients rank food, housing needs, and education expenses as the top three expenditures for the funds they receive (ADB, 2006). Nearly all remittance recipients in the ADB study report receive remittances through banking institutions, which normally takes 4-7 days to clear the overseas transfer. Nevertheless, almost 30% stated that they had also received remittances through informal channels such as the migrant's friend who returns temporarily or permanently (ADB, 2006). A summary of remittance estimates from Indonesian workers based on survey data since 2005 in the existing literature is listed in Appendix Table A.4.

The majority of Indonesian migrant workers are women with limited education. With their typical occupation as domestic helpers, the Indonesian government recognized their 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 (section 4).

3. "First Stage": Remittances in a Panel of Migrant Households

Remittance flows between country pairs are often estimated based on the share of migrants in different destination countries and the host countries' characteristics (IMF, 2009; KNOMAD, 2017; Ratha and Shaw, 2007). The more migrants a region send, the more remittances it can accrue. Changes in the exchange rate in host countries may also influence the volume of remittance flow, 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 take into account the exchange rate so that their families receive a fixed sum per transfer, exchange rate fluctuation will have no effect on the remittances received.

To study the impact of remittances on local public goods, I first establish that currency rate fluctuation leads to variations in the amount of remittances received by migrant households in the area of origin. This section outlines the construction of the explanatory variable, the empirical strategy, the sources of data, and the regression results. I then shift the focus to the empirical strategy to estimate the impact of remittances on public goods indicators and other aggregate development outcomes in Section 4.

3.1. Regression Specification

If migrants send a fixed amount of remittances denominated in the host country's currency per transfer, the amount that their family receives will fluctuate with the exchange rate. I test the relationship between remittances and currency rate fluctuations by regressing the following equation:

$$Remittances_{it} = \alpha + \beta XRshock_{it} + \varepsilon_{it} \tag{1}$$

where the term $Remittances_{it}$ is the amount of remittances 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 the Indonesian rupiah (IDR), $XRShock$. Both $Remittances$ and $XRShock$ are normalized to have a mean zero and a standard deviation of one.

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 and Martinez, 2005; Khanna et al., 2022):

$$XRshock_{it} = \frac{\text{FX rate to IDR}_{ict}}{\text{FX rate to IDR}^{o}_{ic}} \tag{2}$$

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

I use panel data of migrant households to estimate the relationship between exchange rate and remittances, which allows me to add migrant fixed effects, survey wave fixed effects, and other control variables to improve precision (Funkhouser, 2012).

$$Remittances_{it} = \alpha + \beta XRshock_{it} + \gamma X_{it} + \theta_i + \phi_t + +\varepsilon_{it}. \tag{3}$$

The migrant fixed effect term, θ_i, adjusts for time-invariant characteristics of the household and the household member who migrates. To the extent that there are other unobserved characteristics of the migrant, which are invariant, are driving the outcomes, their effects will be absorbed by the migrant fixed effects, too. The survey wave fixed effect term, ϕ_t, controls for time effects common to all respondents in each survey wave. This may include price changes or inflation the households face at home. The vector of control variables X_{it} adjusts for other time-varying characteristics. Standard errors in this estimation 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 individually 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. Two descriptive statistics lend support to this argument. First, 60% of survey respondents in Doi et al. (2014) who remitted money to Indonesia at baseline stated 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 stated their contracts are denominated in dollars (Taiwan, Hongkong, US), dinars (UAE, Bahrain), or riyals (Saudi, Qatar, Oman). If these migrants were to send a fixed portion of their salary, the remittances would be subject to the currency rate fluctuations.[4]

To further alleviate the identification concern, I include control variables that could drive variations in the amount of remittances the migrants are sending home: migrant's time abroad and time to the next religious holiday (Eid al-Fitr). The variable of time abroad serves as an important proxy to the migrant's experience, which may help in locating a remittance service that charges a smaller fee, has a better exchange rate, or provides a faster transfer, all of which would influence the size of remittances received by the migrant family at home. Migrants may also be more likely to remit money to finance religious holiday celebrations at home. For Muslims, who comprise the majority of the Indonesian population, Eid al-Fitr is the biggest annual religious holiday. It is traditionally celebrated with the giving of alms for the poor (*zakat fitrah*) and feasts during a family gathering, which compels domestic migrants to return to their hometowns. International migrants, who have to pay a higher travel cost, are less likely to return during the holiday, especially if they work under a fixed-term contract in non-Muslim environments. In such cases, migrants might send more remittances to their families to help defray the cost of the festivities.

3.2. Migrant Panel Data

I use panel data from Doi et al. (2014), who conducted a field experiment with Indonesian workers about to work in other (South) East Asian countries. The field experiment was a partnership between the World Bank and the government of Indonesia to evaluate a pilot program that seeks to understand the impact of financial literacy training programs on migrant-sending households. The pilot program randomly assigned migrants into four treatment groups: a control group, a migrant-only training group, a household-only training group, or a migrant and household training group. A key outcome of interest in the study was financial planning,

[4]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).

savings, remittances, and migrant insurance. The authors' original analysis showed that while the training increases financial knowledge, none of the treatment arms have significant effects on the likelihood of receiving remittances, their frequency, or the amount received (Doi et al., 2014).

The pilot recruited 400 migrant workers and followed their households in Malang and Blitar, East Java, in three follow-up surveys with a high rate of successful respondent tracking. The study conducted a baseline survey between February-June 2010 to the migrant household member in charge of remittances just before the training treatment was administered for the treatment groups, all prior to the migrant's departure to work overseas. The same members of the household were re-interviewed in the three follow-up surveys (March-April 2011, September-October 2011, and January 2012). The successful recontact rate varied between 91-98% in the three rounds, with up to 83% of households still having a migrant abroad during the follow-up survey.

I reanalyze this data and focus on a subsample of migrant households meeting the following criteria: (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.[5] This definition leaves 418 observations in my sample from 183 households with migrants working in Taiwan, Hongkong, Malaysia, or Singapore. In each follow-up survey, households were asked the amount of remittances received from the migrant since the departure of the migrating household member, denominated in IDR. They reported IDR9.5 million (USD1,119) raw average of total remittances since migrant departure. With an average frequency of remittances per migrant of 4.5, this corresponds to a typical remittance transfer of ∼USD250.[6]

Because the survey phrased the remittance question as the total remittance received since departure, I use the total received remittances in the first follow-up and the difference with the previous response in subsequent follow-ups to obtain the measure of remittances for each period. With this adjustment, the average value is 25 percent lower than the raw average. I transform the remittance measure with natural logarithm before normalizing it to use in the regression of equation (3). With respect to the field experiment, the assignment into treatment arms was randomly allocated at the migrant household level, so they are absorbed by the migrant fixed effect term. For the exchange rate shock, 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 (September 1st, 2011, and August 19th, 2012).

Exchange rate data. Using data from Refinitiv Datastream (2021), migrant 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 moved to IDR1,166/HKD, an appreciation of 3.8% (Figure A.1). At the same time, the exchange rate to Taiwan New Dollar (TWD) moved from IDR296.7/TWDto IDR301.7/TWD, an appreciation of just 1.6%. 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

[5]Specifically, 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.

[6]Gibson and McKenzie (2017) surveyed pairs of Tongan immigrants in New Zealand and their household in Tonga, where remitters and receivers should be reporting the same remittance transactions. They found that the survey responses produce reliable estimates.

summary statistics of the main outcome variable and the regressor variable for my estimation sample.

3.3. Variations in Remittances Due to Foreign Currency Fluctuations

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 addition 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). This analysis suggests an elasticity of 0.4, in line with the Philippine-peso remittances elasticity of 0.6 with respect to the exchange rate (Yang, 2008).

This relationship is robust to additions of relevant covariates in the model. As discussed above, I also test for two additional variables that may influence the amount remitted home: time abroad and time to the next religious holiday. The inclusion of time abroad and time to the next Eid al-Fitr increases the magnitude of the coefficient to 0.41 standard deviations.

These findings present one of the first systematic investigations that links remittance responses to exchange rate fluctuations using household panel data. The panel structure 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 data that I use here explicitly collected information on remittances to migrant households, which are rarely captured in general purpose household surveys fielded in developing countries.[7]

These findings also affirm the observations made by researchers studying changes in aggregate remittance estimates during major financial crises from various contexts, past and present. Following the 2008 Global Financial Crisis, the year-on-year remittances to Nepal rose by 28% in Q1 2009 (Riester, 2012; Mohapatra et al., 2012), and 94% of respondents in a multi-country South Asian migrant household survey reported regular remittances during the crisis period (Rajan and Narayana, 2012). The resilience of the remittance flow was attributed to the depreciation of South Asian currencies against the currencies of Gulf countries (Sirkeci et al., 2012). Researchers have also argued that migrants are willing to absorb negative income shocks to continue sending remittances, which was exemplified by reports of unskilled South Asian migrant workers in the Gulf sharing accommodations and reducing their consumption to save money to send home during this period (Sirkeci et al., 2012). From historical remittance estimates stemming 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]." They noted that migrants took advantage of the best opportunities in cross-exchange rates between Rio de Janeiro, London, and Lisbon, creating a triangular flow of remittances.

My finding suggests that the relationship between remittances and exchange rates is not limited to major financial crisis episodes, given the lack of economic disruption in the region during the survey period of my sample. For Indonesian migrants in my analysis, the positive relationship could be driven by an increased frequency of sending remittances. Appendix Table A.5 presents the positive relationship between the number of remittance transactions and the

[7]For example, because the Indonesia Family Life Survey (IFLS) was not designed as a remittances survey, only 47 households reported receiving international remittances from family members in the 2000 and 2007 consecutive survey waves from a sample of 10,992 panel households (Cuecuecha and Adams, 2016).

exchange rate shock variable. 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.

It is unlikely that Indonesian migrants are responding to exchange rate changes by changing jobs or industries. This was the channel through which exchange rate variations impact migrant workers in Germany, where migrants from higher exchange rate countries exhibit persistent job downgrading (Dustmann et al., 2021). In the case of Indonesian migrants, each migration spell is usually based on a fixed-term contract signed prior to departure. This would have left little room for the migrants to respond to currency rate appreciation through employment adjustment. In comparison, it may be easier for migrants to adjust their work hours through overtime work (SMERU, 2009). This adjustment stands in contrast with Nekoei (2013), who found that migrants in the US do not change jobs although they work less and send less in response to the appreciation of the US dollar.

More broadly, these results illuminate a possible mechanism to explain the countercyclicality of remittances at the national level (Ratha, 2007; Frankel, 2011). This relationship has often been documented through anecdotal evidence of remittance flow following a political crisis or natural disaster in migrants' origin countries, e.g., Thailand, Mexico, and Indonesia (Ratha, 2007). These events typically lead to the depreciation of the migrants' origin country currency relative to the currency of their host countries that are not affected by the disaster. Researchers have 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. Individual migrant responses such as the ones I analyze in the Doi et al. (2014) panel could provide a foundation for the aggregate effects observed by the existing studies in the remittance literature.

4. A Proxy Measure for Remittances in Indonesian Districts

For a subnational level analysis of the effects of remittances, I use a proxy measure of district remittance shocks constructed following an approach similar to constructions of bilateral remittance flow estimates (KNOMAD, 2017; Ratha & Shaw, 2007). I construct the district-level remittance proxy using exchange rate shocks and variations in migration intensity. This section describes the construction of the proxy measure, the empirical strategy that uses it as the explanatory variable, and the sources of data.

4.1. Remittance Proxy Construction and Regression Specification

If remittance flows are exogenously distributed among migrant districts d, the impact of remittances on development can be identified through an ordinary least square regression.

$$Y_{dt} = \alpha + \beta Remittances_{dt} + \varepsilon_{dt} \tag{4}$$

This strategy requires observations of sub-national remittance flows, which are scarcely available[8]. In the absence of direct observations of the remittance, I construct a district-level remittance proxy using the districts' migration intensity and their exposure to international exchange rate fluctuations.

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

$$XRshock_{dt} = \frac{1}{\sum_c mig_{dct}} \sum_c mig_{dct} \frac{\text{FX rate to IDR}_{ct}}{\text{FX rate to IDR}_c^o} \tag{5}$$

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 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.

$$MigShare_d^0 = \log(\frac{migrant_d}{pop_d}). \tag{6}$$

The remittance proxy is the interaction between the exchange rate shock and migration intensity. I use this measure to estimate the following regression by ordinary least squares.

$$Y_{dt} = \alpha + \beta MigShare_d^0 \times XRshock_{dt-1} + \gamma XRshock_{dt-1} + \theta_t + \theta_d + \varepsilon_{dt} \tag{7}$$

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.

[8]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.

4.2. Data

Migrant destinations. To construct the district-level exchange rate shock, I use administrative records from the "migrant terminal" in Soekarno-Hatta International Airport (SHIA), Jakarta. Located about 20 km from the Indonesian capital, it is the primary embarkation point for workers leaving the country to work abroad. In 2010, the airport managed flights to 75 different international destinations, four times more than the country's next biggest airport in Surabaya, East Java. For returning migrants, officials at the SHIA migrant terminal collected information on the migrant's gender, date of departure, date of arrival, country of work, origin district, and placement agency. From arrivals between March 2008-2011, the administrative records collected information pertaining to 1,006,241 migrants from 366 districts who returned from 116 different countries. I use the departure and arrival dates to create a measure of the destination mix for a district's migrants in each month to create a district-month-country level dataset. I merge this with exchange rates from various currencies to IDR from Refinitiv Datastream (2021). I fix June 2007 as the reference period for equation (5), one year prior to the rapid exchange rate changes due to the 2008 Global Financial Crisis (see Figure 1).

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 appreciation was 10.1 p.p. due to its smaller exposure to Saudi Riyal (which is pegged to US dollar at 3.75 riyals per 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.

Migration intensity. I construct district migration intensity using data from the 2005 Village Potential survey (Podes). Podes collects information from village heads every 2–3 years with a coverage of the universe of Indonesian villages. The 2005 survey is the first year in which Podes collect systematic data about the number of migrants from each village, which I then aggregate to the district level. The village-level information allowed a more complete estimation of the migration intensity, including migrants from the village/district who do not return through the SHIA terminal.

Outcome data: I compile information from various datasets to build my analysis sample. I briefly describe my data sources below for my primary outcomes of interest in public goods. A summary of the descriptive statistics for key outcomes and explanatory variables are tabulated in Table 1, Panel B-E.

Data on school establishment comes from *Dapodik*, a registry maintained by the Ministry of Education and Culture. This dataset covers the universe of primary, junior secondary, and high schools under the ministry's purview and includes each school's location and year of establishment. This registry also maintains the status of the school, i.e., whether a school is public or private. The public schools are the focus of my analysis.

The national socio-economic surveys (*Susenas*) are a series of household surveys designed to be representative at the district level. Susenas provided information on school enrollment, education attainment, and household expenditures. The details of individual household members allow disaggregation of education statistics by gender. *Susenas* also provides information

on the source of household drinking water and electrification status, public goods which requires public investment.

I use the World Bank's Indo-Dapoer dataset (Indonesia Database for Policy and Economic Research) to obtain information on the net enrollment ratio with inflation based on population projection. This dataset also provides information on various governance outcomes, including district budgets, poverty levels, and regional GDPs. The information on the district budget, including its revenues and spending summaries, is compiled from the Ministry of Finance. Further details on other datasets I use for district-level analysis are described in Appendix Table A.1.

4.3. Remittance Proxy Measure

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 Appendix Table A.6-7, I report the coefficients from regressing equation (7), but with the left hand side variable lagged by three periods to capture past outcomes. 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.

5. Remittances and Household Outcomes

Because remittances are private transfers to households, any observable effects on public goods will be mediated through the migrant households. In this section, I look into various household outcomes to explore the possible pathways that, in turn, influence public goods provision by the local governments. I look at household expenditures, education-seeking behaviors, and ownership of durable assets.

5.1. Remittances, Expenditures, and Education

Remittances are a direct way for migrants to support their families at home, and increased resources from remittances may allow these families to increase their consumption. I test this

relationship by estimating equation (7) 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 monthly expenditure per capita for education (expressed in log IDR). Data for these indicators come from Dapoer, which aggregates household responses in *Susenas* to create district averages. Table 3 presents the estimation 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 0.11 log points (column 2). This coefficient is nearly three times as big as the coefficient for the average household, which lacks the precision to be statistically significantly different from zero (column 1).[9] For education expenditure, a one SD of remittance proxy shock increases the monthly per capita expenditure by 0.28 log points.

The result on education expenditure suggests remittances may help relax households' liquidity constraints in financing education investments for their school-age children. I investigate this by looking into the effects of remittances proxy shock on net enrollment rates for elementary school (grade 1-6), junior secondary school (grade 7-9), and senior secondary school (grade 10-12). Net enrollment ratio expresses the total school-age students enrolled in schools as a percentage of the population of the same age group. The official age range is 7-12 years old for elementary level, 13-15 for junior secondary level, and 16-18 for senior secondary level. Using age and enrollment information from *Susenas*, I estimate the effects for all children, and separately by gender. Table 4 presents the results.

Remittances lead to overall increased enrollment. One standard deviation of the shock is associated with 2.6 p.p increases in school enrollment among children aged 7-18 (Panel A, column 1). This effect appears to be driven by enrollment increases in junior secondary schools (4.4 p.p.) and senior secondary schools (7.5 p.p.). The estimated effect for elementary school enrollment among 7-12-year-olds is positive, although not significantly different from zero. The increase in secondary education enrollment is particularly noteworthy as the participation rate in post-primary education lags behind the primary level. With a net participation ratio of 66.8% for junior secondary schools and 46.5% for senior secondary schools on average across districts, these secondary level statistics are markedly lower than the average net enrollment ratio for elementary schools at 93.5%. The smaller impact on the elementary school net enrollment ratio reflects a smaller room for improvement. However, in an alternate estimation using a population inflation-adjusted enrollment rate from Dapoer, the effect on elementary school enrollment is more precisely estimated (Appendix Table A.9). Similarly, using district statistics with individual survey weights largely preserves the results (Appendix Table A.10). In contrast, for 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 enrollment, I do not observe any effect of remittances on this population (Appendix Table A.11).

The effects of remittances on school enrollments differ by gender for different education levels. Panel B and C of Table 4 present the effects of remittances on enrollments for boys and girls, respectively. At the elementary level, girls gain with 1.6 p.p. higher enrollment rate in response to a one SD shock, while the estimate for boys is very close to zero. However, the gains in secondary school enrollments mainly reflect the gains in enrollments for boys in junior

[9]These improvements represent substantial effects in poverty alleviation. Remittances reduce the number of households below the poverty line, the share of households below the poverty line, and the poverty gap index (Table A.8).

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. The Indonesian government had intended to raise the educational requirement to work abroad to at least junior secondary school (Law 39/2004 on Migrant Placement), but the Constitutional Court ruled it unconstitutional. With the ruling, elementary school education remains sufficient for Indonesians to seek work placement abroad.

The overall effects of remittances on education completion reflect these gendered patterns. Appendix Table A.12 presents estimates from the regression of completed years of education and completed education levels on remittances among individuals who have finished their schooling. The result suggests a consistent picture: remittances increase completed years of education and schooling for all levels, with weaker effects for females, especially at the secondary level.

Other Household Outcomes: Assets. Durable assets are often the preferred mode of investment among households in developing countries, and remittances may help finance this investment. I analyze the asset ownership responses among households due to the remittance proxy shocks using district-aggregate data from the 2010-2012 Susenas surveys. I analyze responses in ownership of motorcycles, cars, bicycles, refrigerators, and natural gas canisters. Appendix Table A.13 presents the results.

Remittances lead to positive effects in the share of households owning various durable assets. A one standard deviation shock in remittance proxy leads to 4 p.p increases in motorcycle and car ownerships and 7 p.p increases in bicycle ownerships (columns 1-3). This is a nearly uniform response for different vehicle types with varying levels in the share of ownership among households. Whereas motorcycles are the most common vehicles, with three-fifths of households owning a motorcycle, cars are the least common, with less than one-fifth of households owning a car, and the bicycle ownership rate between the two other vehicles at 35%. 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 track the reported use of remittances from the migrant panel data. Appendix Table A.14 reports the coefficients from regression of equation (3) with reported remittance use as the outcomes of interest. The coefficients suggest migrant households use the increased remittances to purchase electronics and durables and to repay migration loans.

6. Remittances and the provision of public goods

With many migrant households receiving positive shocks due to exchange rate fluctuation, how big is the windfall in aggregate, and what effects does it have in the migrant origin region? 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.[10]

This section thus addresses the effects of remittances in the migrant origin by successively looking into public goods at the district level, investigating alternative accounts, and tracing possible intermediary variables.

6.1. Public goods

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 of educational facilities as the main outcomes of interest in my analysis. I look into the density of public schools at the primary, junior, and senior secondary levels, defined as the number of schools per 10,000 population. Public schools are provided free of charge, and the primary and junior secondary levels are compulsory. In combination, public schools educate 83% of total enrolled students at the primary and junior secondary levels. Because of the high attrition rate for students graduating from primary school, the junior secondary level presents the next bottleneck in ensuring education access for all. Table 5 presents the estimation results of equation (7) to investigate the impact of a remittance shock on the publicly provided goods in the district.

I find remittance shocks positively influence the provision of education facilities. A one standard deviation 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. Appendix Table A.15 presents the results for asphalt roads, electricity, and piped water access, supporting the overall finding that remittances improve the provision of public goods. The sample size for estimation of effects on asphalt roads is smaller because the data are only collected every three years. Electricity and piped water are public goods that require complementary private investments in the form of a connection fee. In the presence of a remittance shock, more households also report getting their drinking water from a protected well. The wells are typically a private source of clean drinking water, indicating some substitutions between the public and private provisions of basic services.

This relationship is robust to the inclusion of lagged outcomes as a control variable and the construction of the remittance proxy using inverse hyperbolic sine instead of natural logarithms. The first check tests whether the regression equation that I estimate is misspecified due to the omission of lagged outcomes from the right-hand side. This concern stems from the possibility that the effect I detect actually captures underlying trends in outcome variables that remain correlated with the remittance proxy. Table A.16 in the Appendix reports the estimation with lagged outcomes included as a control. The results show the coefficients for the remittance proxy remain statistically significantly different from zero (for public elementary and junior high school densities) or with a coefficient size that is largely unchanged (for roads). The second check tests whether the natural logarithm transformation for the migration intensity measure bias the results as it omits districts with zero migrants in the Podes 2005 dataset. The inverse hyperbolic sine transformation sidesteps the problem by retaining districts with zero-

[10] 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.

valued observations (Bellemare and Wichman, 2020). I present estimates of regressions with the remittance proxy constructed using the inverse hyperbolic sine transformations and inclusion of lagged outcomes as control variables in Appendix Table A.17. The size and precision of the remittance proxy variables are robust to the alternative variable transformation and the inclusion of zero-migrant districts in the sample.[11]

6.2. Alternative Explanations: Commodity Trade in Oil, Natural Gas and Palm Oil

Could the presented findings be driven by a mechanism other than remittances? 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 mechanism I proposed in this paper. However, the foreign trade statistics aggregating export data reports from all ports of entry (Appendix Table A.18) 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 show little correlation between the two variables (Appendix Table A.19).

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 with 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

[11] In further tests, I include controls of baseline schools interacted with time, province-specific trends, and two-way clustering for standard errors. Appendix Tables A.32-A.34. These controls on average lowers the magnitudes of the effects for primary schools and junior secondary schools by 8% of the estimates in Table 5, but the coefficients remain statistically significantly different from zero.

[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.20 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.

equation 7 and report the results in Tables 6.

I find that the relationship between the remittance shock and the provisions of various public goods is robust to the inclusion of these trade shock variables. The coefficients on remittances are largely unchanged from the main results reported earlier in Table 5. I find instead that the oil and gas trade shock has negative coefficients that are an order of magnitude smaller than the remittance coefficients. This is consistent with the results reported in Cassidy (2021), who ruled out changes in public service delivery due to the oil and gas grant. For the palm oil trade shock, although its estimated coefficients are also positive and statistically significantly different from zero, they are also one order of magnitude smaller than the remittance coefficients. 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.

Using an alternate specification where I interact the remittance shock directly with the district's revenue from oil and gas production, I find a similar pattern. The effects of remittances on public educational facilities remain positive, while the negative coefficients for the interaction term remain an order of magnitude lower (Appendix Table A.21). Appendix Table A.22 presents the results for a similar exercise of interacting the remittance shocks directly with palm oil plantation area, which shows a similar negative interaction pattern between remittances and palm oil production. In contrast, the effects of remittances on their own remain positive.

6.3. Mechanisms: taxation, election, education commitments, and decentralization

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, governments may capture remittance windfall through taxation. Second, electoral competition may induce politicians to provide public goods to win votes. Third, remittances may influence government policies through interactions with pre-existing sectoral priorities. Finally, decentralization may put local governments in a better position to provide public goods for their population.

Taxation. Taxation of economic activities transfers part of the economic gain to the government budget, which they may use to provide public goods. A prerequisite would be that remittances create economic growth, and governments have the power to tax. I test this pathway by estimating the effects of remittances on economic growth outcomes. Then I look into various revenue-gathering streams at the governments' disposal. If the relationship holds, it will open the way to test its effects on governments' spending priority and the actual provision of public goods.

As a first step, I estimate the impact of remittances on economic growth. To measure growth, I use the district-level gross domestic product (GDP) from 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). Data are available at the district level as defined by the 2014 boundary, in constant price using the

year 2000 as the base price. For district splits before 2014, Dapoer provides GDP estimates for the children districts before the split from calculation with data at the sub-district level. 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. I estimate equation (7) for the following outcomes: the overall GDP per capita (excluding oil and gas) and the three major sectors. Table 7 reports the results.

I find that 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 standard deviation remittance proxy shock leads to an increase of 0.09 log points of the overall GDP per capita (column 1), 0.13 log points of the agriculture sector GDP per capita (column 2), 0.24 service sector GDP per capita (column 3), and 0.19 in manufacturing sector GDP per capita (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. 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.

With an increase in local economic growth due to remittances, how much does it change government revenues through taxation? I estimate the impact of remittances on both central and local tax revenue streams. 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% for the income tax and 9% of the property tax). This revenue is reported as a Tax Revenue Share (DBH). I also look into revenues from local taxes, classified as Own Source Revenue (PAD).[14] This revenue stream collects local taxes and fees imposed by the district governments, such as vehicle and hotel taxes. 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 using equation (7). Table 8 reports the estimation results.

I do not find supporting evidence for higher tax revenues collected by the government with a positive remittance shock. In column 1, a one standard deviation positive remittance shock is associated with a *negative* coefficient on central tax revenue sharing in log IDR. As a share of the total revenues, revenue sharing from centrally collected taxes decreases (column 2). When we look at revenues from local taxes in log IDR and as a share of the total district budgets, the coefficients are not statistically significantly different from zero, and they have negative signs (columns 3-4). The 90% confidence interval from estimation in column 3 suggests I can rule out effects where remittances shock leads to increases in the local tax revenue in log IDR that are higher than 1 percent.[15]

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

[14]DBH: *Dana Bagi Hasil*; PAD: *Pendapatan Asli Daerah*.

[15]See Appendix Table A.30 for estimated effects on price and employment outcomes: remittances has no effect on core price index, reduces the size of the total labor force, but do not appear to change the sectoral composition of employment.

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 (7) with a dummy for election years. Since 2005, mayors in Indonesian districts have been elected through direct popular elections every five years. 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). 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 9 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.[16]

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. 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). Districts are required to spend at least 20 percent of their budget on the education function, and the average share of education expenditure in my sample is 35 percent.

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.

I present the results in Table 10 suggests that remittances strengthen the provision of education facilities in districts with a stronger fiscal commitment to education. The interaction

[16]Household survey data from Olken et al. (2014) suggests that remittances lead to lower turnout for elections, with statistically significant loewr turnout in mayoral election (Appendix Table A.28). 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.29).

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.

Decentralization and district splits. In the presence of a positive remittances shock, decentralized governance could facilitate better provisions of public goods by the government. In Indonesia, the decentralization process involved the transfer of responsibilities to provide public goods from the central government to district-level governments. This process has led to the creation of new, smaller districts within existing district boundaries–"district splits" (Bazzi and Gudgeon, 2021; Cassidy and Velayudhan, 2022). Between 2004-2012, district 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. As district splits reduce the average distance between governments and citizens, it may well improve public goods provision.

I interact the remittance proxy with an indicator of district splits to test this mechanism, using the same public goods outcomes as my main specification. 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. Appendix Table A.23 provides the complete list of district splits. Most 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. I regress the public school density on the remittance proxy interacted with the district split indicator.

Table 11 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.

Financing school constructions. To respond to a positive remittance shock with improvements and expansion in public goods provision, governments need to leverage existing resources and alternative streams to finance it. Considering that remittances are not transferred to the government budget and the suggestive negative effects on tax revenue, I examine an unusual strategy where the government intensified 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. 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, the average number of teachers per junior high school, and average sanitation facilities (sinks and toilets) per junior high schools. When new schools are constructed with fewer amenities, as would typically happen under this program, they would bring the district average number down. I regress these variables on the left-hand side of the equation (7) on the remittance proxy variable, and Table 12 reports the results.

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), fewer teachers (column 3), and fewer sinks and toilets (columns 4-5). 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.[17]

7. 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

[17]Estimation using survey data from Olken et al. (2014) shows that village heads in villages with remittance-positive shocks are more likely to rank inadequate education infrastructure higher as the top three challenges than ranking inaffordability of school education as a top challenge (Appendix Table A.26). These village heads were a key actor in the creation of One-Roof Junior High Schools (see Appendix B). Additionally, households participating community building activities in these villages are more likely to contribute money and goods for the building (Appendix Table A.27).

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

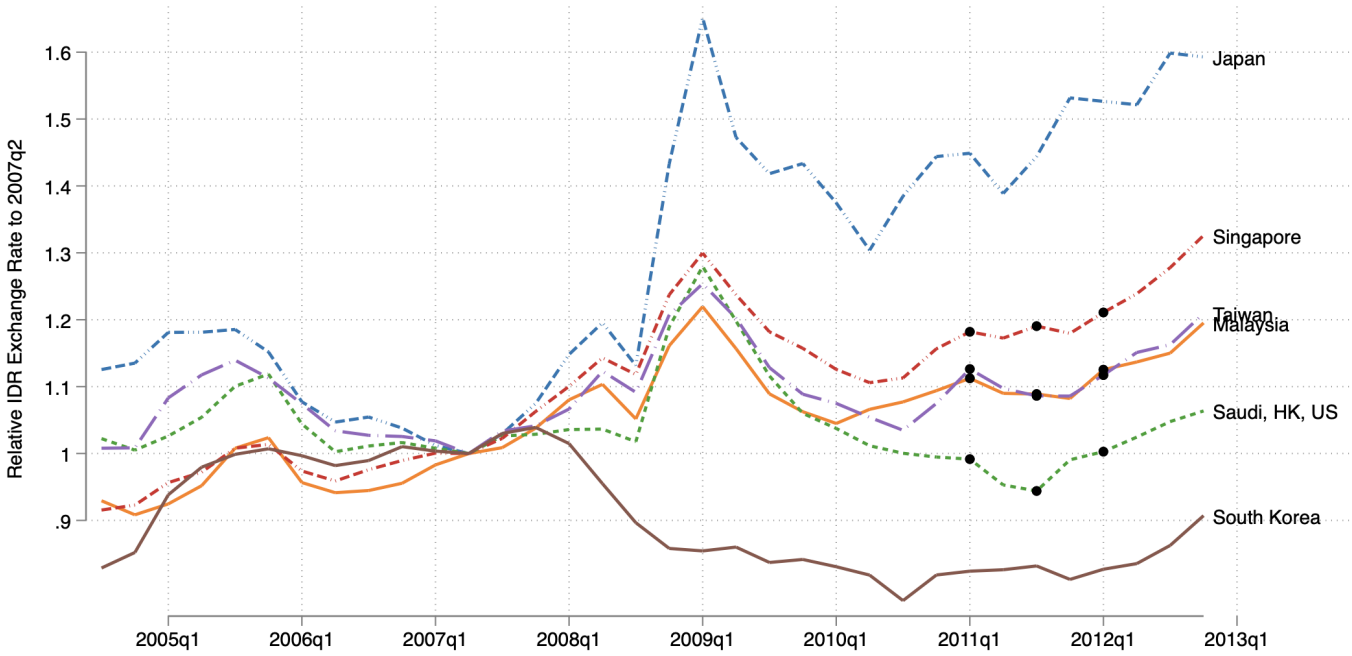

Figure 1: Variations of exchange rate from currencies in selected migration destination countries against Indonesian rupiah (IDR) relative to the prevailing exchange rate in Q2-2007. Quarterly data averaged from monthly exchange rate data provided by Refinitiv Datastream (2021).

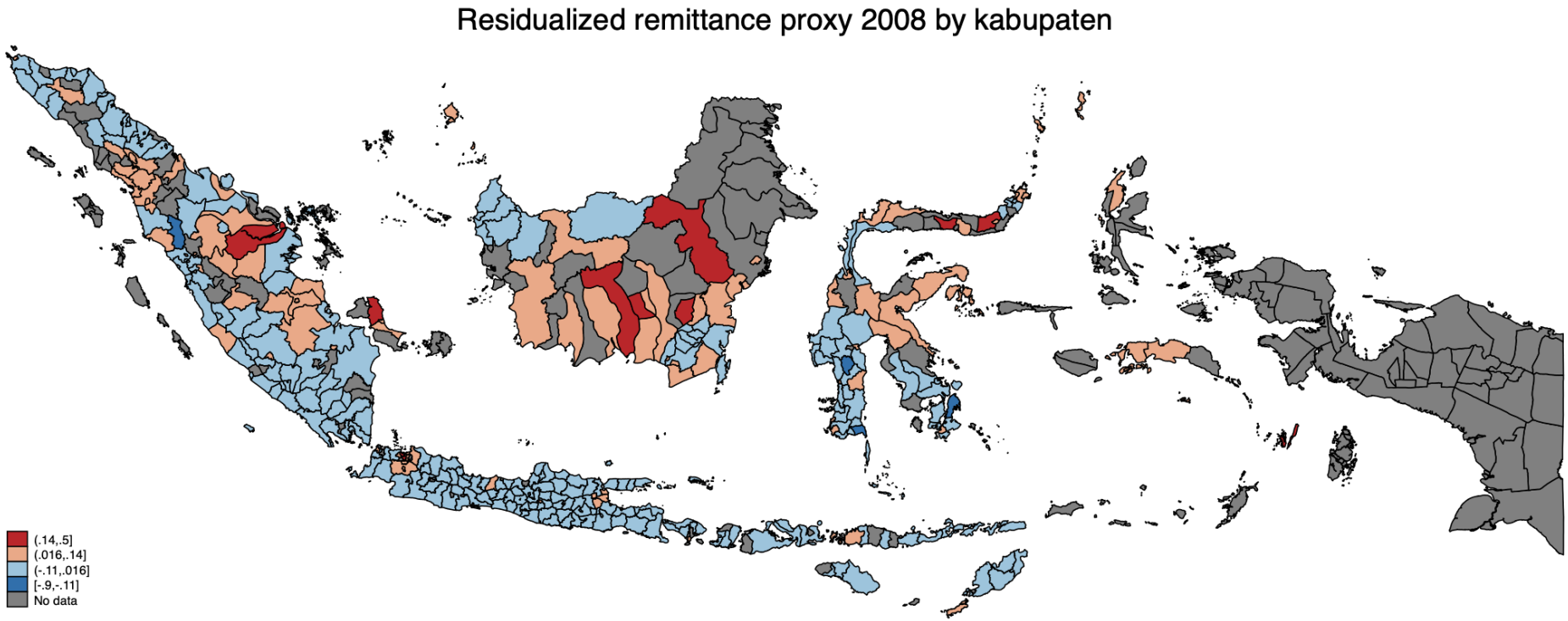

Figure 2: Distribution of residualized remittance proxy in 2008, by kabupaten

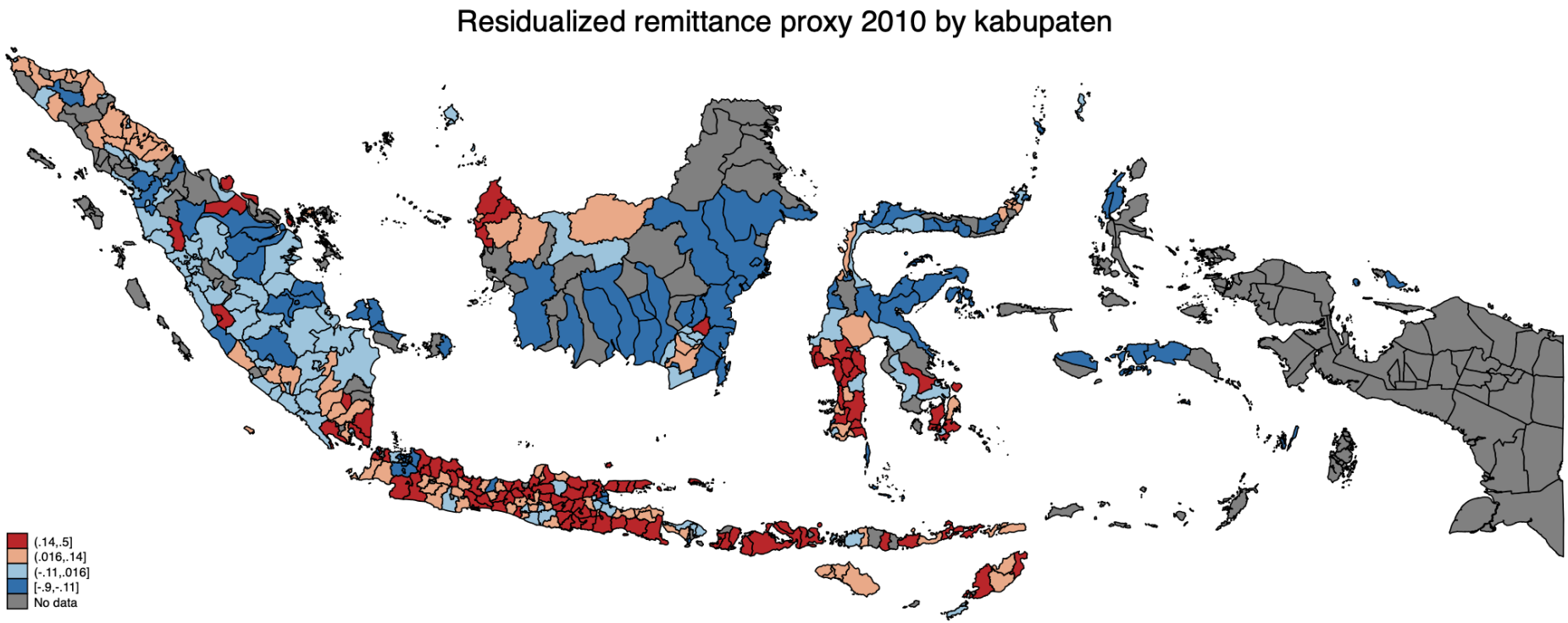

Figure 3: Distribution of residualized remittance proxy in 2010, by kabupaten

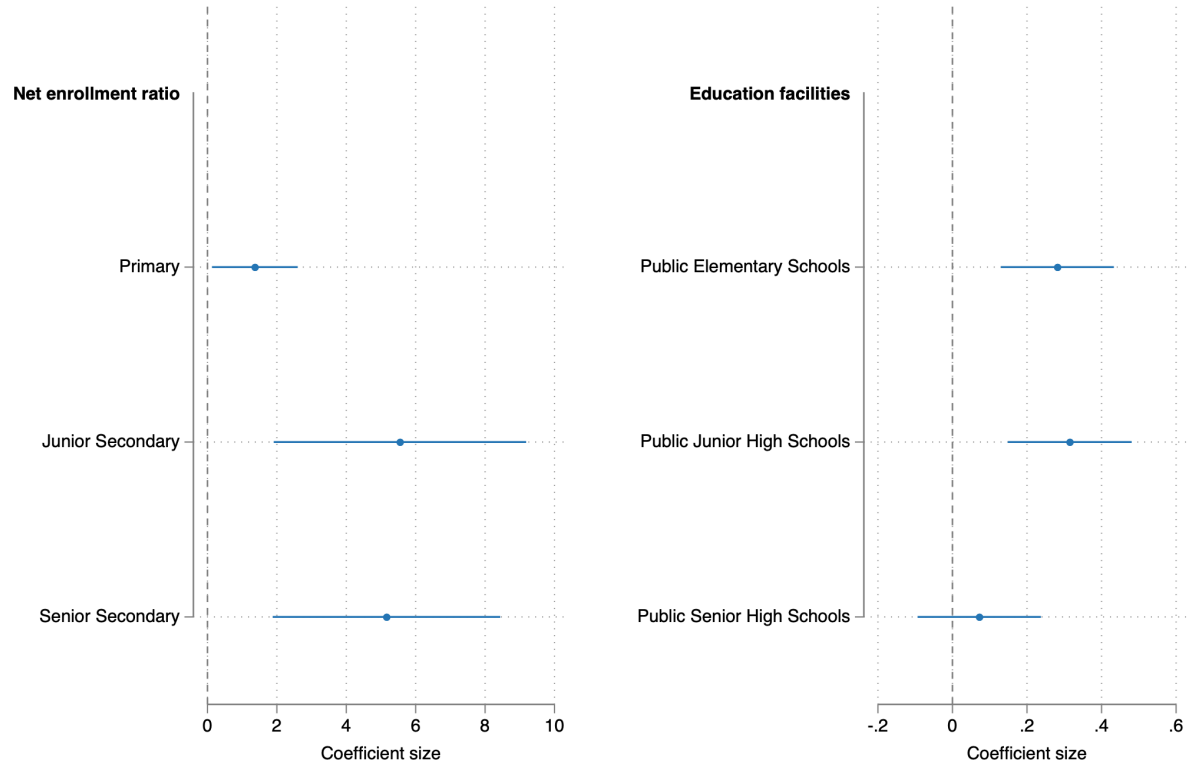

Figure 4: Effects of remittance shocks on education participation and public good provision. Note: each outcome in right panel is expressed in per 10,000 population and standardized. Plot shows point estimates and 90% confidence intervals.

Table 1: Summary statistics

	Mean	Std dev	Min	Max	Obs.
A. Migrant Panel Data from Doi et al. (2014)					
Remittance (z-score of log IDR)	-0.00	1.00	-3.87	2.76	418
Remittance (USD)	804.60	885.59	6.87	9943.21	418
Exchange rate shock (z-score)	0.00	1.00	-3.05	1.70	418
Exchange rate shock (%)	1.01	0.02	0.96	1.04	418
B. District-level regressors					
Migrants (Podes 2005)	3,185	6,494	1	38,367	353
Population (Podes 2005)	588,456	593,375	44,699	4,004,632	353
Migrants per one million people (log)	7.2	1.8	.16	11	353
Exchange rate shock (%)	1.07	0.07	0.86	1.31	2419
Remittance proxy (z-score)	-0.00	1.00	-3.92	2.47	2419
C. Household outcomes					
Enrollment elementary level (%)	93.34	2.96	70.38	100.00	2393
Enrollment junior secondary level (%)	66.52	9.93	20.25	91.47	2393
Enrollment senior secondary level (%)	46.03	12.84	1.35	86.62	2393
Household per capita 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≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

Table 3: Effects on Household Expenditures

	(1) log (HH Expenditure)	(2) log (HH Expenditure bottom quintile)	(3) log (HH Expenditure Education)
Migration x $XRShock^{t-1}$	0.04	0.10***	0.28***
	(0.04)	(0.03)	(0.09)
mean(y)	12.83	12.08	9.62
Clusters	350	350	350
Observations	2060	2060	2060

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 4: Effects on school enrollment

	(1) School Enrollment among 7-18 yo.	(2) Elem School Enrollment among 7-12 yo.	(3) Jun Sec School Enrollment among 13-15 yo.	(4) Sen Sec School Enrollment among 16-18 yo.
A. Boys and Girls				
Migration x $XRShock^{t-1}$	2.6***	0.8	4.4**	7.5***
	(0.8)	(0.7)	(2.1)	(2.2)
B. Boys				
Migration x $XRShock^{t-1}$	3.5***	0.1	6.3***	12.0***
	(0.9)	(0.9)	(2.3)	(2.7)
C. Girls				
Migration x $XRShock^{t-1}$	1.7*	1.6*	1.9	2.8
	(0.9)	(0.8)	(2.9)	(2.8)
mean(y) boys and girls	85.8	93.5	66.8	46.5
Clusters	353	353	353	353
Observations	2411	2411	2411	2411

Notes: Each coefficient is from a separate regression. 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$\leq$ 0.10, ** p$\leq$ 0.05, *** p$\leq$ 0.01.

Table 5: Effects on Public Goods

	(1) Public Elem. School (/10Kpop)	(2) Public Jun. Sec. School (/10Kpop)	(3) Public Sen. Sec. School (/10Kpop)
Migration x $XRShock^{t-1}$	0.85***	0.27***	0.02
	(0.28)	(0.09)	(0.03)
mean(y)	6.39	1.18	0.31
Clusters	353	353	353
Observations	2417	2417	2417

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$\leq$ 0.10, ** p$\leq$ 0.05, *** p$\leq$ 0.01.

Table 6: Public goods robustness with commodity

	(1) Public Elem. School (/10Kpop)	(2) Public Jun. Sec. School (/10Kpop)	(3) Public Sen. Sec. School (/10Kpop)
Migration x $XRShock^{t-1}$	0.90***	0.31***	0.03
	(0.29)	(0.09)	(0.03)
OilGas x $XROilGas^{t-1}$	-0.02	-0.03***	-0.01***
	(0.02)	(0.01)	(0.00)
PalmOil x $XRPalmOil^{t-1}$	0.07	0.04**	0.01**
	(0.05)	(0.02)	(0.00)
mean(y)	6.39	1.18	0.31
Clusters	353	353	353
Observations	2417	2417	2417

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 7: Effects on GDP per capita (log IDR)

	(1) GDP per capita	(2) Agriculture GDP per capita	(3) Service GDP per capita	(4) Manufacturing GDP per capita
Migration x $XRShock^{t-1}$	0.09*	0.13***	0.24*	0.19
	(0.05)	(0.04)	(0.14)	(0.14)
mean(y)	15.50	13.98	14.40	13.81
Clusters	350	350	353	353
Observations	2399	2399	2417	2417

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 8: Effects on Tax Revenues

	(1) Total Revenue log(IDR)	(2) Income, Property, Tobacco Tax revenue log(IDR)	(3) % Income, Property, Tobacco Tax revenue sharing	(4) Own Revenue log(IDR)	(5) Own revenue % share Revenue
Migration x $XRShock^{t-1}$	0.06	-1.58	-0.05**	-1.21	-0.01
	(0.11)	(1.15)	(0.02)	(0.74)	(0.01)
mean(y)	27.10	23.98	0.07	24.01	0.07
Clusters	345	345	345	345	345
Observations	2324	2324	2320	2324	2320

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 9: Public goods interaction with Election

	(1) Public Elem. School (/10Kpop)	(2) Public Jun. Sec. School (/10Kpop)	(3) Public Sen. Sec. School (/10Kpop)
Migration x $XRShock^{t-1}$	0.87***	0.28***	0.02
	(0.28)	(0.09)	(0.03)
Election	-0.24	-0.07	0.01
	(0.49)	(0.19)	(0.04)
Mig x XRshock x Election	-0.01	-0.00	-0.00
	(0.02)	(0.01)	(0.00)
mean(y)	6.39	1.18	0.31
Clusters	353	353	353
Observations	2417	2417	2417

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$\leq$ 0.10, ** p$\leq$ 0.05, *** p$\leq$ 0.01.

Table 10: Public goods interaction with EduBudget

	(1) Public Elem. School (/10Kpop)	(2) Public Jun. Sec. School (/10Kpop)	(3) Public Sen. Sec. School (/10Kpop)
Migration x $XRShock^{t-1}$	0.78**	0.35***	0.03
	(0.31)	(0.09)	(0.03)
EduBudget	0.00	0.47***	0.11***
	(0.32)	(0.11)	(0.03)
Mig x XRshock x EduBudget	0.07**	0.02**	0.00
	(0.03)	(0.01)	(0.00)
mean(y)	6.43	1.17	0.31
Clusters	345	345	345
Observations	2196	2196	2196

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$\leq$ 0.10, ** p$\leq$ 0.05, *** p$\leq$ 0.01.

Table 11: Public goods interaction with District Split

	(1) Public Elem. School (/10Kpop)	(2) Public Jun. Sec. School (/10Kpop)	(3) Public Sen. Sec. School (/10Kpop)
Migration x $XRShock^{t-1}$	0.52***	0.18**	0.01
	(0.18)	(0.07)	(0.02)
Split	-2.36	-0.80	-0.43***
	(1.68)	(0.57)	(0.16)
Mig x XRshock x Split	0.41**	0.09*	-0.01
	(0.16)	(0.06)	(0.01)
mean(y)	6.39	1.18	0.31
Clusters	353	353	353
Observations	2417	2417	2417

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$\leq$ 0.10, ** p$\leq$ 0.05, *** p$\leq$ 0.01.

Table 12: Effects on Characteristics of Junior High Schools

	(1) JunSec. attached to Elem. School	(2) Classrooms/ Jun Sec School	(3) Teachers/ Jun Sec School	(4) Sink/ Jun Sec School	(5) Toilet/ Jun Sec School
Migration x $XRShock^{t-1}$	0.03***	-0.45***	-0.57**	-0.16*	-0.12
	(0.01)	(0.15)	(0.27)	(0.08)	(0.11)
mean(y)	0.08	10.91	19.43	4.35	6.53
Clusters	353	353	353	353	353
Observations	2417	2417	2417	2417	2417

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$\leq$ 0.10, ** p$\leq$ 0.05, *** p$\leq$ 0.01.

Appendix

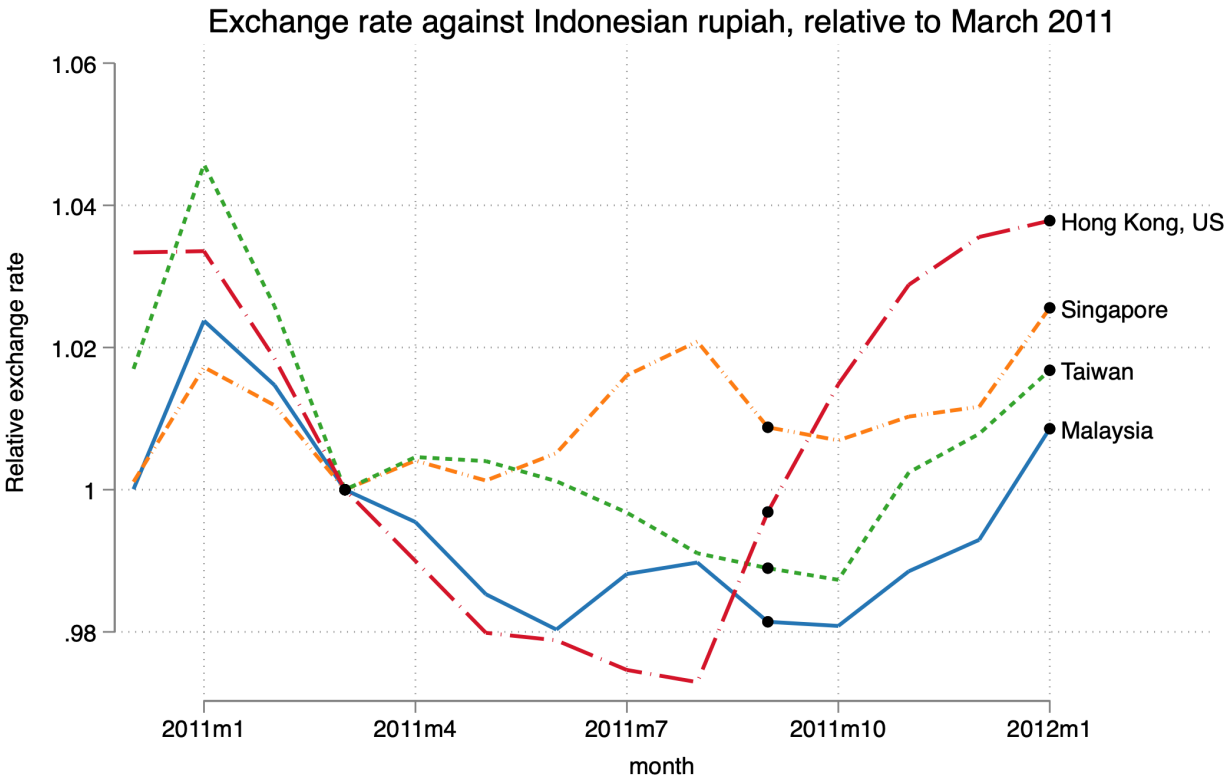

Figure A.1: Monthly exchange rate variation for year 2011, by destination countries. Data are from Refinitif Datastream (2021)

Table A.1: Data sources

Variables	Years	Source
School establishment	2005-2012	Data Pokok Pendidikan (Dapodik) 2018, an administrative registry maintained by the Ministry of Education and Culture. Covers the universe of all primary and secondary schools under the purview of the MoEC in Indonesia. Has year of establishment, location (province and district), level (primary, junior secondary, senior secondary), and status (public or private).
Population	2005-2011	World Bank Indo-Dapoer, aggregating information from Population Census 2000, 2010 and population projection in intervening years from BPS. Because Indo-Dapoer has observations from post-split children district backcasted to years before the split for other variables, missing population variables for some districts are filled in using its earliest available year population variable.
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.
Migration Intensity	2005, 2008, 2011	Potensi Desa (Podes), a tri-annual survey of all villages in Indonesia. Informations about the number of Overseas Indonesian Workers (TKI) were provided by village heads, and aggregated to the district level. TKI information was asked by gender (male and female) for 2005 and 2011 Podes, but was only asked in total for 2008. 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	2005-2011	BNP2TKI Soekarno Hatta migrant terminal arrival records March 2008- March 2011. Collects individual-level information: migrant home district, country of work, date of departure, date of arrival, gender, and reason for return.

Table A.1: Data sources

School Enrollment, Poverty, GDP, Electricity	2005-2011	World Bank Indo-Dapoer, aggregating information from Susenas household surveys.
Tax collection	2005-2011	Ministry of Finance, Direktorat Jenderal Perimbangan Keuangan. Dataset is downloadable at http://djpk.kemenkeu.go.id/
Commodity export	2007	Indonesia Foreign Trade Statistics

Table A.2: 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.3: 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.4: Remittance Estimates from Survey Data

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

Table A.5: 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.6: Future remittances are not correlated with past public goods

	(1) Public Elem. School (/10Kpop)	(2) Public Jun. Sec. School (/10Kpop)	(3) Public Sen. Sec. School (/10Kpop)
Migration x $XRShock^{t+2}$	0.16	-0.0020	0.013
	(0.099)	(0.038)	(0.0094)
mean(y)	6.59	1.11	0.29
Clusters	353	353	353
Observations	1924	1924	1924

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.7: Future remittances are not correlated with past enrollment

	(1) Elem School Enrollment among 7-12 yo.	(2) Jun Sec School Enrollment among 13-15 yo.	(3) Sen Sec School Enrollment among 16-18 yo.
Migration x $XRShock^{t+2}$	-0.24	0.51	1.48
	(0.35)	(1.41)	(1.02)
mean(y)	93.7	65.7	44.2
Clusters	350	350	350
Observations	1590	1590	1590

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: Effects on Poverty

	(1) HH Below Poverty Line	(2) % HH Poor	(3) Poverty Gap
Migration x $XRShock^{t-1}$	-44207.40***	-3.93***	-1.29***
	(5862.17)	(0.76)	(0.23)
mean(y)	95221.36	15.13	2.66
Clusters	350	350	350
Observations	2392	2392	2392

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.9: Effects on School Enrollment Alternative Measure

	(1) Elem. School enrolment	(2) Jun. Sec. School enrolment	(3) Sen. Sec. School enrolment
Migration x $XRShock^{t-1}$	1.37*	5.55**	5.16***
	(0.75)	(2.21)	(1.99)
mean(y)	93.34	66.52	46.02
Clusters	350	350	350
Observations	2391	2391	2391

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.10: Effects on school enrollment

	(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 x $XRShock^{t-1}$	2.5***	1.0	4.6**	6.1***
	(0.8)	(0.7)	(2.2)	(2.0)
B. Boys				
Migration x $XRShock^{t-1}$	3.5***	0.1	5.9**	10.2***
	(0.9)	(0.9)	(2.4)	(2.6)
C. Girls				
Migration x $XRShock^{t-1}$	1.5	1.9**	2.6	1.8
	(0.9)	(0.8)	(2.8)	(2.6)
mean(y) boys and girls	85.8	93.5	66.8	46.5
Clusters	353	353	353	353
Observations	2411	2411	2411	2411

Notes: Each coefficient is from a separate regression. 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$\leq$ 0.10, ** p$\leq$ 0.05, *** p$\leq$ 0.01.

Table A.11: Effects on school enrollment for placebo regressions

	(1) Elem 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			
Migration x $XRShock^{t-1}$	-0.1	-0.1	-0.8
	(0.1)	(0.2)	(0.8)
B. Boys			
Migration x $XRShock^{t-1}$	-0.1	0.1	-0.3
	(0.1)	(0.2)	(0.9)
C. Girls			
Migration x $XRShock^{t-1}$	-0.2	-0.4	-1.2
	(0.2)	(0.3)	(1.0)
mean(y) boys and girls	0.0	0.2	2.9
Clusters	353	353	353
Observations	2411	2411	2411

Notes: Each coefficient is from a separate regression. 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.12: Effects on Education Attainment

	(1) Completed Years of Education	(2) Completed Elem School	(3) Completed Jun Sec School	(4) Completed Sen Sec School
A. Male and Female				
Migration x $XRShock^{t-1}$	0.31***	4.45***	4.27***	2.76**
	(0.09)	(1.16)	(1.29)	(1.35)
B. Male				
Migration x $XRShock^{t-1}$	0.36***	5.07***	5.03***	3.59**
	(0.11)	(1.10)	(1.40)	(1.48)
C. Female				
Migration x $XRShock^{t-1}$	0.27***	3.86***	3.58***	1.94
	(0.10)	(1.33)	(1.34)	(1.34)
mean(y) male and female	6.1	80.7	48.0	30.1
Clusters	353	353	353	353
Observations	2411	2411	2411	2411

Notes: Each coefficient is from a separate regression. 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.13: 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
sd(y)	0.17	0.05	0.21	0.17	0.12
FE	kabid14 year	kabid14 year	kabid14 year	kabid14 year	kabid14 year
Clusters	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.14: Use of increased remittances

	(1)	(2)	(3)	(4)	(5)	(6)
	Electronics	Durables	Migration loan	School	Consumption	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.15: Effects on Other Public Goods and Public Goods with Complementary Private Investments

	(1)	(2)	(3)	(4)
	Household electricity	Piped drinking water	Protected Well drinking water	Asphalt road
Migration x $XRShock^{t-1}$	0.05***	0.09***	0.04*	0.25**
	(0.02)	(0.03)	(0.02)	(0.10)
mean(y)	0.89	0.16	0.29	0.70
Clusters	350	353	353	308
Observations	2175	2411	2411	831

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.16: Effects on Public Goods with Lagged Controls

	(1) Public Elem. School (/10Kpop)	(2) Public Jun. Sec. School (/10Kpop)	(3) Public Sen. Sec. School (/10Kpop)
Migration x $XRShock^{t-1}$	0.81***	0.23***	0.03
	(0.21)	(0.07)	(0.02)
Lagged outcome	0.38***	0.39**	0.56***
	(0.13)	(0.17)	(0.05)
mean(y)	6.39	1.18	0.31
sd(y)	3.03	0.86	0.25
FE	kabid14 year	kabid14 year	kabid14 year
Clusters	353	353	353
Observations	2417	2417	2417

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$\leq$ 0.10, ** p$\leq$ 0.05, *** p$\leq$ 0.01.

Table A.17: Effects on Public Goods with Lagged Controls, Inverse Hyperbolic Sine Specification

	(1) Public Elem. School (/10Kpop)	(2) Public Jun. Sec. School (/10Kpop)	(3) Public Sen. Sec. School (/10Kpop)
asinh Mig x $XRShock^{t-1}$	0.34**	0.09*	0.01
	(0.16)	(0.05)	(0.01)
Lagged outcome	0.38***	0.41**	0.57***
	(0.13)	(0.17)	(0.05)
mean(y)	6.40	1.19	0.32
sd(y)	3.05	0.86	0.25
FE	kabid14 year	kabid14 year	kabid14 year
Clusters	366	366	366
Observations	2475	2475	2475

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.18: 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.19: 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.20: 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.21: Effects on Public Goods–Migration Proxy Interaction with OilGas

	(1) Public Elem. School (/10Kpop)	(2) Public Jun. Sec. School (/10Kpop)	(3) Public Sen. Sec. School (/10Kpop)
Migration x $XRShock^{t-1}$	1.33***	0.63***	0.05
	(0.46)	(0.13)	(0.04)
Migration x $XRshock$ x OilGas	-0.04*	-0.03***	-0.00
	(0.02)	(0.01)	(0.00)
mean(y)	6.39	1.18	0.31
sd(y)	3.03	0.86	0.25
FE	kabid14 year	kabid14 year	kabid14 year
Clusters	353	353	353
Observations	2417	2417	2417

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.22: Effects on Public Goods–Migration Proxy Interaction with PalmOil

	(1) Public Elem. School (/10Kpop)	(2) Public Jun. Sec. School (/10Kpop)	(3) Public Sen. Sec. School (/10Kpop)
Migration x $XRShock^{t-1}$	0.92***	0.32***	0.04
	(0.29)	(0.09)	(0.02)
Migration x $XRshock$ x PalmOil	-0.07	-0.03*	-0.01***
	(0.06)	(0.02)	(0.00)
mean(y)	6.39	1.18	0.31
sd(y)	3.03	0.86	0.25
FE	kabid14 year	kabid14 year	kabid14 year
Clusters	353	353	353
Observations	2417	2417	2417

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.23: District splits

Parent district 2004	Split	New children districts and BPS district code
Aceh Singkil (1102)	2007	Kota Subulussalam (1175)
Pidie (1109)	2007	Pidie Jaya (1118)
Nias (1201)	2008	Nias Utara (1224), Nias Barat (1225), Kota Gunungsitoli (1278)
Tapanuli Selatan (1203)	2007	Padang Lawas (1221), Padang Lawas Utara (1220)
Labuhan Batu (1207)	2008	Labuhan Batu Utara (1223), Labuhan Batu Selatan (1222)
Asahan (1208)	2007	Batu Bara (1219)
Bengkalis (1408)	2009	Kepulauan Meranti (1410)
Kerinci (1501)	2008	Kota Sungai Penuh (1572)
Muara Enim (1603)	2013	Penukal Abab Lematang Ilir (1612)
Lahat (1604)	2007	Empat Lawang (1611)
Musi Rawas (1605)	2013	Musi Rawas Utara (1613)
Bengkulu Utara (1703)	2008	Bengkulu Tengah (1709)
Lampung Barat (1801)	2012	Pesisir Barat (1813)
Tanggamus (1802)	2008	Pringsewu (1810)
Lampung Selatan (1803)	2007	Pesawaran (1809)
Tulangbawang (1808)	2008	Mesuji (1811), Tulangbawang Barat (1812)
Natuna (2103)	2008	Kepulauan Anambas (2105)
Bandung (3204)	2007	Bandung Barat (3217)
Ciamis (3207)	2012	Pangandaran (3218)
Tangerang (3603)	2008	Kota Tangerang Selatan (3674)
Serang (3604)	2007	Kota Serang (3673)
Lombok Barat (5201)	2008	Lombok Utara (5208)
Sumba Barat (5301)	2007	Sumba Tengah (5316), Sumba Barat Daya (5317)
Kupang (5303)	2008	Sabu Raijua (5320)
Belu (5306)	2013	Malaka (5321)
Ngada (5312)	2007	Nagekeo (5318)
Manggarai (5313)	2007	Manggarai Timur (5319)
Pontianak (6104)	2007	Kubu Raya (6112)
Ketapang (6106)	2007	Kayong Utara (6111)
Kutai Barat (6402)	2013	Mahakam Ulu (6411)
Bulungan (6407)	2007	Tana Tidung (6410)
Bolaang Mongondow (7101)	2007, 2008	Bolaang Mongondow Utara (7107), Kota Kotamobagu (7174), Bolaang Mongondow Selatan (7110), Bolaang Mongondow Timur (7111)
Kep. Sangihe (7103)	2007	Siau Tagulandang Biaro (7108)
Minahasa Selatan (7105)	2007	Minahasa Tenggara (7109)
Banggai Kepulauan (7201)	2013	Banggai Laut (7211)
Morowali (7203)	2013	Morowali Utara (7212)
Donggala (7205)	2008	Sigi (7210)
Tana Toraja (7318)	2008	Toraja Utara (7326)
Buton (7401)	2014	Buton Tengah (7414), Buton Selatan (7415)
Muna (7402)	2007, 2014	Buton Utara (7409), Muna Barat (7413)
Konawe (7403)	2007, 2013	Konawe Utara (7410), Konawe Kepulauan (7412)
Kolaka (7404)	2013	Kolaka Timur (7411)
Gorontalo (7502)	2007	Gorontalo Utara (7505)
Mamuju (7604)	2013	Mamuju Tengah (7606)

Table A.23: District splits

Maluku Tenggara Barat (8101)	2008	Maluku Barat Daya (8108)
Maluku Tenggara (8102)	2007	Kota Tual (8172)
Buru (8104)	2008	Buru Selatan (8109)
Kepulauan Sula (8203)	2013	Pulau Taliabu (8208)
Halmahera Utara (8205)	2008	Pulau Morotai (8207)
Manokwari (9105)	2012	Manokwari Selatan (9111), Pegunungan Arfak (9112)
Sorong Selatan (9106)	2009	Maybrat (9110)
Sorong (9107)	2008	Tambrauw (9109)
Jayawijaya (9402)	2008	Nduga (9429), Memberamo Tengah (9431), Yalimo (9432), Lanny Jaya (9430)
Nabire (9404)	2008	Dogiyai (9434)
Paniai (9410)	2008	Intan Jaya (9435), Deiyai (9436)
Puncak Jaya (9411)	2008	Puncak (9433)
Sarmi (9419)	2007	Mamberamo Raya (9428)
Parents = 57 kabupaten		Children = 74 kabupaten

Table A.24: Correlation between Transfers from Household Members Abroad and Expectations of Future Outcomes for Children in the Household

	(1)	(2)	(3)
	In school	Years of education	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. * $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$.

Table A.25: Public goods interaction with EduBudget

	(1) Health Facilities Z-score	(2) Hospitals (/10Kpop)	(3) Doctors (/10Kpop)	(4) Midwives (/10Kpop)	(5) Community Health Centers (/10Kpop)	(6) Maternity Clinics (/10Kpop)
Migration x $XRShock^{t-1}$	0.51	0.13	-0.47	-0.02	1.35**	1.48
	(0.63)	(0.09)	(1.00)	(1.59)	(0.66)	(1.41)
EduBudget	0.07	0.10	-0.12	-1.13	0.08	2.32**
	(0.31)	(0.09)	(0.64)	(1.39)	(0.78)	(1.11)
Mig x XRshock x EduBudget	0.04*	0.01	0.09**	0.16***	-0.06	0.14*
	(0.02)	(0.01)	(0.04)	(0.06)	(0.07)	(0.08)
mean(y)	-0.20	0.08	1.68	5.61	1.66	1.48
Clusters	283	155	283	283	159	255
Observations	725	310	725	725	318	636

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.26: Effects of Remittances on Village Head's Perception of Education Challenges in Village'

	(1) Primary Edu Problem: Facility Not Adequate	(2) Jr Sec Edu Problem: Facility Not Adequate	(3) Primary Edu Problem: Edu cost Not Affordable	(4) Jr Sec Edu Problem: Edu cost Not Affordable	(5) Primary Edu Problem is facility not affordability	(6) Jr Sec Edu Problem is facility not affordability
Migration x $XRShock^{t-1}$	0.200	0.353	-0.441*	-0.506*	0.0548	0.206*
	(0.49)	(0.95)	(-1.69)	(-1.77)	(0.36)	(1.74)
mean(y)	0.9	0.8	0.3	0.4	0.3	0.2
Clusters	572	572	572	572	572	572
Observations	6886	6886	6886	6886	6886	6886

Notes: Sample is villages in Generasi SPKP survey (Olken et al, 2014). Respondents are village heads. 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 priority ranking of problem in education that the village faces, with a higher number indicating a higher priority. 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.27: 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.28: 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	-0.116*
	(-0.95)	(-2.21)	(-0.15)	(-1.86)
mean(y)	0.98	0.97	0.97	0.58
Clusters	605	520	549	573
Observations	18539	16636	12079	5261

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.29: 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.30: Effects on Prices and Employment

	(1) Core Price Index, 2007 base	(2) Total Labor Force (log)	(3) Share Employed (%TLF)	(4) Share Unemployed (%TLF)	(5) Share Underemployed (%TLF)
Migration x $XRShock^{t-1}$	1.90	-0.17***	0.00	-0.00	0.04**
	(3.19)	(0.05)	(0.01)	(0.01)	(0.02)
mean(y)	113.76	12.24	0.93	0.07	0.33
Clusters	47	350	350	350	350
Observations	330	1905	1905	1905	1905

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.31: Effects on Sectoral Employment Share

	(1) Share Employed Agriculture (%TLF)	(2) Share Employed Trade (%TLF)	(3) Share Employed Social (%TLF)	(4) Share Employed Industry (%TLF)	(5) Share Employed Transport (%TLF)	(6) Share Employed Constructions (%TLF)
Migration x $XRShock^{t-1}$	-0.04	-0.01	-0.03***	0.01	0.01	0.00
	(0.03)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)
mean(y)	0.46	0.18	0.14	0.09	0.05	0.05
Clusters	350	350	350	350	350	350
Observations	1903	1901	1899	1881	1900	1892

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.32: Effects on Public Goods controlling for baseline trend

	(1) Public Elem. School (/10Kpop)	(2) Public Jun. Sec. School (/10Kpop)	(3) Public Sen. Sec. School (/10Kpop)
Migration x $XRShock^{t-1}$	1.03***	0.32***	0.03
	(0.31)	(0.10)	(0.03)
mean(y)	6.38	1.17	0.31
Clusters	349	349	349
Observations	2400	2400	2400

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, controlling for baseline (2004) primary school density interacted with year, baseline junior high school density interacted with year, and baseline senior high school density interacted with year. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

Table A.33: Effects on Public Goods with two-way standard errors clustering

	(1) Public Elem. School (/10Kpop)	(2) Public Jun. Sec. School (/10Kpop)	(3) Public Sen. Sec. School (/10Kpop)
Migration x $XRShock^{t-1}$	0.85**	0.27**	0.02
	(0.30)	(0.09)	(0.02)
mean(y)	6.39	1.18	0.31
Clusters	8	8	8
Observations	2417	2417	2417

Notes: Standard errors clustered two-way at the kabupaten- and year-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.34: Effects on Public Goods with province trends

	(1) Public Elem. School (/10Kpop)	(2) Public Jun. Sec. School (/10Kpop)	(3) Public Sen. Sec. School (/10Kpop)
Migration x $XRShock^{t-1}$	0.81***	0.09**	0.00
	(0.19)	(0.04)	(0.01)
mean(y)	6.40	1.17	0.31
Clusters	354	354	354
Observations	2410	2410	2410

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 province, year, and province-year fixed effects. * p≤ 0.10, ** p≤ 0.05, *** p≤ 0.01.

B. Mechanism for One Roof Junior High School Program

(Depdiknas 2008)

1. District Education Offices propose locations to Province Education Office.
2. Province Education Offices verify proposals based on a set questionnaire. Verification steps:
   (a) Interview with Head of District Education Office
   (b) Interview with the Principal of Primary Schools where program location is proposed
   (c) Interview with Village Head where the primary school proposed to create One Roof Junior High School is located
3. Province Education Offices nominate selected locations to Directorate of Junior Secondary Education Oversight at the Ministry.
4. The Directorate of Junior Secondary Education Oversight analyze and verify a sample of the nominated location. The Directorate issue Establishment Letter for the selected location.
5. District Mayors for selected locations and the Director General of Primary and Secondary Education sign a Note of Agreement of One-Roof Schools Development Block Grant.