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BOSTON UNIVERSITY  
GRADUATE SCHOOL OF ARTS AND SCIENCES

Dissertation

**ESSAYS IN DEVELOPMENT ECONOMICS**

by

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Submitted in partial fulfillment of the  
requirements for the degree of  
Doctor of Philosophy

2023

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# ESSAYS IN DEVELOPMENT ECONOMICS

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## ABSTRACT

This dissertation consists of three essays in development economics. The first chapter studies the effects of migrant remittances on economic development and education investments. The second chapter examines the drivers of charitable donations on an online charity platform. The third chapter studies the political economy of education in Indonesia, where the state competes with religious schools to provide education services.

In the first chapter, I study the effects of remittances on development indicators and education investments in Indonesian districts. I use the interaction between local outmigration patterns and country-specific exchange rate shocks to identify the effects of remittances. I find that remittances increase household consumption, reduce poverty, and stimulate growth. Remittance recipients are able to send more children to school, thereby prompting district governments to increase public schools at the primary and junior secondary levels. The state also increases provisions of other public goods that complement household investments. These responses to remittances are not driven by electoral concern or the capture of economic gain through taxation, but rather pre-existing policy commitments and changes in government accountability.

In the second chapter (joint with Gedeon Lim and Yohanes Eko Riyanto), we study the optimal way to elicit online donations in a developing country setting.

We investigate the impact of randomizing choice set size and the randomization of beneficiary characteristics on the propensity and size of donations in the context of a Covid-19 mutual aid platform in Indonesia. We find that users assigned to a smaller choice set of potential beneficiaries are more likely to make a donation. This leads to higher average donations in smaller choice set groups as compared to larger choice set groups. Remarkably, we find no significant decrease in the amount transferred per donation. Our results suggest that donors are susceptible to choice overload.

In the third chapter (joint with Samuel Bazzi and Benjamin Marx), we study the competition in the education market between the state and Islam community in Indonesia. We develop a new theoretical framework to understand how states take over education markets at the expense of alternative providers. We apply this model to a primary school expansion policy in 1970s Indonesia that aimed to homogenize and secularize education, at odds with a longstanding and largely informal Islamic school system. Using novel administrative data, we identify dynamic effects of the policy on education markets. Funded through growth in charitable giving and informal taxation, Islamic schools entered new markets, formalized, and introduced more religious curriculum to compete with the state. While primary enrollment shifted towards state schools, religious education increased overall as Islamic secondary schools absorbed increased demand for continued education. Exposed cohorts are not more attached to secular values and instead report greater religiosity. Our findings offer a new perspective on the consequences of education reforms and the persistence of dual institutional systems across numerous settings.

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## Chapter 1

# Remittances, Economic Development, and Education Investment

### 1.1 Introduction

Remittances—money that migrants send to their home countries—are an important resource for many developing countries. In fact, remittances bring in more resources than oil in Nigeria (The Economist, 2019), revenues from the Suez Canal in Egypt, and IT services exported from India (Ratha et al., 2016). 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 their GDP. This is the case for countries as diverse as Tonga (39%), Tajikistan (27%), and El Salvador (24%) (World Bank, n.d.). The sheer magnitude of the remittance flow holds great potential for development in developing countries (World Bank, 2006, 2017).

Migrant remittances may influence how the state provides public goods. For example, since remittances can finance various household investments, including substitutes for public services, the state may respond by reducing public investments, leading to a “remittance curse.” On the other hand, if remittances increase the demand for public services, the state may make complementary investments. The state’s investments through the provision of public goods can subsequently indicate how it responds to the remittance windfall. The link between remittances and the state’s

response is, however, not well understood.

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

In this paper, I address these issues by investigating the effect of remittances on both households and districts in Indonesia. I identify the effects of remittances by combining three sources of variation: the share of migration in different regions, the destination countries, and shifts in currency exchange rates over time. The latter provide unanticipated shocks to the size of remittances that households receive, and variations in the magnitude of the shock depend on the migration destination. Since the share of migration differs by region, this difference induces variation in the remittance shocks at the district level. I build on a similar strategy employed by Yang (2008) and Khanna et al. (2022) in the Philippines by estimating the reduced form effects of exchange rate shocks on outcomes in Indonesian districts. While a two-stage least squares estimation (2SLS) of the effects of remittances on outcomes is also of interest to my study, this approach requires data on actual remittances flow at the sub-national level, which is scarcely available, making it impossible for me to make such estimations.

Indonesia provides an excellent setting to study the impact of remittances on public goods provision because nearly one million Indonesians migrate abroad annually. As such, Indonesia is the 14th largest remittance receiver in the world (World Bank, 2019). Indonesia also provides reliable subnational data, making it possible to exploit variations in destination and the scale of migration across hundreds of districts to overcome endogeneity challenges. The districts across Indonesia operate similarly under the same code of law, providing the opportunity to overcome the limitations of cross-country regressions, where unobserved variables may correlate with remittances and public goods provision.

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

Next, I leverage a unique dataset to construct a remittance proxy at the district level. Specifically, I obtained an administrative record of more than one million migrant returnees and use their destination and origin addresses to measure the district-level exposure to foreign currency shocks between 2005-2011. During this period, the global financial crisis led to sharp changes in currency exchange rates against the Indonesian rupiah (IDR) at varying magnitudes. For example, the US dollar (USD) and Saudi riyal (SAR) exchange rates to the IDR both rose by 23% between 2007-2009. In contrast, the value of the Korean won (KRW) decreased by 9%.<sup>1</sup> I construct a

---

<sup>1</sup>The monthly average exchange rates changed from IDR 8,827 (June 2007) to IDR 10,900 (January 2009) per USD. The Saudi riyal (SAR) is pegged to the USD at a rate of SAR 3.75 per USD.

remittance proxy using the interaction of migration intensity and currency fluctuations. Districts with many migrants to countries with strongly appreciating currencies experience a positive remittance shock, while districts with few migrants whose destinations have weak currencies receive a negative remittance shock. I subsequently combine this measure with rich data from household surveys, school registries, and regional budget reports to estimate the effect of remittances.

I find that remittances improve development indicators. Specifically, they increase household expenditures, especially at the bottom quintile of the expenditure distribution. An increase in the remittance proxy by one standard deviation (SD), which corresponds to a back-of-the-envelope windfall of USD 260,000 to the economy in the given district, raises poor households' consumption by USD 2 per month (a 10 percent increase). Households also report a higher asset index, reflecting acquisitions of various durable assets such as motorcycles, refrigerators, and cooking gas canisters. Remittances also reduce the share of households living below the poverty line, the poverty gap, and inequality as measured by the Gini coefficient. Using regional GDP per capita as an indicator of development, I find a one SD shock is associated with 0.09 log points higher total GDP per capita. This magnitude corresponds to a  $\sim$ USD 55 increase at the mean.

Households can use remittances to invest in education, and remittances enable households to send more of their children to school. A one SD shock raises the enrollment rate by 3.7 percentage points (p.p.) for children aged 6-18 years in primary and secondary school. At each level, remittances raise enrollment by 3 p.p., 4 p.p., and 7 p.p. for primary (grades 1-6), junior secondary (grades 7-9), and senior secondary (grades 10-12) levels, respectively. Cohort-specific analysis shows children ages 6, 13, and 16 drive increased enrollment; this finding is important because each

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Within the same period, the KRW exchange rate changed from IDR 9.51 to 8.65 per KRW (Refinitiv, n.d.).

of these are the crucial ages when children begin each level. These effects represent a meaningful improvement in achieving universal basic education, particularly in a context where secondary level enrollments have lagged behind the near-universal primary enrollment.

As households invest in education, the state has responded accordingly. After the Soeharto regime fell, the Indonesian central government devolved responsibility for providing education services to district-level governments. In response to a one SD shock in remittances and subsequent increased enrollment, districts opened 0.87 more public primary schools and 0.27 more public junior high schools per 10,000 population one year after the shock. The coefficient for public senior secondary schools is positive but not statistically different from zero. To provide junior secondary schools, district governments expand existing primary schools, which allows new schools to be established rapidly with fewer classrooms and teachers. Because of the expansion, the increased enrollment reported by households may include the effect of relaxing the constraint on the school supply. Like the provision of education, the provision of other public goods under district governments' purview demonstrates a consistent pattern: the state expands access to services that complement household investments.

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

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

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

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

commodities. The coefficients for remittances did not change meaningfully with the inclusion of trade variables, indicating that commodity trade is unlikely to be the main driver of the observed results.

**Literature.** I contribute to the literature on the impact of international migration and remittances. Research on these topics has continued to grow, reflecting increased interest among policymakers. While the existing literature has established the positive effect of remittances on household income and consumption using cross-country analysis, it has come to diverging conclusions on economic growth.<sup>2</sup> Yang (2008) and Khanna et al. (2022) take advantage of a natural experiment based on the 1997 exchange rate shock in the Philippines to provide compelling evidence on the short- and long-term effects of remittances on migrant households and origin areas. I use a similar strategy in Indonesia, a new setting, to show that remittances increase household consumption, reduce poverty, and stimulate growth.

My paper provides two distinct contributions to the existing studies. First, I estimate the effects of remittances on public goods. Researchers have used cross-country data to link remittances to various governance outcomes. Abdih et al. (2012) and Ahmed (2012, 2013) proposed theoretical models arguing for the existence of a remittance curse, where remittances increase corruption and reduce political turnover. Others, however, have argued that the remittance curse model does not hold for political competition and that remittances are more likely to increase government spending on education in democracies (Desierto, 2018; Easton and Montinola, 2017). These conflicting results may be due to the difficulty of disentangling the endogenous link between state failure as indicated by corruption, the outmovement of migrants,

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<sup>2</sup>The cross-country regression literature has shown evidence for opposing views of the effects of remittances on growth. Giuliano and Ruiz-Arranz (2009) and Catrinescu et al. (2009) show positive effects, while Chami et al. (2008) and Le (2009) demonstrate negative effects. The cross-country analyses concur more with regard to the effects of remittances on poverty (Adams and Page, 2005; Gupta et al., 2009). For reviews of recent empirical evidence, see Yang (2011); Alpaslan et al. (2021); Brown & Jimenez-Soto (2015).

and its subsequent remittance flow (Mosley and Singer, 2015). Variations in governance structure across countries may also further hinder analysis of how governments provide public goods. To overcome these obstacles, I study a setting where local governments provide public goods according to a common governance structure, thereby allowing me to study the state's response to the remittance windfall.

Second, I utilize rich data from Indonesia to investigate the mechanisms through which the state responds to remittances. My datasets enable me to investigate the role of taxation, policy commitments, decentralization, and election in shaping the state's response to remittances and the patterns of public goods provision. Asatryan et al. (2017) find that remittances increase the likelihood of introducing the VAT. Decentralization-led district splitting could also influence public goods provision (Lewis, 2017; Cassidy and Velayudhan, 2022). Banerjee and Somanathan (2007) highlight cases in India and elsewhere where top-down interventions financed by public budgets have been central to public goods expansion. Pierskalla and Sacks (2018, 2020) have documented that government spending and hiring in Indonesia are influenced by election cycles. Marx (2018) shows that elections incentivized African leaders to complete visible development projects. My findings, on the other hand, suggest that the state responds to remittances not through taxation or election but through policy commitments and increased accountability.

My work also contributes to the literature on human capital and migration. Recent studies have evaluated interventions designed to stimulate remittances for investment in education among Salvadoran and Philippine migrants (Ambler et al., 2015; De Arcangelis et al., 2015). These studies build on the literature that points to the positive effect of remittances on school enrollment (Edwards and Ureta, 2003; Yang, 2008; Amuedo-Dorantes and Pozo, 2010; Salas, 2014). Other studies have also linked migration opportunities to human capital investment (Dinkelman and Mari-

otti, 2016; Theoharides, 2018; Abarcar and Theoharides, 2021; Khanna and Morales, 2021). These studies focus on the response to education demand. Abarcar and Theoharides (2021) is a notable exception that also measures effects on the supply side and shows that expanding US visas for nurses led to the creation of new nursing programs at existing private tertiary institutions. Similarly, I measure changes in both the demand for and supply of education while focusing on the effects of remittances from low-skill migrants. My results contribute to the brain drain debate by providing evidence that low-skilled migration can induce brain gain.

## **1.2 The Indonesian Context: Migrants, Remittances, and Public Administration**

### **1.2.1 Migrant Remittances**

According to the Indonesian Central Bank, approximately four million Indonesians worked abroad between 2005-2012 (Bank Indonesia, 2018). The international migrants, known locally as TKI (*Tenaga Kerja Indonesia*), are mainly women with low education. Placement statistics from the agency for the placement and protection of Indonesian workers (BNP2TKI) indicate that about half of these women only completed primary education, and even fewer have completed secondary or post-secondary education (BNP2TKI, 2014).

Although the Indonesian government had intended to raise the educational requirement to work abroad (Law 39/2004 on Migrant Placement), the Constitutional Court deemed the requirement unconstitutional. The current ruling upholds that six years of education in primary schools is sufficient for Indonesians to seek work placement abroad. Correspondingly, most of Indonesian migrants work in low-skilled jobs as housekeepers (61 percent), plantation workers (10 percent), or fisherman (5 percent, BNP2TKI, 2014).

The main countries to which Indonesians migrate include the following: Saudi Arabia and other Gulf countries, Malaysia, Taiwan, and Singapore (Appendix Table A.2, see also Bank Indonesia (2018)). Village census data reveals that a village's ethnicity and religious composition strongly influence the destination country. Migrants from a village are more likely to go to Arab countries rather than Malaysia or Singapore as the share of ethnic Arabs in the village increases, while the likelihood of migration to Hong Kong and Taiwan increases as the share of ethnic Chinese in the village grows (Bazzi, 2012). With respect to religion, the greater number of Christians living in the village correlates negatively with the likelihood migrants from the village working in Arab countries. Another key factor that influences a migrant worker's destination is the interaction with recruiters/"sponsors" in the village. These recruiters connect prospective migrants with a placement agency, and they are frequently the prospective migrant's first point of contact in starting their migration journey (Bazzi et al., 2021).

With their low education backgrounds and foreign working environment, Indonesian workers are especially vulnerable to exploitation. The Indonesian government recognized this vulnerability and established an agency for the placement and protection of Indonesian workers (BNP2TKI, Law 39/2004). The agency's responsibilities included the creation of a TKI service post at debarkation points—commonly referred to as the "migrant terminal" in Indonesian airports—where they recorded returning migrants' details and provided other relevant services. The administrative record from this terminal is a key component in the empirical analysis (subsection 1.3.3).

Indonesian migrants typically work under a fixed-term contract of 2-3 years (Bazzi, 2012). Prior to their departure, the migrants sign a contract with an agency that is then responsible for their training and preparation (Bazzi et al., 2021). The contract stipulates the worker's salary in the destination country's currency (Bazzi et al.,

2021), and the salary remains fixed for the duration of the contract. Nevertheless, because the Indonesian rupiah (IDR) uses a floating rate, the migrant's salary in IDR fluctuates based on the exchange rate between the destination country's currency to IDR.

Indonesian migrant workers remitted more than USD 11 billion in 2018, making Indonesia the 7th largest remittance receiver in Asia and the 14th largest in the world (World Bank, 2019). A survey of migrants in four Asian countries documented that Indonesian workers send remittances multiple times a year: workers in Hong Kong on average remit monthly, while workers in Singapore send money on average every four months (ADB, 2006). Former female migrants surveyed in Bazzi et al. (2021) report remitting, on average, USD 183 to their families per month. A summary of survey-based remittance estimates in the literature is listed in Appendix Table A.3. Remittance recipients rank education expenses as one of the top three expenditures to which they allocate the funds that they receive (ADB, 2006). This suggests that remittances may influence education-seeking behavior at home.

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

Although the Indonesian government is aware of remittance flow into the country, the government does not tax remittances. Government officials have observed that the remittance flow into Indonesia exceeds the revenues from tax amnesty (Media Indonesia, 2017). At the same time, the state's capacity to enforce taxation is weak:

out of a population of 255 million, fewer than one million people pay their taxes (Bloomberg, 2016). Furthermore, Government officials have also spoken of remitting workers as “foreign currency heroes” (Media Indonesia, 2017).

### **1.2.2 Local Public Administration**

After the Soeharto regime fell in 1998, the Indonesian central government devolved its responsibility for frontline service provision to district-level governments. This policy environment underlies the selection of my outcomes of interest to analyze the state’s responses to remittances and focus on key services managed by local governments.

In Indonesia, education is a key service that local governments are responsible for providing. Public schools comprise 76 percent of all schools under the purview of the Ministry of Education, and 83 percent of students are enrolled in public schools (3). Students progress through three levels of education: primary (grades 1-6, for children ages 6-12 years), junior secondary (grades 7-9, for children ages 13-15 years), and senior secondary (grades 10-12, for children ages 16-18 years). The primary and junior secondary levels are compulsory. Although enrollment is nearly 100 percent at the primary level, this number drops to 67 percent at the junior secondary level and 42 percent at senior secondary level due to attrition. In this way, the junior secondary levels present the next bottleneck in ensuring education access for all.

Local governments must also provide other types of public goods, including piped water, electricity, and roads. Piped water is a public investment in clean water managed by district government-owned enterprises. Piped water stands in contrast to other safe drinking water sources such as bottled water, protected wells, or boreholes, which households access through private investments. Districts also provide electricity through a state-owned enterprise, and grid capacity commonly constrains households from accessing this service. Residents are required to pay a complementary private fee to connect to both electricity and piped water. The local government also manages

roads. High quality roads in Indonesia are paved with asphalt, but roads in some villages may be paved only with gravel or dirt. In some cases, improvements in village roads are often funded partly by informal taxes that the villagers pay in form of labor or goods (Olken and Singhal, 2011a).

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

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

To provide services, district governments follow a budget proposed by mayors and

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

The central government collects income taxes, property taxes, and tobacco excise and then returns a portion of the revenue to district governments based on the following predetermined formula: 12 percent of total collected income tax and 9 percent of total collected property tax. This revenue is reported as a Tax Revenue Share (DBH). The DAK grants are conditional, matching transfers provided by the central government on a discretionary basis. Districts need to match at least 10 percent of the funds provided by the central government. Funds are earmarked for the construction of education facilities and other types of infrastructure see (see Cassidy, 2022). Revenues from local taxes are classified as Own Source Revenue (PAD) and based on local taxes and fees imposed by the district governments (i.e., vehicle and hotel taxes).

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

## 1.3 Data and Methodology

### 1.3.1 Data

To analyze the effects of remittances, I combine district-level data that includes a collection of official statistics, household surveys, and administrative records. I also use several household-level panels as auxiliary datasets to perform out-of-sample analysis and investigate the channels by which remittances induce effects on the outcomes of interest.

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

I use administrative records of migrant departures and arrivals to obtain information on migration destinations. These records come from the “migrant terminal” at the Soekarno-Hatta International Airport. Located about 20 km from Indonesia’s capital, it is the primary point of departure for migrants leaving the country to work abroad. For returning migrants, officials at the migrant terminal record the migrant’s gender, date of departure, date of return, country of work, and origin district. From March 2008-2011, the terminal recorded 1,006,241 migrants from 366 districts returning from 116 countries. I use the departure and arrival dates to measure the monthly destination mix for each district and create a district-month-country level dataset.

I merge the aforementioned administrative records with exchange rates of various currencies to IDR using Refinitiv Datastream (2021). I also utilized supplementary sources described in the Appendix for currencies without direct information on ex-

change rate to IDR. Exchange rate observations are recorded monthly and expressed as relative changes to the exchange rates in June 2007, one year before the exchange rate upheaval of the Global Financial Crisis of 2008 (see Figure 1.1).

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

I measure school enrollment and asset ownership directly from the 2005-2012 National Socio-Economic Surveys (Susenas). Both measures capture household investment: durable assets can indicate improved living conditions, while school enrollment reflects migrants' oft-cited motivation to provide a better future for their families through education. The Susenas surveys are repeated cross-section household surveys with representative samples at the district level. The details of individual household members allow disaggregation of education statistics by gender and age. Susenas also provides household housing information, including the source of drinking water and various durable assets. Some questions are only available for a subset of years; for example, information on whether a household member is working overseas is only available until 2007, while asset questions are only available from 2010.

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

I describe these datasets in more detail in the Data Appendix.

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

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

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

### **1.3.2 Remittances and Exchange Rate Shocks**

The remittance flow between countries is estimated based on the share of migrants in a given country and the host country's characteristics (IMF, 2009; KNOMAD, 2017; Ratha and Shaw, 2007). These characteristics include changes in the host country's exchange rate, although the effects are ex-ante ambiguous. When the currency of

the migrant’s host country appreciates relative to the country of origin, transfers of a fixed amount in the host country’s currency will increase the size of remittances (Yang, 2008). If, however, migrants want their families to receive a fixed sum, then exchange rate fluctuations will have no effect on the remittances received.

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

$$XRshock_{it} = \frac{\text{FX rate to IDR}_{ict}}{\text{FX rate to IDR}_{ic}^o} \quad (1.1)$$

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

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

$$Remittances_{it} = \alpha + \beta XRshock_{it} + \gamma X_{it} + \theta_i + \phi_t + \varepsilon_{it}. \quad (1.2)$$

where  $Remittances_{it}$  is the amount received by migrant  $i$ ’s household of origin at time  $t$ . The coefficient of interest is  $\beta$ , which expresses changes in remittances due to fluctuations in the relative exchange rate to IDR,  $XRShock$ . Both  $Remittances$  and  $XRShock$  are standardized to have a mean of zero and a standard deviation of one. The migrant fixed effect term,  $\theta_i$ , adjusts for time-invariant characteristics of

the household of origin and the household member who migrates. Effects from the migrant’s unobserved invariant characteristics are also absorbed by the migrant fixed effects. The survey wave fixed effect term  $\phi_t$  controls for time effects common to all respondents in each survey wave. The  $X_{it}$  vector adjusts for other time-varying characteristics. Standard errors are clustered at the household level.

I argue that the exchange rate shock that each migrant experiences is plausibly exogenous conditional on the included control variables. Migrants take the exchange rate as given: they transfer remittances in small amounts relative to the economy and thus are unlikely to alter the exchange rate, ruling out reverse causality. Furthermore, migrant families cannot anticipate changes in the exchange rate.<sup>3</sup>

I also include the following control variables that could drive variations in remittances: migrant’s duration abroad and amount of time to the next religious holiday (Eid al-Fitr). Duration abroad proxies for the migrant’s experience, which may help the individual find a better currency conversion and transfer service with a cheaper fee or a better exchange rate. Migrants may also be more likely to send money to family on the occasion of a religious holiday. For Muslims, who comprise the majority of the Indonesian population, Eid al-Fitr is the biggest annual religious holiday. Overseas migrants facing costly travels are less likely to return home, especially if they work in non-Muslim countries. In such cases, migrants might send more remittances to their families for a religious holiday in order to help defray the cost of the festivities.

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<sup>3</sup>Two descriptive statistics lend support to this argument. First, 60% of remitters in the Doi et al. (2014) survey stated at baseline that they have either never heard of the term “exchange rate” or they do not understand the meaning of the term. Second, a survey of 5,564 former migrants from Bazzi et al. (2021) shows that only 2% of respondents have their contracts state their salaries in IDR. For the majority, on the other hand, their salaries are denominated in dollars, dinars, or riyals in their contracts. Consequently, if they were to send a fixed portion of their salaries, then their remittances would be subject to currency rate fluctuations. In a different setting—namely, a survey of Tongan migrants in New Zealand—39% of respondents send a constant amount of NZD each month (Gibson et al., 2006). In contrast, only 14% of remitters attempted to send a constant amount of Tongan pa’anga each month. The majority of respondents (48%) sent remittances only for special occasions (Gibson et al., 2006).

I reanalyze the Doi et al. (2014) data and focus on a subsample of migrant households of origin that receive remittances. This definition leaves 418 observations in my sample, which includes 183 households with migrants working in Taiwan, Hong Kong, Malaysia, or Singapore (see Appendix for details). The Doi et al. follow-up surveys were administered in three waves between 2011-2012. In each follow-up, households were asked the IDR amount of remittances that they received from their migrant family member. They reported having received an average of IDR 9.5 million (USD 1,119) total remittances since their family member migrated. With an average transfer frequency of 4.5, this corresponds to an average of  $\sim$ USD250 per transfer.<sup>4</sup>

Because the survey phrased the remittance question as the total remittances received since the migrant’s departure, I use total remittances in the first follow-up and the difference from the previous response in subsequent follow-ups as the measure of remittances for each period. I transform this measure with natural logarithm and standardize it in the regression of equation (1.2). Migrants in the panel comprise the evaluation sample of a financial literacy RCT where treatment was randomized at the household level so that the intervention’s effects are absorbed by the migrant fixed effect.<sup>5</sup> I use the monthly average exchange rate for the follow-up survey month as the observed exchange rate. I fix the reference period to March 2011, the month of the first follow-up survey after the respondents began working abroad. The time to the next Eid al-Fitr is calculated based on the 2011 and 2012 dates.

Workers in Hong Kong observed an average exchange rate of IDR 1,123 per Hong Kong dollar (HKD) in March 2011, and by January 2012, the rate had appreciated

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<sup>4</sup>Gibson and McKenzie (2017) surveyed pairs of Tongan immigrants to New Zealand and their households of origin in Tonga, and they found that the survey responses produce reliable estimates (i.e., remitters and receivers consistently reported sending and receiving the same transactions, respectively).

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

by 3.8 percent (Figure A-1; Refinitiv (n.d.)). At the same time, the exchange rate to Taiwan Dollar (TWD) appreciated by only 1.6 percent (IDR 296.7/TWD to IDR 301.7/TWD). In these two examples, the raw measure of exchange rate shock for HKD and TWD are 1.038 and 1.016, respectively. Overall, the average raw exchange rate shock for migrants in my sample is 0.995 in the second follow-up and 1.029 in the last follow-up. Table 1.1 (Panel A) presents the summary statistics of the main outcome and the regressor variables for my estimation sample.

**Results.** Migrant households of origin receive more remittances when the currency of the migrant’s host country appreciates against the IDR. Table 1.2 presents the estimation results of equation (2), with the progressive addition of control variables from Columns 1-4. OLS correlation of remittances and exchange rate shocks 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 a 0.38 standard deviation of remittances (Column 2). The magnitude is in line with the responses reported by Philippines migrants’ households of origin to the 1998 exchange rate shocks (0.6, see Yang (2008)). This relationship is robust to two additional variables that may influence the amount of money remitted: duration abroad and amount of time to the next religious holiday (Columns 3-4).

These findings present one of the first systematic investigations to link remittance responses to exchange rate fluctuations using household panel data. Prior research has used cross-section and aggregate data to argue that the resilience of remittances during the 2008 Financial Crisis is due to the depreciation of South Asian currencies against Gulf countries’ currencies (Sirkeci et al., 2012). Remittances to Nepal rose by 28% in Quarter 1 of 2009 (Riester, 2012; Mohapatra et al., 2012), and 94% of migrant households in South Asia reported regularly receiving remittances during that period (Rajan and Narayana, 2012). Researchers have argued that migrants are

willing to absorb negative shocks in order to continue sending remittances; to this end, unskilled migrants in the Gulf reported sharing accommodations and reducing their food consumption to save money to send home (Sirkeci et al., 2012).<sup>6</sup> In estimating remittances from pre-World War I migration out of Europe, Esteves and Khoudour-Castéras (2009) write that “migrants often waited for the most favorable exchange rates before sending money [to Europe].” The panel structure of the data that I use provides a way to mitigate self-selection bias among migrants and remitters in cross-sectional data (Funkhouser, 2012). Furthermore, the Doi et al. (2014) survey explicitly collected information on remittances to migrant households, which is rarely captured in general purpose household surveys conducted in developing countries.<sup>7</sup>

It is unlikely that my results are due to Indonesian migrants responding to exchange rate changes by changing jobs or industries because every instance of migration is based on a fixed-term contract that a migrant signs prior to departure, making it difficult (if not impossible) for migrants to change employment while abroad. For my analysis sample, the positive relationship could be driven by an increased frequency of sending remittances. Appendix Table A.4 suggests remittance transactions increased with positive exchange rate shocks. If remittance transactions are costless/free, then the total remittances received at home will increase mechanically with the full amount of the additional transfer. However, migrant households of origin do not receive the full amount because each transaction is subject to bank and MTO fees.

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<sup>6</sup>Using analysis of single country time series or cross-country regressions, researchers have also argued that currency depreciation causes increases in remittances. 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, 2011), 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.

<sup>7</sup>Only 47 of 10,992 households in the Indonesia Family Life Survey (IFLS) panel reported receiving international remittances (Cuecuecha and Adams Jr., 2016). It is important to note, however, that the IFLS was not designed as a remittance survey.

### 1.3.3 Constructing A Proxy Measure for District-Level Remittances and Regression Specification

Analyzing the effects of remittances on the area of origin necessitates sub-national remittance data, which is scarcely available.<sup>8</sup> In the absence of direct observations, I construct a proxy for remittance flow.

To construct the district-level proxy, I follow an approach analogous to the construction of bilateral remittance flow estimates (KNOMAD, 2017; Ratha and Shaw, 2007)—namely, I use exchange rate shocks and variations in migration intensity as the determinants of the proxy. The exchange rate shock for each district is defined as follows:

$$XRshock_{dt} = \frac{1}{mig_{dt}} \sum_c mig_{dct} \frac{\text{FX rate to IDR}_{ct}}{\text{FX rate to IDR}_c^o} \quad (1.3)$$

where  $d$  indexes districts,  $c$  indexes destination countries, and  $t$  indexes years. The  $mig_{dct}$  is thus the number of migrants from a district  $d$  who are abroad in country  $c$  in year  $t$ . The latter denotes the relative appreciation or depreciation of the host country’s currency relative to a reference period  $o$ . This shock variable essentially averages the foreign exchange rate shocks its migrants face due to their locations, using the share of its migrants in each destination as the weight. In this way, the  $XRshock_{dt}$  variable represents the variation in remittance flow a district will receive due to currency rate fluctuation from its destination mix in a given year.

I complement the above calculations with a measure of the district’s migration intensity at baseline, which I define as the natural log of the proportion of its migrant

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<sup>8</sup>The International Monetary Fund’s International Transaction in Remittances: Guide for Compilers and Users notes that, “options for direct measurement of remittance transactions are very limited (IMF (2009), p.46).” The Indonesian Central Bank publishes national remittance estimates aggregated from reports by commercial banks and MTOs to the central bank. Staff from one of Indonesia’s largest banks with knowledge of the bank’s remittance desk operations described these reports as proprietary and confidential.

workers per a population of one million inhabitants.

$$MigShare_d^0 = \log\left(\frac{migrant_d}{pop_d}\right). \quad (1.4)$$

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

$$Y_{dt} = \alpha + \beta MigShare_d^0 \times XRshock_{dt-1} + \gamma XRshock_{dt-1} + \theta_t + \theta_d + \varepsilon_{dt} \quad (1.5)$$

where  $Y_{dt}$  is the outcome of interest. In this case, we are interested in the  $\beta$  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, since the shock precedes any changes in the outcome of interest. The regression equation also includes the time-varying  $XRshock_{dt-1}$  as a control, which is also lagged by one year. The baseline district migration intensity is absorbed by the district fixed effect  $\theta_d$ , which captures the variation in outcomes due to the district's time-invariant characteristics.  $\theta_t$  is the year fixed effects that capture common time effects shared across all districts. The term  $\varepsilon_{dt}$  is a mean-zero error term. Standard errors in this estimation are clustered at the district level.

The  $\beta$  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  $\beta$  relies on the identification assumption that unobserved determinants of outcomes in the district must be unrelated to the interaction term conditional on control variables and fixed effects. 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 destination countries, and the fluctuations of its currency exchange rates simultaneously.

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

There are considerable spatial and temporal variations in the resulting remittance proxy measure. I plot the residual variation in the remittance proxy measure after adjusting for the exchange rate fluctuation, district fixed effects, and year fixed effects and superimpose them on the district boundaries in Figures 1·2-1·3. The colors of the districts on the map indicate the magnitude of the residual variation, where the blue color denotes exposure to a smaller remittance shock while the red color denotes exposure to a higher remittance shock. Prior to the Global Financial Crisis of 2008, districts with positive shocks are scattered across all main island groups, mainly in Riau in Sumatera, some urban districts in Java, and districts in Kalimantan and

Northern/Central Sulawesi (Figure 1.2). After the rapid currency valuation change in 2010, considerable variation in the districts that received greater shocks occurred (Figure 1.3). While many districts in Java ended the year with a positive shock, some benefited 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 and, therefore, some districts remained blue.

It is unlikely that these variations capture only an unobserved trend in the outcomes of interest, since future remittances are not correlated with past district outcomes. In Table 1.3, I report the coefficients resulting from regressing equation (1.5). In this instance, however, I shift the right hand side variable forward by three periods to capture future remittances. If the remittance variable is merely a proxy for an unobserved trend, then a statistically significant correlation between this “future” remittance and past outcomes should result. I run this regression on my main outcomes—a set of outcomes on enrollment and public goods—and, reassuringly, find that the magnitude of the coefficients is small and statistically indistinguishable from zero.

What is the size of the aggregate windfall? Summary statistics from the migrant panel survey suggest that districts with the normalized remittance proxy of one receive  $\sim$ USD 45,000 more remittances per 100,000 people compared to districts at the mean of remittance proxy distribution. Given the average population size of 588,456 for districts in my sample, a back-of-the-envelope calculation suggests a windfall of USD 260,000 to the district for every one standard deviation of the remittance proxy shock. This figure is roughly half of the average district budget for social protection in 2008, underscoring the significance of this financial flow to the region.<sup>9</sup>

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

## 1.4 The Development Impacts of Remittances

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

### 1.4.1 Remittances Increase Consumption

Remittances allow migrants to support their families directly. In turn, the additional funds enable families to increase their consumption. I test this relationship by estimating equation (1.5) on consumption outcomes. I look at key consumption indicators: the monthly expenditure per capita for the average household and the household in the bottom quintile as well as per capita expenditures on education. All variables are in log IDR unit. Data for these indicators come from Dapoer, which aggregates household responses in Susenas to create district averages. Table 1.4, Panel A presents the results.

I find that remittances increase household consumption, especially for those at the bottom of the expenditure distribution. They also increase investment in education. For households in the lowest quintile, a one standard deviation (SD) of remittance proxy shock increases the average household expenditure per capita by 0.10 log points (Column 2). This coefficient is more than twice the coefficient for the average household, which lacks the precision to be statistically significantly different from zero (Column 1). The shock also increases the monthly per capita expenditure for education by 0.28 log points. These increases are unlikely to be a mechanical response to rising prices. In Column 4, I regress the core price index from 47 districts, which is benchmarked to the 2007 price. I cannot reject the null hypothesis that remittances have no effect on price. Although the estimate is positive, it is smaller

than the 7 percent average annual inflation rate for the 2005-2012 period, and I can rule out effects larger than 6 percent ( $3.19 \times 1.96$ ). The increases that I observe in household consumption are thus unlikely to be an artifact of mechanical responses to rising prices. I defer the discussion on the robustness of the results in this section and the next to section 1.6.

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

#### **1.4.2 Remittances Increase Asset Ownership and Reduce Poverty**

Remittances may finance purchases of durable assets, which is often the preferred mode of investment among households in developing countries. I use an asset index to summarize household asset ownership in the 2010-2012 Susenas surveys.<sup>10</sup>

I find remittances increase the asset ownership index by 0.03 (Panel B, Column 1). This value represents 16 percent of the dependent variable mean. The assets included are motorcycles, cars, bicycles, refrigerators, natural gas canisters, water

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

heaters, air conditioners, cable TVs, and boats. Appendix Table A.7 presents a detailed breakdown by each asset. I estimate precise effects in vehicle ownership, with 4-7 p.p. increases for motorcycles, cars, and bicycles. Motorcycles are the most common vehicles in my sample; three-fifths of households own a motorcycle. Cars, on the other hand, are the least common asset, with a rate of less than one-fifth ownership. Households also appear to acquire refrigerators and natural gas canisters in response to the remittance proxy shock. Specifically, 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, which reflects an increase in the average ownership rate of 17 percent and 12 percent, respectively. These results are consistent with the reported use of remittances from the migrant panel data. Appendix Table A.8 reports the coefficients from the regression of equation (1.2) with reported remittance use as the outcomes of interest. Households of origin in the migrant panel data use the increased remittances to purchase electronics and durables.

A series of studies from other settings report increased investment in electronics and durables after households receive remittances or other transfers. For example, benefiting from the 1998 exchange rate shocks, Philippine migrant households responded by purchasing vehicles and radios (Yang, 2008). In a different context, Mexican households receiving cash from the Oportunidades program invested 25 percent of the transfer in productive assets (Gertler et al., 2012). Early descriptive work on Indonesian migrants from Java and East Nusa Tenggara described similar responses to increased income, reporting that migrant families used remittances to buy refrigerators, televisions, radios, motorcycles, and houses (Sukamdi et al., 2004).

More broadly, asset ownership can indicate an escape from poverty. Developing country governments frequently determine poverty status using asset-based proxy-means tests in the absence of complete household income data (Banerjee et al., 2020).

Using three different measures—share of district population living below the poverty line, the poverty gap, and Gini coefficient, I examine the effect of remittances on poverty and inequality. The poverty gap is a measure of poverty intensity, while the Gini coefficient serves as a measure of inequality.

Remittances reduce poverty. With households in the bottom quintile showing the strongest gain in household expenditures due to remittances, the added income translates into a reduction in district poverty rate. A one SD remittance proxy shock reduces poverty by nearly 4 p.p., roughly a quarter of the mean poverty rate of 15 percent. It also reduces the poverty gap by 1.3 p.p., nearly halving the mean distance of 2.7 percent between the poor’s income with the poverty line. These results underscore the power remittances have to alleviate poverty. My findings echo results from the Philippines, where remittance shocks due to 1998 exchange rate depreciation reduced the incidence of household poverty by two thirds of the pre-crisis mean and offset the mean increase in poverty gap in the aftermath of the crisis (Yang and Martínez, 2005). In addition to poor households primarily benefitting from remittances, I also observed a reduction in Gini coefficient by 0.03, one-tenth of the mean dependent variable in the sample.

### **1.4.3 Remittances Lead to Economic Growth**

In aggregate, the infusion of resources due to remittances can stimulate growth. To measure growth, I use the district-level gross domestic product (GDP) from Indo-Dapoer, which is calculated and published in official reports issued by an independent statistical agency. Indonesia is one of the few developing countries in the world with reliable regional GDP estimates, and it has been used to benchmark night light satellite data with economic growth measures (Gibson et al., 2021). GDP data is expressed in constant price, benchmarked to the year 2000. I first divide the district GDP figure by population to obtain the GDP per capita value in IDR, and then

transform it with a natural logarithm. I group the GDP figure into three major sectors: agriculture, service, and manufacturing. Table 1.4, Panel C reports the results.

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

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

## 1.5 Remittances and Education Investments

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

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<sup>11</sup>See Appendix Table A.23 for estimated effects on employment outcomes: remittances do not appear to change the sectoral composition of employment although it reduces the size of the total labor force.

remittances.

### 1.5.1 Remittances Increase Enrollment

I investigate the effect of remittances on enrollment in Table 1.5. Net enrollment ratio expresses the total school-age students enrolled in schools as a percentage of the population of the same age group. Using age and enrollment information from Susenas, I estimate the effects for all children, and separately by gender.

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

The effects of remittances on school enrollment differ by gender for different education levels. Panel B and C of Table 1.5 present the effects of remittances on enrollments for boys and girls, respectively. At the primary level, girls demonstrate a 3.8 p.p. higher enrollment rate in response to a one SD shock, which is 50 percent higher than the estimate for boys at 2.5 p.p. However, the gains in secondary school enrollments mainly reflect the gains in enrollments for boys in junior secondary (6.3 p.p.) and senior secondary (12 p.p.). In contrast, the enrollment gain for girls is merely one-fourth to one-third of the effect sizes for boys. These gendered responses hint at the possibility that some girls forego secondary education to work as migrants. The windfall may send the message that only primary education is important, since

women with only primary school education sent the remittances.

### Enrollments at School-Entry Age

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

$$\begin{aligned}
 Y_{iaudt} = & \alpha + \phi CohortTreat_a \times Mig_u \times XRshock_{dt-1} + \beta Mig_u \times XRshock_{dt-1} + \lambda CohortTreat_a \\
 & + \delta CohortTreat_a \times Mig_u + \xi CohortTreat_a \times XRshock_{dt-1} + \eta Mig_u + \gamma XRshock_{dt-1} \\
 & + \theta_d + \theta_t + \varepsilon_{iaudt}.
 \end{aligned} \tag{1.6}$$

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

Table 1.6 reports the estimation results, supporting the fact that the effects on enrollment are driven by individuals in the relevant school age brackets. Panel A uses a district-level migration intensity variable. The coefficients could be interpreted as the differential effect of remittances on enrollment by the relevant age cohort relative to the untreated cohort, i.e., cohorts that are too young or too old for each level. Overall, a one SD remittance shock raises enrollment at any level by 4.1 p.p. among

the school-age population (Column 1). The enrollment effects are most pronounced for primary school cohorts and senior secondary cohorts (7 p.p.). The estimated effect for junior secondary cohorts is also positive but smaller (3 p.p.).

Panel B of Table 1.6 focuses on the relative response of school-age cohorts between migrant and non-migrant households in the presence of the exchange rate shock. The sample for estimating this interaction is smaller because the indicator is only available for individuals surveyed between 2005-2007. Coefficient on the interaction of treated (school-age) cohorts, migrant households, and exchange rate shock are positive and statistically significantly different from zero for primary and junior high school enrollment. For further contrast, in a placebo regression where I estimate the effects of remittances on school enrollment for the 19-24 year old population, who are older than the normal primary and secondary school students, I do not observe any effect of remittances on this population (Appendix Table A.5).

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

$$Y_{iadt} = \alpha + \sum_{a=4}^{20} \phi_a Cohort_a \times Mig_d^o XRshock_{dt-1} + \beta Mig \times XRshock_{dt-1} + \sum_{a=4}^{20} \lambda_a Cohort_a + \sum_{a=4}^{20} \delta_a Cohort_a Mig_d^o + \sum_{a=4}^{20} \xi_a Cohort_a XRshock_{dt-1} + \gamma XRshock_{dt-1} + \theta_d + \theta_t + \varepsilon_{adt}. \quad (1.7)$$

Figure 1.4 plots the coefficients  $\phi_a$  of the triple interaction term. The patterns of interaction are pronounced at ages 6, 13, and 16. These are the entry ages for primary, junior secondary, and senior secondary levels. When a child is about to enter a new school level, the realization of positive remittance shocks that occurred in the preceding year is particularly timely to encourage enrollment. In contrast, for children ages 8-11 and 14-15 years, the effect is not significantly different than zero. At these ages children are simply continuing along in their primary and secondary levels. These effects are consistent with Alatas (2011), who does not find an effect on school enrollment from a cash transfer program because its disbursement to benefi-

ciaries did not occur until the school year had already begun. In her study, Son (2015) presents a complementary picture where negative income shocks are less likely to induce dropouts when children are enrolled in their last year of school due to the sheepskin effects. With regard to remittances, the positive shocks likely allow households to afford to pay for things such as uniforms when children begin new school levels.

### 1.5.2 Public goods

Table 1.7 presents the estimation results of equation (1.5), which investigates 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 SD shock leads to 0.87 more public primary 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 significant. The coefficients for primary and junior secondary school density amount to 13 percent of the mean density of elementary schools across districts (6.39 schools per 10,000 population) and 23 percent 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.

According to Table 1.7, Panel B the increase in asphalt roads, electricity, and piped water access indicates that remittances improve the provision of public goods overall. For electricity and piped water, a one SD of remittance shocks increases the share of households with access by 5 and 9 p.p., respectively. This effect size for piped water is more than 50 percent of the mean share of household access to piped water (16 percent), representing a meaningful expansion of this service. The share of villages with asphalt roads in the district rises by 25 p.p., from a mean share of 70 percent. Such improvements in road quality have the potential to reduce transportation costs

for tens of thousands of villagers. Appendix Table A.20 presents evidence of an informal tax issued to build roads and other village infrastructures from the SPKP survey data. Households in remittance-positive villages are more likely to give money or in-kind contributions to village building projects and in higher amounts (compare with findings from Olken and Singhal (2011b)).

## **1.6 Alternative Explanations: Commodities and Trends**

Could the findings above not, in fact, be caused by remittances? I consider several alternative explanations for such results, including: commodity trade, differential trends depending on baseline outcome, and differential regional trends.

### **1.6.1 Commodity Trade in Oil, Natural Gas, and Palm Oil**

It is possible that the exchange rate shock mechanism actually works through a trade channel on various commodities. When the trading partners' currency appreciates, Indonesian commodities become cheaper and more attractive in the international market, leading to a trade surplus that enables districts to finance and provide public goods. If the exchange rate shocks are ordered in a similar distribution among migration destination and trading partners, then this undermines my interpretation that the effects can be attributed to remittances. However, the foreign trade statistics on export data reports on all ports of entry (Appendix Table A.9) show that only a few countries can be considered the top migration and export destinations. Top Indonesian trading partners such as the USA, China, and the EU are not the countries where many Indonesian migrants work. Regressions of the export value and the number of migrants recorded in the migrant terminal data at the country level also do not show a statistically significant correlation between the two variables (Appendix Table A.10).

To further corroborate the incompatibility of the trade channel with the estimated

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

Similarly, palm oil is Indonesia's most valuable agricultural export commodity, with USD 7.9 billion worth of export in 2007. I obtain the the list of countries to which crude palm oil and crude olein were exported and construct variable  $XRshockPalm_t$ . I use the area of land dedicated to oil palm plantations from the 2003 agricultural census/village census to obtain a measure of palm oil intensity at the district level and then interact the two variables to obtain the trade shock exposure variable to palm oil.<sup>12</sup> I then include these trade shock variables in regression equation 1.5.

Table 1.8 reports the results with the inclusion of commodity trade controls. In Panel A, I examine the coefficients of the remittance proxy on regression with development indicators as the outcome variables. Panel A1 reproduces the main estimates, and Panel A2 presents the coefficients including the two commodities as control. The magnitudes of the effects on the expenditures for households in the bottom quintile, asset index, and poverty rate did not vary more than 5 percent of the original estimates. Although as the effect for total GDP per capita is revised downward it loses

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<sup>12</sup>Appendix Table A.11 shows that the intensity of migration at the district level and the intensity of oil and gas production as well as palm oil land area are not significantly correlated.

statistical significance, the estimates in general change little. In Panel B, I examine the coefficients of the remittance proxy for education outcomes. Panel B2 presents the coefficients from regressions that include the two commodities as control. In comparison to the main estimates in Panel B1, the patterns are the same and the inclusion of controls raises the magnitudes of the coefficients by 6-18 percent of the main estimates. The most pronounced increase is in the effect of junior secondary school enrollment from 4.4 p.p. to 5.2 p.p. in response to a one SD remittance shocks. By and large, the coefficients on the oil and gas trade shock and the palm oil trade shock themselves are an order of magnitude smaller than the remittance coefficients (not shown).

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

### **1.6.2 Baseline and Regional Trends**

Another alternative account for the presented results concerns differential trends. If areas observed with high remittances have the inherent propensity to exhibit different

development paths due to their characteristics, it would challenge the attribution of the effects to remittances. Two sources of trends are relevant: regional trends and differential trends based on their baseline outcomes. I test for the robustness of the effects of remittances with the inclusion of variables that flexibly controls for these trends.

Table A.13 reports the results with the inclusion of regional trends. The regressions reported in this table add island-year interaction terms that flexibly accounts for potential differential trajectories in outcome variables between districts in different islands. Panels A1 and B1 reproduce the main estimates, while Panels A2 and B2 present the results with regional trends for various development indicators and education outcomes, respectively. The remittance proxy coefficient are stable across the two specifications both for development indicators and education outcomes. All development indicators but the total GDP per capita income maintain their precisions and magnitudes (Panel A2). In Panel B2, estimates on education outcomes largely maintain their statistical precision and magnitudes. For the density of senior secondary school, the estimated coefficient is nearly 50 percent larger, which improves the precision of the effect.

Table A.14 reports the results with the inclusion of baseline trends. To account for potential differential responses to remittances in districts that depend on their pre-period outcome, I use two different sets of baseline trends. In Table A.14, Panel A, I include the 2004 agriculture GDP per capita interacted with year dummies as the baseline level-specific trend. Inclusion of the agriculture sector GDP per capita reflects the fact that agriculture is the largest sector of employment in the country and that migrant households also predominantly come from agricultural households (Bazzi, 2017; Makovec et al., 2018). A comparison between Table A.14, Panel A2 and the main estimates in Panel A1 show that the latter are robust to the addition

of trends specific to the level of agricultural GDP per capita prior to the shocks. In Panel B, I include the school densities in 2004 separately by level (elementary, junior secondary, and senior secondary) interacted with year dummies. Inclusion of these variables adjusts for potential differential trends that could be due to the fact that the government simply decided to build more schools where there had been fewer schools to serve the school-age populations. Panel B2 shows that all estimates increased in magnitude with the inclusion of these variables, and the statistical precision is maintained in comparison to the main estimates. The estimates for enrollment rate and basic education facility density rise by 18-36 percent from the main specification (Column 1-5).

### 1.6.3 Other Robustness Checks

I conduct several other robustness checks—namely, I use alternative counts to construct migration intensity as well as an alternative data source to construct the exchange rate shock measure. In addition, I include lagged outcome variables.

Since I use the migrant count from the 2005 village survey as the measure of district migration intensity, one concern that arises is that the number of migrants may have changed substantially by the end of my sample period. In Appendix Table A.15, I present estimates from an alternate construction that addresses this concern using data from the three waves of village survey (2005, 2008, 2011). I limit my use of the 2005 migrant count to the years 2006-2008, and I refer to the 2008 and 2011 survey to update the count for 2009-2011 and 2012, respectively. The results remain consistent, reflecting the strong correlation between migrant counts within a district during the three periods.

Another possible concern are inaccuracies in destinations recorded in the migrant terminal dataset. Officials collect this data when migrants return to Indonesia. These measurement errors can potentially bias the results. Therefore, I address this using

village-level plurality destination recorded in the 2005 village survey, since this is the only year in which the survey collected migrant destination information. The responses are limited to only the top 11 migration destinations and include only one country per village, i.e., the country to which the most migrants from the village left. Using the same exchange rate data, I measure the shock and aggregate it to the district level. Appendix Table A.16 presents the estimation results. The main estimates are robust to a different information sources of migration destinations.

The inclusion of the lagged outcome variable as a regressor addresses the concern that future outcomes are predicted by past outcomes. If past outcomes are correlated with the remittance proxy when it is omitted from the right hand side of equation (1.5), this will bias the coefficient upward. In Appendix Table A.17, I show that the results are also robust to the inclusion of lagged outcomes as a control variable.

Lastly, I test for the possibility that the errors are simultaneously correlated within region and within time (Cameron et al., 2010). I first note that the inclusion of year dummies mitigate this concern to some degree, as the fixed effects inclusion in practice reduces within-cluster correlations (Colin Cameron et al., 2011). Appendix Table A.18 shows the estimation results. The statistical precision of the results is preserved most strongly for public school density and the poverty rate.

## 1.7 Mechanisms

What drives the government to provide public goods in the presence of positive remittance shock? This question is particularly essential because remittances are private transfers of money between individuals. In this way, local governments do not have access to them. Furthermore, constructing public facilities typically requires significant investment, and governments in developing countries are often resource-strapped.

I investigate several pathways through which migrant remittances may influence

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

### 1.7.1 Pre-existing policy priorities

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

To test this mechanism, I use district finance data from the Ministry of Finance to proxy a district's commitment to education by the share of the district's expenditure on education out of its total expenditure. I estimate a regression of education facilities at time  $t$  on the interaction of 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 elucidate the relationship between remittances and a district's policy priorities.

The results in Table 1.9, Panel A suggest that remittances strengthen the provision of education facilities in districts with a stronger fiscal commitment to education. The interaction term between remittance proxy and share of education expenditure has positive and significant coefficients in estimations with elementary and junior secondary schools as the outcome. This finding suggests that the marginal impact of

remittance shocks on basic education facilities increases with the district government's level of fiscal commitment to education.

**Village Head Survey.** How does government policy adaptation operate in practice? At the lowest level, village governments have the best vantage point because they frequently interact with both villagers and the service providers (teachers and school principals). In the SPKP survey, village heads in five provinces were asked to list the main challenges they face in education service provision. Frequent answers included inadequate facilities or families not being able to afford education for their children. I use the survey responses and create indicators of whether the village heads mention facilities and/or cost concern, and whether they rank facilities concern higher than cost concern. I regress these indicators on modified equation (1.5), specifying the remittance proxy variable at the village level instead of at the district level. Panel B, Table 1.9 reports the results.

Village heads are less likely to mention education cost concern in villages with remittance-positive shocks (Column 2), which is consistent with the positive effects on household welfare that I documented earlier. The coefficient for facility concern is positive but, statistically, is not significantly different than zero (Column 1). When comparing facility concern and cost concern directly, inadequate education infrastructure was ranked higher than unaffordability of school education within the top three challenges village heads face in education provision (Column 3). These rankings likely would have inclined officials to be more supportive of policies aimed at increasing and improving education facilities in their villages.

**Constructing junior high school facilities.** One policy to increase education facilities is to build junior high schools through a more intense use of existing resources. In the 1970s and 1980s, the Indonesian government built numerous public primary schools across the country through the INPRES program (Duflo, 2001). This

celebrated program provided an initial stock of land that the government in the 2000s could use to expand junior secondary education.

I look into a program that allows local governments to build junior high schools more cheaply by using existing primary schools, building smaller schools, and providing fewer amenities. Within the scope of this “One Roof” program, district governments can build junior high schools as attachments to existing primary schools. The expansion of the existing elementary school enables current students to seamlessly continue into the subsequent three grades of junior high school. In this program, local governments are still responsible for hiring teachers for the newly created schools; although, in practice, existing primary school teachers or educated locals may be asked to teach the junior high students (Departemen Pendidikan Nasional, 2008). Similarly, the new junior high school may also borrow already existing primary school classrooms while construction of the junior high facilities takes place. Because the junior high schools are attached to primary schools, the primary school principals are responsible for the joint management of both schools. This policy allows rapid establishment of schools because the district governments do not need to acquire additional land.

I use detailed school-level characteristics from the Ministry of Education’s administrative data to examine this margin of response. I look into the following outcome variables: an indicator of whether a junior high school is attached to an primary school, the average number of classrooms per junior high school in the district, and the average number of teachers per junior high school. When new schools are constructed with fewer amenities, which typically occurs under this program, the average number of teachers within the district falls. Table 1.9, Panel C reports the results of estimating equation (1.5) for these variables.

I find district governments economize on new school constructions so that they

can respond rapidly to the remittance shocks. In Table 1.9, Panel C, Column 1, a one SD shock in the remittance proxy variable results in 3 p.p. increase in the share of junior high schools that are attached to primary schools in the district. These newly created junior high schools also have fewer classrooms than “normal” junior high schools (Column 2), and fewer teachers (Column 3). Overall, these results point to the trade-off district governments make in order to respond to the remittance shock; they establish schools with less-than-perfect facilities in order to ensure that more children have access to secondary education.

### 1.7.2 Taxation

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

Suppose the government is able to capture part of the economic growth in their districts through taxation. In this case, the remittance shock on the regression of tax revenues from centrally or locally collected taxes should result in positive coefficients when using equation (1.5). Remittances should alter neither the general DAU budget that comes from unconditional intergovernmental transfers nor the share from natural resources revenues. With respect to the DAK budget, the effects are ex-ante ambiguous. Table 1.10 reports the results.

I do not find supporting evidence that the governments collected higher tax revenues collected after the positive remittance shock. The coefficients for tax revenues and other revenue streams are imprecisely estimated in log IDR (Table 1.10, Panel

A). The 90 percent confidence intervals from the estimations in Columns 1-2 suggests I can rule out effects where remittance shock leads to tax revenue increases that are higher than 1 percent. Furthermore, when I look at the revenue streams as a share of the total budget, the negative effect on revenue sharing from centrally collected taxes becomes statistically significant at the 5 percent level (Table 1.10, Panel B, Column 1).

### 1.7.3 Decentralization and District Splits

In the presence of a positive remittance shock, decentralized governance could facilitate better provisions of public goods. I use a binary variable of district splitting to indicate regions where the governance accountability changed due to decentralization. This district split indicator takes a value of 1 for parent districts and their children in the year the split occurred/the children districts are created and thereafter. On the other hand, the indicator takes a value of 0 for the following two scenarios: (i) districts that never split and (ii) districts that have not yet split. I regress the public school density on the remittance proxy interacted with the district split indicator.

Table 1.11, Panel A reports the estimation results: some of the effects of remittances on public goods are driven by the creation of public schools in districts that had split as the result of the decentralization of governance. In a regression where public primary schools per 10,000 population is the outcome, the interacted term has a coefficient roughly half the size of the remittance proxy coefficient in the main specification (Column 1). For public junior high school density, the coefficient for the interaction is roughly one-third of the coefficient in the main specification (Column 2). For these outcomes, the coefficients for the remittance proxy remain precisely estimated. Taken together, these results suggest that a positive association between remittances and public goods is stronger in districts that had split.

#### 1.7.4 Election

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

To test the aforementioned mechanism, I interact the remittance proxy variable in equation (1.5) with a dummy for election years. I compile various publicly available information to create a district-year election dummy, which takes a value of 1 if the district holds a direct election in the given year, and 0 otherwise. Suppose elections are the main mediator of the remittance effects on public goods. In this case, we should expect positive coefficients on the remittance and election interaction term, while the uninteracted remittance proxy variable loses precision. Table 1.11, Panel B presents the results where I estimate regressions with the same public goods outcome (public schools) on the interaction between remittances and an election.

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

Analysis of household responses in the SPKP panel indicates that remittances lead to lower voter turnout as well as statistically significant lower voter turnout for mayoral elections (Appendix Table A.21). During election years, villagers also complain less to village leaders about the implementation of anti-poverty programs within

the villages. Despite the lower formal engagement, villagers may still interact with government officials informally through various community groups. In this regard, remittances lead to heterogeneous effects in different community group participations, with positive effect on credit and recreation groups and negative effects on production groups (Appendix Table A.22).

## 1.8 Conclusion

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

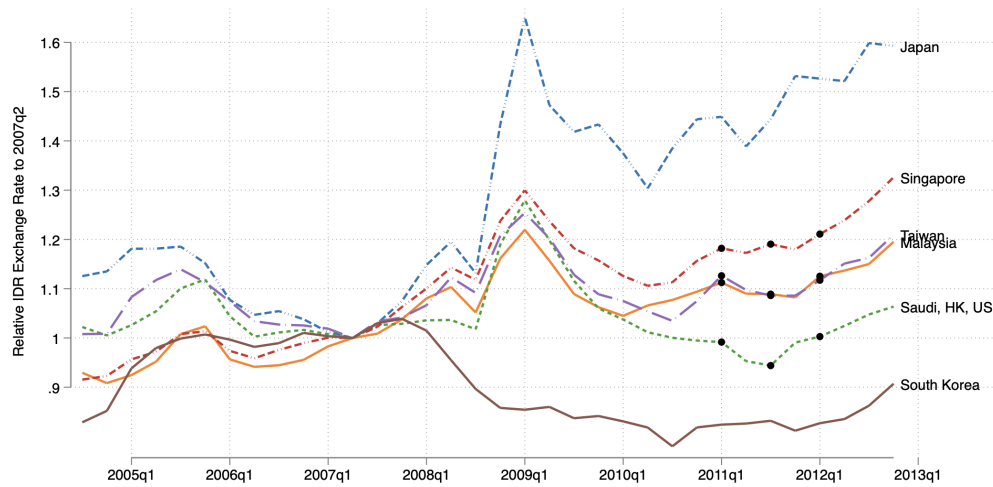
This study provides new evidence on the link between remittances and development in the migrant’s area of origin. With a plausibly exogenous variation of remittances, I investigate the causal impact of remittances on local development. The variations allow me to obtain the effect of remittances separately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

Since remittances can be linked to the provision of public goods in sectors that are especially salient to migrant households, this empirical relationship can be of partic-

ular interest to policymakers in countries that send off many migrants. Stakeholders can direct capital crowd-in from public finance to take further advantage of the remittance windfall. Ultimately, more empirical research is necessary to provide a complete understanding of the pathways between remittances, migration, and development.

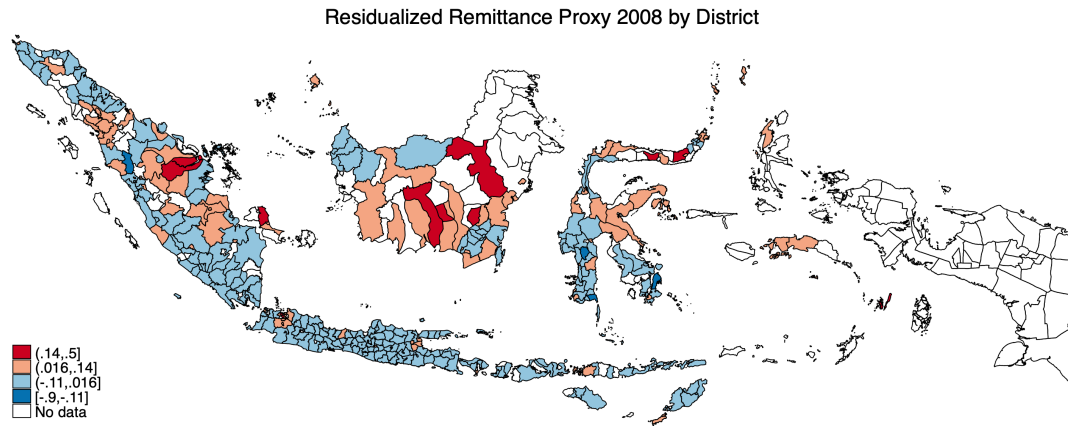
## 1.9 Figures and Tables

**Figure 1.1:** Variations of Exchange Rate to Indonesian Rupiah (IDR)



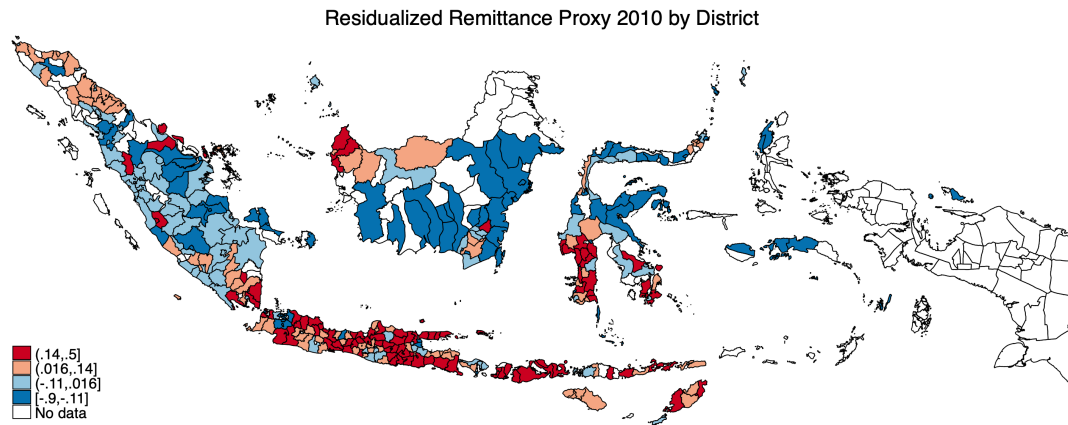
Note: Exchange rates plotted are relative to the prevailing exchange rate in Q2-2007. Countries selected are major migration destination countries. Quarterly data averaged from monthly exchange rates provided by Refinitiv Datastream (2021). Black dots denote quarters when Doi et al. (2014)'s follow-up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

**Figure 1-2:** Spatial Distribution of Residualized Remittance Proxy in 2008



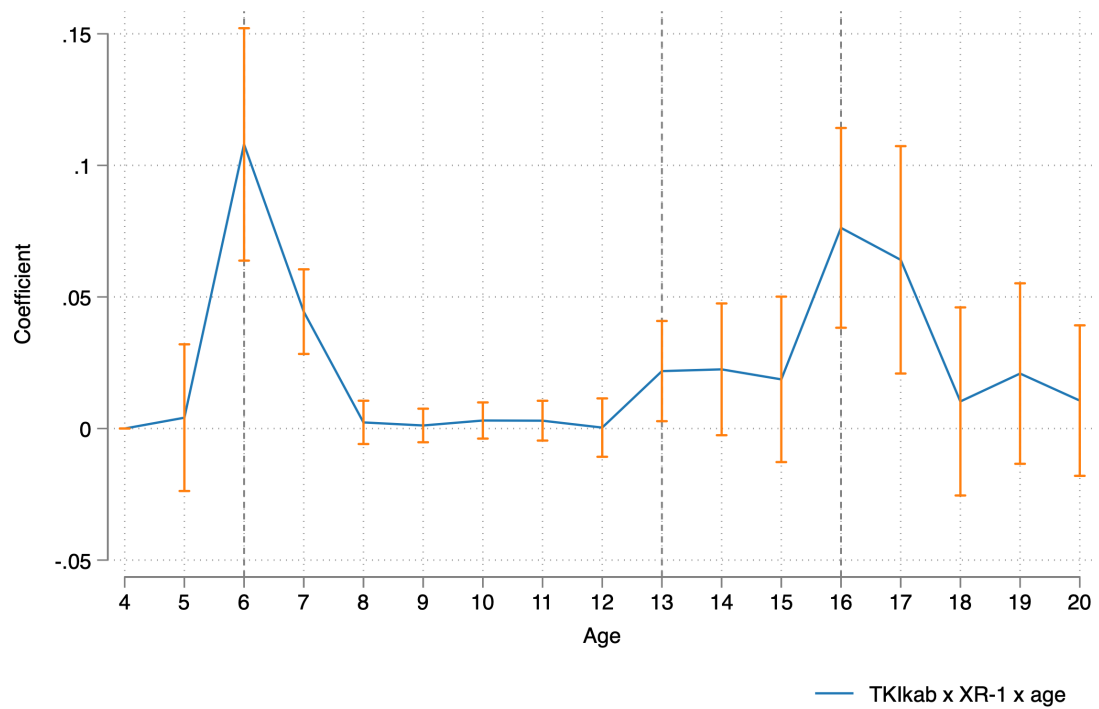
Note: This map displays Indonesian districts (*Kabupaten/Kota*) with the color indicating the magnitude of residualized remittance proxy in 2008. The residual term is from a regression of remittance proxy (interaction of migration intensity and exchange rate shock) on district and year fixed effects.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

**Figure 1-3:** Spatial Distribution of Residualized Remittance Proxy in 2010



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

**Figure 1.4:** Age-specific Enrollment Responses to Remittance Shocks



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

**Table 1.1:** Summary Statistics

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

**Table 1.2:** Effect of Currency Exchange Fluctuations on Remittances

	(1)	(2)	(3)	(4)
	Remittance	Remittance	Remittance	Remittance
XR shock	0.050 (0.048)	0.378** (0.159)	0.410** (0.162)	0.406** (0.163)
Duration abroad			-0.001 (0.000)	-0.001 (0.000)
Time to next Eid				-0.069 (0.192)
Dep. Var. Mean	-0.0	-0.0	-0.0	-0.0
Household FE, Wave FE		✓	✓	✓
HH	183	183	183	183
Observations	418	418	418	418

Notes: The 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 at the first follow-up, and the difference from previous response in subsequent follow-ups. Remittances are expressed in log Indonesian rupiah (IDR), standardized. XR shock is the exchange rate to IDR relative to March 2011, standardized. Exchange rate data are from Refinitiv Datastream. Standard errors are clustered at the household level. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

**Table 1.3:** Correlations between Subsequent Remittances and Past Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)
A. GDP Per Capita and Household Consumption Expenditure (Log IDR)						
	Household Expenditure	Household Exp Bottom 20%	GDP Total	GDP Agriculture	GDP Service	GDP Industry
Migration <sub>d</sub> <sup>o</sup> × XRShock <sub>dt+2</sub>	0.01 (0.02)	-0.00 (0.02)	-0.00 (0.02)	-0.00 (0.02)	0.23 (0.16)	0.20 (0.16)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.45	11.77	15.40	13.94	14.23	13.68
Districts	341	341	350	350	353	353
Observations	1522	1522	1907	1907	1924	1924
B. Net Enrollment Rate (%) and Education Facilities (Per 10,000 people)						
	Elementary Enrollment (Ages 6-12)	Junior Secondary Enrollment (Ages 13-15)	Senior Secondary Enrollment (Ages 16-18)	Elementary School (Grades 1-6)	Junior Secondary School (Grades 7-9)	Senior Secondary School (Grades 10-12)
Migration <sub>d</sub> <sup>o</sup> × XRShock <sub>dt+2</sub>	-0.49 (0.48)	0.51 (1.41)	1.48 (1.02)	0.16 (0.10)	-0.00 (0.04)	0.01 (0.01)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	88.63	65.73	44.24	6.59	1.11	0.29
Districts	350	350	350	353	353	353
Observations	1590	1590	1590	1924	1924	1924

Notes: This table reports the estimates of a modified version of equation (1.5), where the exchange rate shock variable (XRShock) is shifted forward by two periods. Sample is from 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable Migration<sub>d</sub> × XRShock<sub>t+2</sub> proxies for remittances, and is standardized to have a mean of zero and a standard deviation of one. XRShock is the district-level yearly average of migrant-weighted foreign currency exchange rates between the host country's currency and IDR, relative to June 2007. The district-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration (intensity) is the natural log of ratio between the total migrant and total population from the 2005 village census. GDP per capita are expressed in a log of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. \* p ≤ 0.10, \*\* p ≤ 0.05, \*\*\* p ≤ 0.01. Standard errors are clustered at the district level in parentheses.

**Table 1.4:** Effects of Remittances on Development Indicators

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

Notes: This table reports the estimates of equation (1.5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable Migration<sub>d</sub> × XRShock<sub>t-1</sub> proxies for remittances, and is standardized to have mean of zero and a standard deviation of one. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. The district-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and total population from the 2005 village census. GDP per capita is expressed in log of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. \* p ≤ 0.10, \*\* p ≤ 0.05, \*\*\* p ≤ 0.01. Standard errors are clustered at the district level in parentheses.

**Table 1.5:** Effects on School Enrollment

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

Notes: This table reports the estimates of equation (1.5). The sample is from the 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. Interaction variable Migration<sub>d</sub> × XRShock<sub>t-1</sub> proxies for remittances and is standardized to have a mean of zero and a standard deviation of one. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. The district-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and total population from the 2005 village census. Outcomes data is from Susenas household surveys. Other outcomes data details are as described in Appendix A.1. \* p ≤ 0.10, \*\* p ≤ 0.05, \*\*\* p ≤ 0.01. Standard errors clustered at the district level in parentheses.

**Table 1.6:** Effects on Enrollment, Cohort-Specific Analysis

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

Notes: This table reports the estimates of equation (1.5). The sample is 2005-2007 individuals aged 4-20 in Susenas survey. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. CohortTreat dummies are indicators for individuals in school age (6-18 years), primary school age (7-12 years), junior secondary age (13-15 years), and senior secondary age (16-18 years). \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ . Standard errors are clustered at the household level in parentheses.

**Table 1.7:** Effects on Public Goods Provision

	(1)	(2)	(3)
A. Public Schools (per 10,000 population)			
	Elementary (Grades 1-6)	Junior Secondary (Grades 7-9)	Senior Secondary (Grades 10-12)
Migration <sub>d</sub> <sup>o</sup> × XRShock <sub>dt-1</sub>	0.85*** (0.28)	0.27*** (0.09)	0.02 (0.03)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	6.39	1.18	0.31
Districts	353	353	353
Observations	2417	2417	2417
B. Other Public Goods			
	Share Household with Electricity	Share Household with Piped Water	Share Villages with Asphalt Roads
Migration <sub>d</sub> <sup>o</sup> × XRShock <sub>dt-1</sub>	0.05*** (0.02)	0.09*** (0.03)	0.25** (0.10)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	0.89	0.16	0.70
Districts	350	353	308
Observations	2175	2411	831

Notes: This table reports the estimates of equation (1.5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $\text{Migration}_d \times \text{XRShock}_{t-1}$  proxies for remittances and is standardized to have a mean of zero and a standard deviation of one. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. The district-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and total population from the 2005 village census. Outcomes data sources and details are as described in Appendix A.1. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ . Standard errors are clustered at the district level in parentheses.

**Table 1.8:** Effects on Development and Education Outcomes, Robustness with Main Trade Commodities

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

Notes: This table reports the estimates of equation (1.5) with the addition of two control variables on the right hand side to account for commodity trades. The variables are OilGas<sub>d</sub><sup>o</sup> × XROilGas<sub>l-1</sub> and PalmOil<sub>d</sub><sup>o</sup> × XRPalmOil<sub>l-1</sub>. The sample is from the 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable Migration<sub>d</sub> × XRShock<sub>l-1</sub> proxies for remittances and is standardized to have a mean of zero and a standard deviation of one. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and total population from the 2005 village census. GDP per capita is expressed in a log of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01. Standard errors are clustered at the district level in parentheses.

**Table 1.9:** Effects of Remittances on Education Supply

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

Notes: This table reports the estimates of equation (1.5). Panel A include interaction terms with lagged education expenditure budget as a share of total expenditures. The sample in Panels A and C are the 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from the airport arrival data. The interaction variable Migration $_d \times$  XRShock $_{t-1}$  proxies for remittances and is standardized to have a mean of zero and a standard deviation of one. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and total population from the 2005 village census. The sample for Panel B is the Village Head Survey from Olken et al. (2014) and Cahyadi et al. (2020). Other outcomes data sources and details are as described in Appendix A.1. \* p $\leq$  0.10, \*\* p $\leq$  0.05, \*\*\* p $\leq$  0.01. Standard errors are clustered at the district level in parentheses.

**Table 1.10:** Effects on District Revenue Streams

	(1)	(2)	(3)	(4)	(5)
	Central Taxes (DBH)	Local Taxes (PAD)	Natural Resources	Special Grant (DAK)	Formulaic Base Grant (DAU)
A. District Revenue Streams (Log IDR)					
Migration <sub>d</sub> <sup>o</sup> × XRShock <sub>dt-1</sub>	-1.58 (1.15)	-1.21 (0.74)	-0.23 (2.20)	0.57 (1.71)	1.82 (1.26)
District FE, Year FE	✓	✓	✓	✓	✓
Dep. Var. Mean	23.98	24.01	21.01	23.60	26.38
Districts	345	345	345	345	345
Observations	2324	2324	2324	2324	2324
B. Revenues as Share of Total (%)					
Migration <sub>d</sub> <sup>o</sup> × XRShock <sub>dt-1</sub>	-0.05** (0.02)	-0.01 (0.01)	0.03 (0.02)	0.03*** (0.01)	-0.01 (0.02)
District FE, Year FE	✓	✓	✓	✓	✓
Dep. Var. Mean	0.07	0.07	0.06	0.07	0.62
Districts	345	345	345	345	345
Observations	2320	2320	2320	2320	2320

Notes: This table reports the estimates of equation (1.5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. The interaction variable  $\text{Migration}_d \times \text{XRShock}_{t-1}$  proxies for remittances and is standardized to have a mean of zero and standard deviation of one. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and total population from the 2005 village census. Outcomes data sources and details are as described in Appendix A.1. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ . Standard errors are clustered at the district level in parentheses.

**Table 1.11:** Effects of Remittances, Interaction with District Split and Election Indicators

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

Notes: This table reports estimates of equation (1.5). Panel A includes interaction terms with an indicator of whether the district has split into smaller districts, Panel B includes interaction terms with an indicator of whether there is a district-level election in the year. Sample are 2005-2012 panel of Indonesian districts in Indo-Dapoer dataset with recorded returnees from airport arrival data. Interaction variable  $Migration_d \times XRShock_{t-1}$  proxies for remittances, and is standardized to have mean zero and standard deviation of one. XRShock is district-level yearly average of migrant-weighted foreign currency exchange rate between host country currency and Indonesian rupiah, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration (intensity) is the natural log of ratio between the total migrant and total population from the 2005 village census. Other outcomes data sources and details as described in Appendix A.1. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ . Standard errors clustered at the district level in parentheses.

## 1.10 Supplementary Material A: Data Sources

### 1.10.1 Main Explanatory Variables

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

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

I aggregate the district-destination/currency-month level data to the district-year level using the number of migrants in each destination country and month as a weight

to create the average at the district-year level ( $N=2,463$ ). This panel is not balanced. The resulting district-year exchange rate shock is then matched with the Dapoe dataset on district and year identifiers.

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

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

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

### **Outcomes Variables**

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

**Susenas** (*Survei Sosio-Ekonomi Nasional*/National Socioeconomic Survey) is a household survey with representative sampling at the district level conducted by

the Central Bureau of Statistics (BPS). I use data from 2005-2012 for the following variables: participation in school (elementary, secondary), gender, age, and location in order to create a district-average enrollment rate by gender and age groups (7-12, 13-15, 16-18, 7-18, and 19-24 as placebo). I also use households' answers to source of drinking water and assets. Asset data are only available from 2010-2012.

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

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

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

### Supplementary Datasets

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

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

**SPKP data** (*Survei Pelayanan Kesehatan dan Pendidikan*) are a set of baseline and follow-up surveys conducted in 700 subdistricts across Indonesia to evaluate the impact of a household cash transfer program (PKH/*Program Keluarga Harapan*) and a community block grant program (Generasi, see: Alatas, 2011; Olken and Singhal, 2011; Olken et al., 2014; Cahyadi et al., 2020). The respondents are households, village heads, schools, health workers, and subdistrict heads. I analyzed data from the following four survey waves: 2007, 2008, 2009, and 2014. Village and household

samples are a mixture of cross-section and panel (i.e. some households/villages were observed only once). Sample sizes vary between survey waves, depending on its purpose, e.g., the 2008 was a midline survey only for the Generasi block grant program. The surveys cover: West Java, East Java, North Sulawesi, Gorontalo, and NTT.

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

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

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

## Chapter 2

# Online Charitable Donation and Information Load

Coauthored with Gedeon Lim and Yohanes Eko Riyanto

### 2.1 Introduction

Non-profits raise hundreds of billions of dollars annually from individual giving, and the proportion of those that give through online channels has been growing (Paxton, 2020; Clark et al., 2019). US non-profits raise 13% of its total funds from online sources and online giving has become the first response channel of choice for individual donors during the Covid-19 pandemic (Blackbaud Institute, 2021). Online giving could play an especially important role in developing countries for two reasons: formal social safety nets are often inaccessible, and the increasing adoption of mobile money in these countries has made it easier to receive aid through direct transfers (Suri et al., 2023).

Typically, charitable individuals face large numbers of alternatives to which one can donate to on online platforms. The proliferation of alternatives could influence donation rates in opposing directions. If more choices are better, the demand for charities can increase (weakly) with the number of choices. On the other hand, the psychology literature on choice overload suggests that it might lead to inaction, decreasing the donation rate (e.g., Bertrand et al., 2010). For these reasons, the optimal way to maximize charitable donations in the face of choice overload remains

an open question.

To address this gap, we partner with an online donation platform based in Indonesia, Bagirata, whose explicit objective was to connect potential donors to individuals who had suffered Covid-related job or income losses. We study two main questions. First, how do donors respond to variations in their choice set size? In other words, do they behave differently when the number of donation targets increases? Second, what information is most influential to donors in their giving decisions?

We address these questions by embedding a randomized evaluation on the platform. To study the effect of choice set size, we randomly assigned potential donors to view a display of 3, 8, or 10 beneficiary cards. Each beneficiary card contains a short narrative description of beneficiary circumstances and characteristics including, among others, their previous job and how they would put the donation to use. From these beneficiary-card narratives, donors are free to choose which beneficiary (or beneficiaries) to donate to and the amount to donate. Each card is also randomly drawn from the database. Hence, we combine the set size randomization with the random allocation of beneficiaries characteristics to study the impact of choice set size and the saliency of beneficiary characteristics that could maximize donations.

Our core results are consistent with a choice overload framework: we find that a reduction in choice set size leads to an increase in both the donation rate and unconditional mean donation amount. Donors assigned to a 3- (8-)beneficiary choice set are 1.8p.p. (0.7p.p.) more likely to donate to any single beneficiary compared to an average donation rate of 1.6% for donors assigned to a 10-beneficiary choice set. We also find that the unconditional mean donation amounts are 42% (75%) larger in the 3- (8-)beneficiary choice sets compared to the 10-beneficiary choice set group. Do higher donation rates come at the expense of lower donations per beneficiary? We test for a substitution effect in our setting and do not find strong evidence for

it. Conditional on having made a donation, donors in the smallest choice set group donate about US\$0.4 less per donation than the 10-beneficiary control group (mean of US\$10.63).

To what extent do beneficiary characteristics affect the decision of individual donors? We analyze the individual effects of the entire set of displayed beneficiary characteristics on the incidence and size of donations. The ability to use all available information displayed to donors allows us to better alleviate omitted variables concerns typical of observational studies. We find three salient features that donors respond to. First, donors respond positively to longer appeals containing more detailed information about the beneficiaries. Every additional 50 words in narrative length is associated with a 1.3pp increase in donation rate. Second, beneficiaries who indicate they are breadwinners are 0.7pp more likely to receive a donation. Third, donors respond to gender markers – beneficiaries with feminine names experience higher donation rates. The effects of other notable demographic characteristics vary: there is no significant effect on donation associated with religious/Muslim names, but beneficiary location matters. Beneficiaries located on the island of Java, Indonesia’s most populous island, are generally more likely to receive donations, but being located in the capital metropolitan area itself is negatively associated with donation receipts.

Our paper contributes to the literature on charitable donation and online giving. Online fundraising has become increasingly common and recent studies have looked into microdonations on various platforms (Cersosimo et al., 2022; Jiang et al., 2023). Researchers have also studied how online giving can be influenced by beneficiary’s appearances (Jenq et al., 2015), the salience of charitable causes (Perroni et al., 2022), and the urgency of disaster relief (Jayaraman et al., 2020; see also Scharf et al., 2022). Our paper is most closely related to Altmann et al. (2019)’s experiment

with default options on an online charity platform in Germany. They found that default options induced some people to donate more, although people opted out of donation altogether at a higher default amount. We experiment with another aspect of choice architecture, the choice set size, to show that donors are influenced by the structure of options presented to them.

We provide two distinct contributions to existing studies. First, we use a field experiment to study the effect of choice architectures on charitable donors. In laboratory experiments, Scheibehenne et al. (2009) argue that choice overload is only activated among study participants when they have to justify their decisions. Filiz-Ozbay and Uler (2019) study how competition among substitutable charities reduce giving among laboratory participants. Researchers have also used crowdworker samples to argue that helpers prefer to allocate aid across multiple individuals (Sharps and Schroeder, 2019). Our setting provides the advantage to observe donors' decision in a natural setting.

Second, we examine charitable giving to beneficiaries in a developing country from donors in the same population. Most studies on (online) giving examines charitable giving from rich to poor countries (e.g., Altmann et al., 2019; Jenq et al., 2015). To the extent that donors are most responsive to charities and disasters in their own country, our single setting is important for understanding the contours of giving in developing countries. Moreover, different contextual environments could make choice overload and identity markers more salient in these settings.

Our study also connects to the literature on choice overload. A large body of research in psychology and economics finds that a smaller choice set is associated with greater participation in various markets. These studies include evidence that a person's willingness to take up loans (Bertrand et al., 2010), enroll in 401(k) plans (Sethi-Iyengar et al., 2004) and purchase goods (Iyengar and Lepper, 2000; Boatwright

and Nunes, 2001) decreases when the size of choice set increases. Iyengar and Karmanica (2010) shows that larger choice sets lead to a greater preference for simpler options in 401(k) plans. Our paper contributes to this literature by extending these results to charitable giving in online settings.

We organize the remainder of this paper as follows. Section 2 describes the context of charitable giving in Indonesia and the donation platform. Section 3 and 4 provide details of our empirical strategy and results. Section 5 concludes.

## **2.2 Context**

### **2.2.1 Charitable giving and Covid-19 in Indonesia**

Indonesia ranked 10th in the World Giving Index that reports aggregate giving behaviors between 2009 and 2018 (Charities Aid Foundation, 2019). In the Gallup World Poll, 78% of respondents in Indonesia donated money, 53% volunteered their time, and 40% helped a stranger (Charities Aid Foundation, 2018). They linked the high donation rate with zakat or Islamic almsgiving, one of the Five Pillars of Islam.

Almsgiving in Indonesia is individualized and primarily informal, with only one-quarter of total zakat contributions channeled through formal organizations (Noor and Pickup, 2017). Unless they meet specific requirements (e.g., paid to government-recognized institutions), zakat and other charitable donations are not tax-deductible, and the state does not collect mandatory zakat payments. While the National Board of Zakat reported an overall collection of IDR 6.2 trillion/USD 434 million of alms in 2017, this number represents only 1.6% of the estimated zakat potential that reaches 3.4% of the Indonesian GDP (Baznas, 2019).

When the Covid-19 pandemic began spreading to Indonesia, the government first imposed mobility restrictions in Jakarta on April 10th, 2020. By August 2020, the pandemic has negatively affected 29.1 million workers: 0.76 million dropped out of

the labor force, 1.77 million furloughed, 2.56 million laid off, and 24 million saw their incomes reduced (Aria, 2021). A nationwide survey revealed widespread vulnerability, with half of the households reporting that they have no emergency savings, one-quarter of households pawned their assets to make ends meet, and another quarter of households borrowing money from friends and families (SMERU Research Institute, 2021).

The Indonesian government allocated USD 49 billion from its budget for economic recovery in 2020, which included spending to strengthen its social protection programs. However, gaps remain, especially for the near-poor. Bottom-up initiatives to raise and disburse resources quickly sprung up to fill the gap: Kitabisa, the biggest crowdfunding platform in Indonesia, listed 242 Covid-related fundraisers by April 15th, 2020. These campaigns successfully raised USD 3.5 million by the first week of a city-wide lockdown in the capital.

The pandemic has also increased the adoption of digital financial services (DFS). A J-PAL SEA survey found that 21% of men and 22% of women use DFS for the first time during the Covid-19 outbreak (J-PAL SEA, 2020). Combined with existing users, they raise DFS users to 75% of men and 70% of women. A majority of them expect to continue using DFS after the pandemic subsides. As users cite money transfer as one of the primary triggers of use, DFS can facilitate direct giving that could mitigate the effect of Covid-19. In the next section, we describe our partner platform that leverages this potential.

### **2.2.2 Bagirata**

Bagirata is an online platform based in Indonesia. It was launched in April 2020 as a direct response to the Covid-19 pandemic and its stated objective was to facilitate unconditional, charitable donations from potential donors to individuals/potential beneficiaries facing Covid-related income and job losses. The platform centers around

an online, central beneficiary database where workers facing Covid-induced income and job losses can sign up to join, allowing them to receive donations through the platform. These workers provide their employment status, economic hardship details, financial needs, social media handles, mobile payment QR codes, and other contact details to Bagirata. Volunteers verify these workers' information, and only verified applicants are included in the beneficiary database.

The majority of beneficiaries are workers in the food and beverage sector, with a substantial fraction working as ride-share drivers for popular ride-sharing platforms, or in the hospitality and services sector (Table 2.1). They are mainly located in Greater Jakarta, followed by other major cities in Java with a small fraction based off Java (mainly Bali and Sumatera). Less than half of the beneficiaries work as permanent employees. On average, beneficiaries ask for slightly less than IDR 2 million ( $\sim$  US\$ 133). Many describe how they were laid off or had their salary cut as their employers could not afford to retain them or pay their full salary. They describe their families' pressing needs for baby milk or children's school fees, and some described skipping meals to stretch their budget.

Bagirata connects these beneficiaries to potential donors visiting the Bagirata website. Each time a potential donor visits the website, they are presented with a random selection of beneficiaries from the database, from which they can choose whom to donate to and how much Figure 2.1 (see also Table B.1 for a selection of appeals made by the beneficiaries). Donors can also refresh their displays to view additional sets of random beneficiaries. Donors then make direct donations to their chosen beneficiary through one of three popular digital payment systems and, after having made the donation, are directed to report the donated amount and donation status in the Bagirata platform.

Who donates in this setting and how do they compare to beneficiaries? Table 2.2

describes the demographic characteristics of Bagirata donors from a voluntary survey posted on the Bagirata website. Compared to beneficiaries, donors are more likely to be female and unmarried. Donors are also more educated, and nearly one in ten explicitly declared the lack of any religious affiliation. Donors also earn more: the average donor earns four times the average beneficiary's (US\$8,626/year vs. US\$1,882). Despite this disparity, however, both donors and beneficiaries report allocating a similar percentage of their earnings for charity: 6% for donors and 5% for beneficiaries – twice the amount of mandatory *zakat* charity of 2.5% that Islam requires its adherents to provide. This figure is even higher for individuals who only filled up our survey: Indonesians in this category report giving up to 14% of their income to charity. These figures are higher than the average 3.7% of income given to charities for donor households in the US (Clark et al., 2019) but we note, that this figure in the US is driven by individuals in the US born between 1928-1945 and 1901-1927 (who respectively gave 3.9% and 8.8% of their income). A more appropriate comparison group of millennials in the US report giving on average only 0.9% of their income. This suggests that, perhaps, due to the lack of social safety nets, altruistic motives for donors in our setting might differ from broader trends in developed countries.

Tables B.4–B.5 tabulate the giving behaviors among platform users. Nearly four in five respondents of all type donated to religious organizations in the past year. Similarly high proportions of giving are channeled as spontaneous donations to beggars, buskers, and the homeless. Fewer people donated to cause-related organizations (education, health, or humanitarian issues). Around half of the respondents cited religious teaching as their reason to donate, although among users who donate on the Bagirata platform only 43% cited this reason. Instead, a higher proportion cited the charity's trustworthiness, their effectiveness in using donations, and the perceived need of beneficiaries.

In 2020, Bagirata channeled an estimated amount of ~IDR 500 million to 1,475 recipients. In the first two months of operation, the median donation amount channeled through the Bagirata platform was IDR 100,000 (US\$7), and the maximum amount was IDR 3 million. The Bagirata platform shares similarities with crowdfunding websites such as GoFundMe and Kiva. However, there are two important differences. First, Bagirata’s model unambiguously involves unconditional charitable giving (the literal translation of the name is “divide equally” in Indonesian). This is in contrast to platforms like Kiva that operate as a microlending platform. Second, the donation process involves donors giving direct donations to recipients without the use of an intermediary like GoFundMe. In our setting, beneficiaries receive mobile cash, much like transfers from GiveDirectly, but straight from donors.

## **2.3 Empirical strategy**

### **2.3.1 Randomized evaluation**

We investigate the effect of beneficiary set size on donation outcomes by implementing a randomized experiment on the platform where, upon entering the website and moving past the landing page, each potential donor is randomly assigned to view a fixed set size of 3, 8, or 10 beneficiaries. Figure B-1 presents the schematics of the treatment assignments. Operationally, set sizes are assigned to a potential donor’s IP address with each assignment lasting for a duration of three hours. In other words, as long as an individual logs on using the same device/browser, he/she will continue to see the same number of beneficiaries in each choice set. In this manner, donors and sessions in our setting are interchangeable unless otherwise stated.

Each beneficiary is displayed as a card to the donor in vertical successions, and they are randomly selected from the recipient database. At the bottom of each display, donors have the option to ‘refresh’ the beneficiary set and get a new random draw

of the same set size. For example, a donor assigned to the eight-sized group will obtain a new set of eight beneficiaries upon hitting 'refresh.' As discussed above, this randomization persists for a session of three hours, so if the donor closes their browser and revisit the platform within a session timeframe, they will see the same number of recipients with a newly drawn set of beneficiaries. This ensures a consistent user experience on the website and, at the same time, minimizes donors' awareness of the experiment. The experiment ran from October 2020-June 2021 (Figure B.2 displays visitors over time in this period).

### 2.3.2 Regression specifications

Because the variation in choice set size is randomly assigned, we can estimate its effects on donation decisions using simple OLS. For donor session  $i$  seeing beneficiary  $j$  in  $k$ -th set, with  $l$  indexing beneficiary's order within the set and  $L \in \{3, 8, 10\}$ , we estimate:

$$Donate_{ijkl} = \alpha_1 + \beta_1 SetSize_i + BeneficiaryFE_j + \varepsilon_{1,ijkl} \quad (2.1)$$

where *Donate* is either donation indicator or amount and *SetSize* is an indicator for either the 3- or 8-recipient groups. The  $\varepsilon$  term is the idiosyncratic error term. Standard errors are clustered at donor- and beneficiary levels to account for possible error correlations within non-nested donor and beneficiary clusters (Colin Cameron et al., 2011). We estimate this equation both without and with the beneficiary fixed effects, with the latter being our preferred specification.

We separately estimate the effect of beneficiary's characteristics on display with the following estimation (same notation as above):

$$Donate_{ijkl} = \alpha_2 + \beta_2 Characteristics_j + DonorFE_i + \varepsilon_{2,ijkl} \quad (2.2)$$

where *Characteristics* is a vector of all beneficiary characteristics displayed and considered by donors in the donation process. Broadly, we consider two sets of beneficiary characteristics. The former are inferred from beneficiary names and includes characteristics like gender and religion, and the latter are characteristics we code from beneficiary narratives. These include breadwinner status and indicators for having been laid off from their previous job. As above, the  $\varepsilon$  term is an idiosyncratic error term. Because we observe all beneficiary characteristics as displayed on the platform, this allows us to alleviate concerns that, in their donation decision, donors might be considering other omitted variables that we do not observe.

The backbone of our analysis is based on Bagirata’s full database, which includes their beneficiary roster, session trace, and donation trackers. The session data tracks which beneficiaries are displayed to each donor, self-reported indicators of donation status and amount after the transfer is completed, and unique donor session identifier. Donors are also prompted to disclose their email addresses after donating, although the disclosure is not mandatory. When donors provide their emails, we can link individuals across donor sessions and construct the *DonorFE* indicators.

We will also augment the regression analysis with Bagirata user survey data. This survey captures a rich set of demographic variables, altruistic behaviors both on the Bagirata platform and beyond, as well as altruistic preferences. The survey sample size is considerably smaller, and analysis of this dataset will be limited to descriptive statistics. The reasons for the small sample are twofold: participation is voluntary, and the survey is decoupled from the main user interaction flow to minimize friction in user experience toward donation activities. In this dataset, we also observe respondents who had not used the platform as a donor or recipient but likely participated in the survey from the link that Bagirata promoted through Instagram and Twitter.

## 2.4 Results

We present the aggregate summary of donations at the donor level in Table B.2. Donations are made in 17% of total sessions. Because the mean donor sees 2.6-4.6 sets per session, donors are exposed to 21 beneficiaries per session on average. Each donor on average made 2.78 donations in a session, resulting of a 2.27% overall donation rate over all beneficiary presentations.

### 2.4.1 Choice Overload

*Choice set size* Differences in choice set size matters for both donation outcomes and the size of donations made. We find that donors assigned to the smallest 3-choice beneficiary set size are more than twice as likely to make a donation compared to donors assigned to the largest 10-choice beneficiary set (Table 2.3 and Figure 2, left panel). Specifically, from a baseline donation rate of 1.6% for the 10-beneficiary choice set,<sup>1</sup> donors assigned to a 3-beneficiary choice set group (8-beneficiary choice set group) are 1.8 p.p. (0.7 p.p.) more likely to make a donation. Only the difference between the 3 and 10-choice set group, however, is statistically significant.

This result is also reflected in the donation rates for beneficiaries along the sequence with which they are displayed to the donors. Figure B.3 display the share of beneficiaries receiving donations, ordered by their position in the sequence. Among the first twenty beneficiaries displayed to the donors, beneficiaries in three-option sets typically have a higher rate of receiving donation. Figure B.4 displays a similar outcome, but beneficiaries' display sequence are aligned along the sets that they appear in. In Table B.3, we check the robustness of this result by running the regression for the donor-beneficiary pairs only in the first set (Column 2), or only the first 3-10

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<sup>1</sup>While this donation rate seems low, this is in line with the conversion rate in the general charitable giving literature as well as in the Betterplace experiment (3.3%). Altmann et al. (2019) also noted that a study on online fundraising sites reported a median conversion rate of just 0.76%.

pairs for all sessions (Columns 3-5). Generally, donors in the 3-beneficiary choice sets donate at a higher rate in the sets following the first sets (i.e., to the fourth individuals onward rather than to individuals number 1-3 that they encounter).

Turning to the donation value transferred to beneficiaries, Columns (3) and (4) in Table 2.3 (and Figure 2, middle panel) shows that the higher donation rates translates into a statistically significant increase in unconditional average donations of IDR1699-IDR1972 in the 3-beneficiary choice set group compared to the control group. This effect is a 75% increase compared to the control group mean of IDR2776. Similar to our results on donation rates, we do not find a statistically significant difference between the 8 and 10-beneficiary choice set group. We hypothesize that these estimates are driven by the conversion of new donors on the extensive margin who wouldn't have otherwise donated<sup>2</sup>. On the intensive margin, conditional on having made a donation, donors in the smallest choice set group donate about US\$0.4-2.5 less per donation compared to the the control group, but none of these differences are statistically significant.

The higher donation rate for donors presented with the smallest choice set size is consistent with a choice overload framework. Donors seeing ten beneficiaries may feel overwhelmed evaluating the large number of beneficiaries on display and hence, decide not to donate. In comparison, donors confronted with three beneficiary choice sets face a lighter cognitive load and can better evaluate alternatives on offer. We present two sets of additional evidence in support of this interpretation.

*Donor behavior: refresh rates* The smallest set size gives donors finer information control. Each time donors are faced with a set of beneficiaries, they can choose to donate or refresh and obtain a new draw of beneficiaries of the same choice set size. This allows us to test whether the display of fewer beneficiaries/donation targets

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<sup>2</sup>Similarly Sudhir et al. (2016) finds that individual profiles boost donation in comparison to profiles on groups of beneficiaries during a charity mailer experiment in India

induces donors to actively search for more potential beneficiaries through examining the effect of choice set size on refresh rates, i.e., the number of times a donor requests the website to draw a fresh set of beneficiaries after reaching the last beneficiary card on display. To test this, we aggregate our observations up to the donor-level and estimate the impact of set size on information-seeking behavior using refresh rates as a proxy.

On average, assignment to the smallest 3-choice set induces donors to search for additional donation targets (Table 2.4 and Figure 3, left panel). Donors in the 3-choice set are twice as likely to hit refresh compared to donors assigned to the largest 10-choice set size (control average: 2.58). Nevertheless, because of the difference in set size, donors in the smallest set size still see the 12 fewer potential beneficiaries overall. There is no significant difference between donors seeing eight and ten beneficiaries at a time. Taken together, this suggests that one mechanism by which choice overload occurs in this setting is that donors might feel overwhelmed by the large number of characteristics from a 10-beneficiary choice set and simply give up looking for additional suitable donation targets.

*Beneficiary display order* Donors see the beneficiary cards sequentially, scrolling from top to bottom. Figure B-5 displays the share of beneficiaries receiving donation based on order in a set. The average donation share slopes downward for beneficiaries displayed in sets of eight and ten.

Because beneficiary cards are randomly drawn from the database, the display order of beneficiaries within a set is thus also randomly assigned. Hence, we can estimate the impact of display order by including a regressor that indicates the numerical value of the order in which each beneficiary was displayed. Table 2.5 reports the estimates from this regression. Being placed at the lower end of a set significantly reduced a beneficiary's likelihood of receiving a donation. Column (2) indicates that each

lower position leads to a 0.068p.p. decrease in the likelihood of receiving a donation. This means a request randomly placed at the bottom of a 10-set beneficiary display has on average a 26% lower chance of receiving a donation compared to beneficiaries displayed in pole position.

Are these effects driven by cognitive overload? To test this hypothesis, we further split our sample by set size. Columns (3) - (5) show that the average effect in Column (2) masks significant heterogeneity across set sizes. The negative coefficient in Column (2) is driven by 8- and 10-beneficiary sets. This suggests that donors make sequential decisions within a set only when faced with large, overwhelming choice sets. Indeed, for the smallest set size, the coefficient estimate is positive, although not statistically different from zero. Table 2.6 reports similar, albeit mostly statistically insignificant, estimates when we look at the effects of display order on the value of donation made.

#### **2.4.2 Beneficiary Characteristics**

We now turn to the analysis of the characteristics that move donors to send donations. We include in this analysis all beneficiary's characteristics that the donors observe on the platform: demographic characteristics (sex and religion inferred from the name, location, employment sector), donation ask (amount of money needed, duration of need), social media presence (indicators for links to their Facebook, Twitter, or Instagram accounts), e-payment channels, and narrative (length of narrative, content). In addition, we code from the narrative whether the beneficiary is perceived to be a breadwinner (based on keywords referring to children, parents, siblings, or being responsible for their family needs).

Figure 4 and Table 2.7 presents the coefficients from the analysis of beneficiary characteristics on the donation receipt indicator. Both intrinsic and situational characteristics seem to matter to a different degree. Beneficiaries with feminine names tend to receive more donations, but donors also tend to donate more to beneficiaries

that provide a more detailed narrative in their ask. Each additional 50 words in the narrative are associated with a 1.3pp increase in donation rate. If they indicate they are the breadwinners, this information is associated with a 0.7pp increase in donation rate. Employment in the education sector (e.g., as teachers, para-teachers, or tutors) is associated with a 1.4pp higher donation rate than workers in the food and service category (the comparison category). On the other hand, information about being laid off or uncertainty in work and the amount of aid the beneficiaries ask have no significant effect on donation outcomes. Similarly, explicitly Muslim names do not have any significant correlation with the donation receipt.

We also see some evidence of how alignment between donor and beneficiaries' characteristics may matter. A key aspect of aid is its delivery channel and payment frictions matter for donors. As most donors use the GoPay platform, beneficiaries also using this platform tend to receive a 2.2pp higher donation rate.

*Descriptive statistics on donor-beneficiary matches* Beyond looking at beneficiary characteristics, we can obtain further insights using a sub-sample of donor-beneficiary dyads which we are able to link to our voluntary user survey data. Table B.6 provides descriptive statistics for two salient markers of identity: gender and religion.

Alignment in religious identity seem to matter more for non-Muslim donors, the minority group in Indonesia, but has little effect on Muslim donors. Non-muslim donors donate to beneficiaries who do not have Muslim names with an average donation of Rp.27,194, a higher amount than the average donation of Rp.20,710 to beneficiaries with Muslim names. Muslim donors are also less likely to donate to beneficiaries with Muslim names (5% for Muslim-named beneficiaries in this subsample vs. 10% for non-Muslim names). As a result, the average donation for Muslim-named beneficiaries from Muslim donors is only about three-fifths of the average donation for non-Muslim-named beneficiaries (Rp. 6,787 and Rp.11,159, respectively).

Alignment in gender identity seems to matter less for all donor types. Both male and female donors donate at a higher rate with higher amounts to beneficiaries with typical woman names. Note, however, that while the statistics in this table summarizes the effects of random pairing between donor characteristics and beneficiary characteristics, we are only able to do this for a limited subsample where we can match activity traces with user survey data. Hence, the dramatically smaller sample size limits our statistical power.

## **2.5 Conclusion**

This paper documents that donors are susceptible to choice overload in the context of online charitable giving in a developing country context. Donors randomly assigned to a three (eight)-beneficiary choice set are 1.8p.p. (0.7p.p.) more likely to make a donation and, on average, donations made by these donors are 75% (42%) larger in size compared to donors assigned to a ten-beneficiary choice set. At the same time, we do not find a statistically significant decrease in donation size on the intensive margin, suggesting that higher donation rates do not come at the expense of lower average donations. We also find that two salient identity markers of female gender and breadwinner status leads to higher donation rates on average. These findings have implications for thinking about the ways to maximize charitable giving in disaster response.

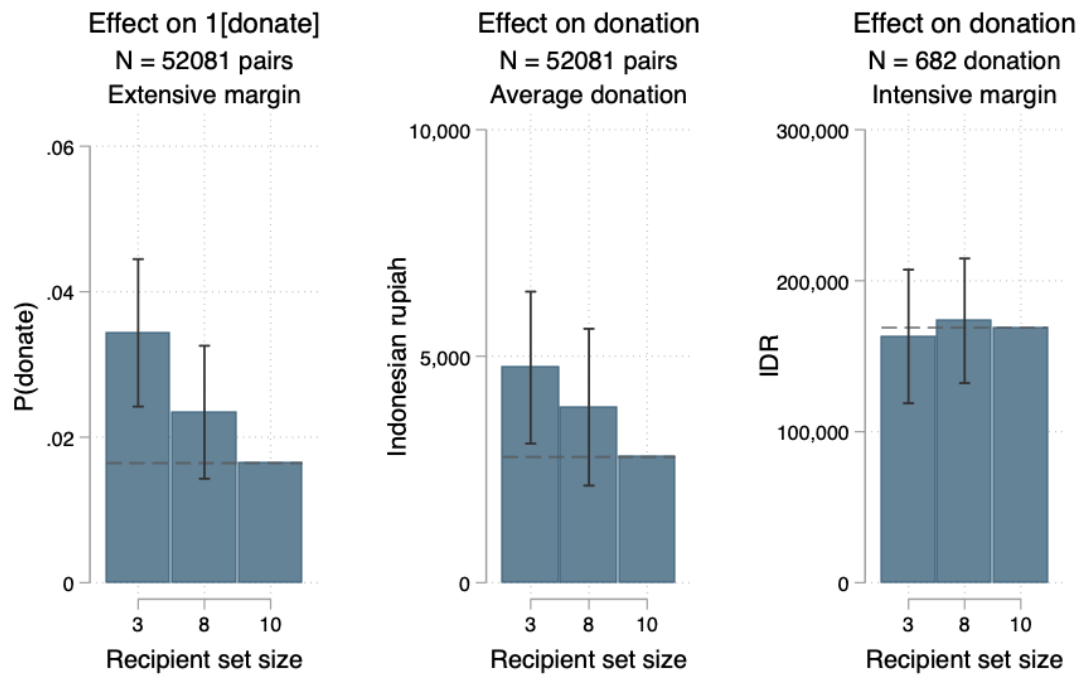
## **2.6 Figures and Tables**

Figure 2.1: Donor's View of Beneficiary on the Platform



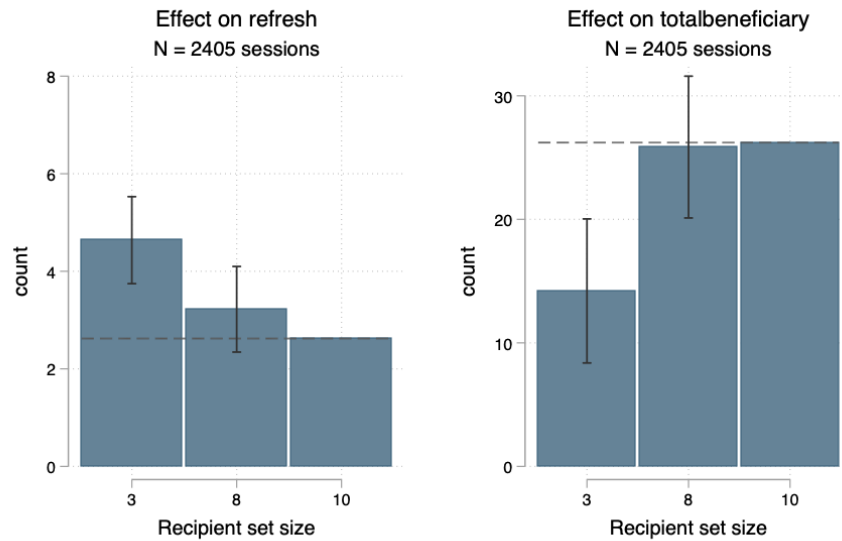
*Note:* An example of a beneficiary-card that potential donors view upon clearing the landing page of the Bagirata website. Cards are shown sequentially on the website where users must swipe/scroll down to view the next card in the set.

**Figure 2·2:** Effects of Choice Set Size on Donation



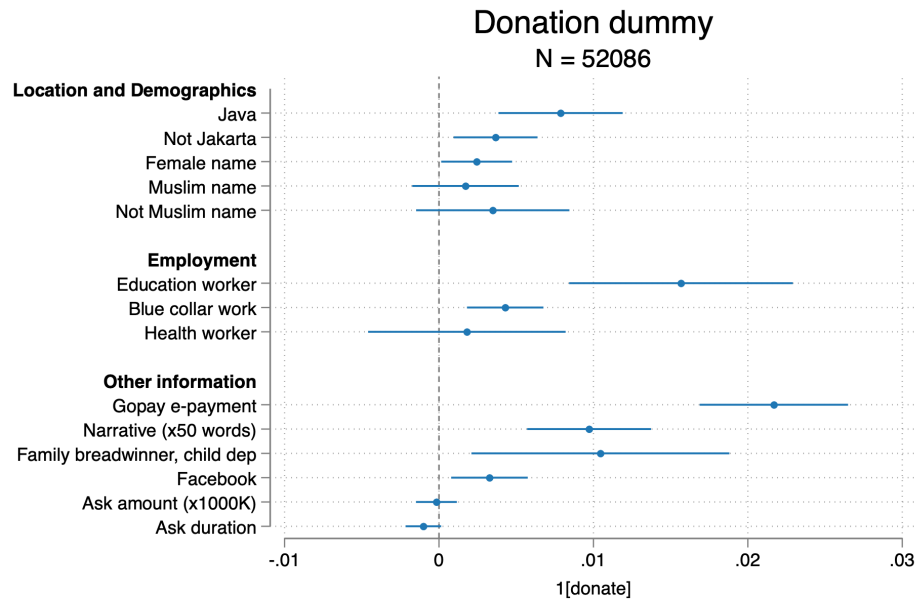
*Note:* Charts plot the mean for control group (set of 10) plus the coefficient for treatment groups (set of 3 or 8). Coefficients in plot is from  $Y_{ijkl} = \alpha_1 + \beta_1 SetSize_i + BeneficiaryFE_j + \varepsilon_{1,ijkl}$ , with standard errors clustered at donor session and beneficiary levels. Groups are assigned randomly. The sample uses data from Oct 2020–Jun 2021, excluding outlier donors. Samples for left and center plots are donor-beneficiary pairs, sample for right plot is pairs where donation occurred, excluding singleton beneficiaries. Whisker for each bar indicates the 90% CI.

**Figure 2-3:** Effects of Choice Set Size on User Behaviors and Total Choice Exposures



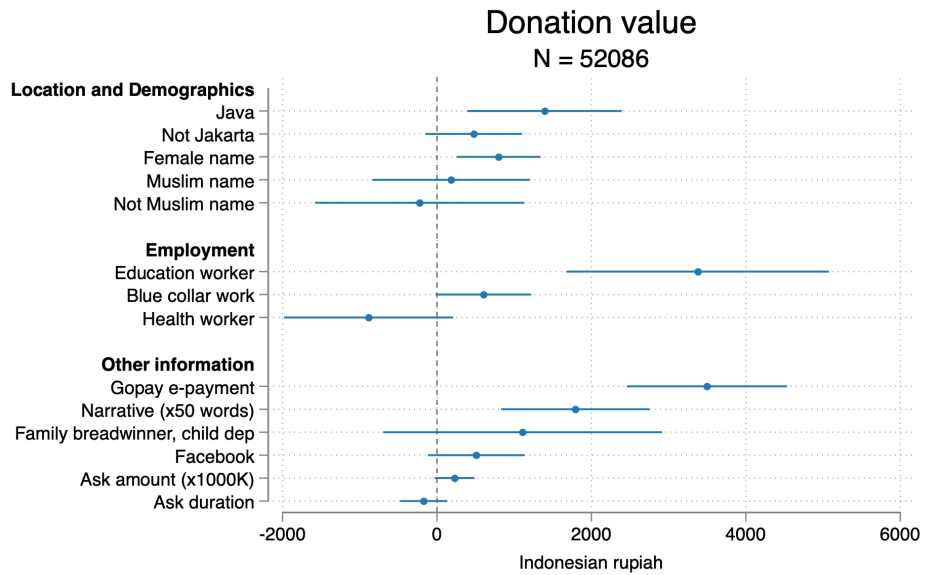
*Note:* Charts plot the mean for control group (set of 10) plus the coefficient for treatment groups (set of 3 or 8). Coefficients from equation (1). Groups are assigned randomly. The sample consist of donor sessions from Oct 2020-Jun 2021, excluding outlier donors. Whisker for each bar indicates the 90% CI.

**Figure 2.4:** Effects of Beneficiary Characteristics on Donation Indicator



*Note:* Chart plots coefficients from  $Y_{ijkl} = \alpha_2 + \beta_2 \text{Characteristics}_j + \text{Donor}FE_i + \varepsilon_{1,ijkl}$ . Range for each coefficient indicates 90% confidence interval.

**Figure 2·5:** Effects of Beneficiary Characteristics on Donation Values



Note: some coefficients not plotted (e-channels, IG, Twtr, sectors, order in set).

Note: Chart plots coefficients from  $Y_{ijkl} = \alpha_2 + \beta_2 \text{Characteristics}_j + \text{Donor}FE_i + \varepsilon_{1,ijkl}$ . Range for each coefficient indicates 90% confidence interval.

**Table 2.1:** Applicants and Verified Beneficiaries - Summary Statistics

	(1)		(2)	
	All applicants		Verified	
Female	.34	(.47)	.35	(.48)
Muslim	.15	(.35)	.24	(.43)
Christian or Hindu	.037	(.19)	.06	(.24)
Breadwinner	.25	(.43)	.21	(.41)
Greater Jakarta	.69	(.46)	.67	(.47)
Java	.91	(.28)	.91	(.28)
Facebook	.45	(.5)	.44	(.5)
Instagram	.71	(.45)	.77	(.42)
Twitter	.13	(.34)	.15	(.36)
Gopay	.62	(.49)	.64	(.48)
Dana	.39	(.49)	.39	(.49)
Jenius	.089	(.28)	.11	(.31)
Ask amount (USD)	133	(75)	134	(72)
Narrative (x50 words)	.59	(.3)	.6	(.3)
Ask duration (months)	2.1	(.9)	2.2	(.88)
Formal language	.59	(.49)	.59	(.49)
Laid off	.45	(.5)	.46	(.5)
Work uncertain	.58	(.49)	.56	(.5)
Permanent employee	.42	(.49)	.48	(.5)
uber driver	.099	(.3)	.064	(.24)
F&B, hospitality	.55	(.5)	.6	(.49)
Arts	.13	(.33)	.16	(.37)
Education	.032	(.18)	.037	(.19)
Health	.015	(.12)	.017	(.13)
Observations	3549		2054	

*Notes:* Statistics from beneficiary database until June 2021. Bagirata runs the verification process to ensure each applicants are a real person and fill all requisite fields in the application form correctly. Only verified beneficiaries are displayed to potential donors. Table displays the means and standard deviations (in parentheses).

**Table 2.2:** Bagirata User Profiles - Summary Statistics

	All	Donors	Recipients	Survey only
Male	.37	.3	.57	.38
Age	29	29	30	29
Married	.6	.34	.43	.65
Years of education	13	15	13	12
Javanese	.52	.56	.48	.52
Islam	.86	.68	.87	.89
Migrant	.43	.6	.5	.4
Earning (x2019 GDP/cap)	.74	2.2	.4	.54
HH size	4	3.2	3.7	4.1
Earning for charity	.12	.06	.054	.14
Uses mobile money	.93	.97	1	.93
Mobile money platforms in use	1.4	2.3	1.4	1.3
Employer corporation or international	.15	.49	.17	.097
Employer small	.37	.13	.38	.4
Occupation in finance or IT	.059	.21	.033	.037
Occupation in govt, edu, or health	.087	.17	.033	.077
Occupation in retail or hospitality	.24	.069	.35	.27
Occupation in other sectors	.47	.36	.38	.48
Give via platform	46,525	368,570	0	0
Received frm platform	12,863	0	359,460	0
Observations	1716	216	60	1438

*Notes:* Survey responses from Oct 2020-July 2021. Survey is voluntary and decoupled from donation process (see text).

**Table 2.3:** Impact of choice set size on donation outcomes

	(1) P(give)	(2) P(give)	(3) Donation	(4) Donation	(5) Donation  Give	(6) Donation  Give
set=3	0.0174*** (0.00533)	0.0179*** (0.00517)	1699.0* (908.7)	1972.9** (855.2)	-36537.6 (26032.9)	-5819.1 (22468.9)
set=8	0.00686 (0.00468)	0.00700 (0.00466)	925.6 (934.9)	1099.1 (882.8)	-10027.7 (29363.8)	4546.1 (20959.6)
Constant	0.0164*** (0.00215)	0.0162*** (0.00208)	2775.7*** (500.9)	2646.2*** (421.1)	168911.1*** (22282.4)	150863.3*** (13757.4)
FE	_cons	beneficiary	_cons	beneficiary	_cons	beneficiary
Observations	52086	52081	52086	52081	1183	682

*Notes:* Regression of donation outcomes on choice set size with and without beneficiary FEs (even numbered columns and odd, respectively). Observation unit is a donor-beneficiary dyadic pair. Change in observation numbers is due to dropping singleton beneficiaries when running the specification with beneficiary FEs. Columns 5 and 6 are restricted to pairs where donation occurred. Standard errors are clustered at donor- and beneficiary-level, displayed in parenthesis. Sample is from Oct 2020-Jun 2021, excluding outliers. \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

**Table 2.4:** Impact of choice set size on user behavior and information exposure

	(1)	(2)
	Beneficiaries seen	Refresh
set=3	-12.0*** (3.54)	2.02*** (0.54)
set=8	-0.36 (3.49)	0.60 (0.53)
Constant	25.8*** (2.48)	2.58*** (0.38)
Observations	2405	2405

*Notes:* Regression of information and behavior outcomes on choice set sizes. Observation unit is a donor session. Sample is from Oct 2020-Jun 2021, excluding outliers. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table 2.5:** Impact of display order within set on the probability of donation

	(1)	(2)	(3)	(4)	(5)
	P(give)	P(give)	P(give   Set3)	P(give   Set8)	P(give   Set10)
3.set	0.0154*** (0.00270)				
8.set	0.00628*** (0.00225)				
Order in set	-0.000724*** (0.000247)	-0.000680*** (0.000260)	0.000667 (0.00201)	-0.000815* (0.000444)	-0.000499 (0.000327)
Constant	0.0202*** (0.00197)	0.0257*** (0.000936)	0.0318*** (0.00377)	0.0269*** (0.00167)	0.0190*** (0.00151)
<i>N</i>	52081	52081	10317	20673	20585

*Notes:* Regression of 1[donate] on beneficiary order and set counter with beneficiary FE. Observation unit is donor-beneficiary dyadic pair. Standard errors are clustered at donor- and beneficiary-level, displayed in parenthesis. Sample is from Oct 2020-Jun 2021, excluding outliers. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table 2.6:** Impact of display order within set on the value of donation

	(1)	(2)	(3)	(4)	(5)
	Donation	Donation	Donation   Set3	Donation   Set8	Donation   Set10
3.set	1757.8*** (548.1)				
8.set	1037.8* (551.0)				
Order in set	-61.59 (68.60)	-65.11 (70.64)	551.7 (490.0)	-78.09 (94.25)	-59.59 (108.8)
Constant	2984.8*** (438.7)	3772.6*** (266.5)	3240.6*** (953.8)	4022.8*** (362.3)	3073.1*** (522.4)
<i>N</i>	52081	52081	10317	20673	20585

*Notes:* Regression of donation values on beneficiary order and set counter with beneficiary FE. Observation unit is donor-beneficiary dyadic pair. Standard errors are clustered at donor- and beneficiary-level, displayed in parenthesis. Sample is from Oct 2020-Jun 2021, excluding outliers. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table 2.7:** Correlations between beneficiary characteristics and donation outcomes

	(1)		(2)	
	donatedummy		value	
female_RA	0.004**	(0.002)	1483.831***	(556.906)
nonislam_RA	0.001	(0.003)	36.712	(915.142)
tlgpungung_RA	0.007**	(0.003)	1657.121**	(843.941)
Greater Jakarta	-0.005**	(0.002)	-875.625*	(446.963)
Java	0.007**	(0.003)	487.031	(1018.497)
ojek_RA	0.003	(0.008)	2264.356	(2596.902)
Facebook	0.005***	(0.002)	664.197	(714.162)
Instagram	0.002	(0.002)	-636.623	(988.756)
Twitter	-0.002	(0.003)	-268.699	(765.648)
Gopay	0.015***	(0.003)	2738.133***	(1055.255)
Dana	-0.002	(0.003)	-368.566	(699.311)
Jenius	0.009	(0.006)	937.303	(1042.590)
Ask amount (x100K)	0.000	(0.000)	39.328	(25.132)
Narrative (x50 words)	0.007**	(0.003)	1876.996**	(758.137)
Ask duration	-0.000	(0.001)	403.429*	(238.887)
formallang_RA	-0.001	(0.001)	-398.258	(413.387)
phk_RA	0.003	(0.002)	180.955	(611.065)
Order in set	-0.001*	(0.000)	-47.963	(73.789)
Permanent employee	-0.000	(0.002)	994.652**	(499.371)
Arts	-0.003	(0.003)	65.817	(590.100)
Education	0.017***	(0.006)	4075.831**	(1827.939)
Health	0.003	(0.005)	-799.616	(899.154)
rantau_RA	0.009	(0.009)	5278.413	(5263.245)
pelajar_RA	0.005	(0.010)	1020.205	(2032.460)
tdkpasti_RA	0.006***	(0.002)	1548.081**	(703.861)
potonggaji_RA	0.001	(0.004)	1628.627	(1924.480)
byrhutang_RA	-0.002	(0.004)	-747.158	(763.160)
byrkos_RA	-0.005	(0.004)	-2234.843	(1633.732)
makanan_RA	0.012**	(0.005)	4396.200*	(2447.482)
bukausaha_RA	0.003	(0.005)	253.260	(1142.755)
berhutang_RA	0.005	(0.012)	-1415.163	(1648.442)
ambiltabungan_RA	-0.005	(0.006)	-2756.001	(1736.811)
kerahbiru_RA	0.007***	(0.002)	1416.072**	(637.897)
lengthonsite	-0.000**	(0.000)	-3.540	(4.013)
Constant	-0.009	(0.007)	-3309.578*	(1692.172)
r <sup>2</sup>	0.224		0.095	
N	20690		20690	

*Notes:* Regression of donation outcomes on beneficiary characteristics with donor session FE. Observation unit is donor-beneficiary dyadic pair. Standard errors are clustered at donor- and beneficiary-level, displayed in parenthesis. Sample is from Oct 2020-Jun 2021, excluding outliers. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table 2.8:** Bagirata Users Self-Declared Preferences of Donation

	All	Donors	Survey only
Very likely give to Breadwinner	.71	.86	.68
Very likely give to ChronicPoor	.77	.85	.76
Very likely give to Laid off/bad shock	.72	.82	.7
Very likely give to Female	.54	.69	.53
Very likely give to SameEnviron	.61	.56	.62
Very likely give to LessEdu	.46	.53	.45
Very likely give to SameRelig	.58	.49	.6
Very likely give to SameEthnic	.49	.42	.5
Very likely give to OtherDonorPick	.43	.34	.45
Very likely give to Young	.32	.32	.33
Observations	1716	216	1438

*Notes:* Survey responses from Oct 2020-July 2021.

## Chapter 3

# Religion, Education, and Development

Coauthored with Samuel Bazzi and Benjamin Marx

### 3.1 Introduction

Developing states face the challenge of becoming the sole legitimate provider of certain public goods (Weber, 1922). Throughout this process historically, European states “frequently found the traditional authorities allied with the people against them” (Tilly, 1975). In other settings, states still compete with a variety of incumbent informal providers, whether in the domains of tax collection (Olken and Singhal, 2011b), health (Lowe and Montero, 2019), policing (Blattman et al., 2021), or justice (Acemoglu et al., 2020). Central to this challenge is how alternative providers adapt to government reforms, and how these responses might shape modernization and development.

Education is a key sector in which non-state actors compete with the state. Competition in education markets has far-reaching consequences as schooling might affect ideology, identity, and nation building (Akerlof and Kranton, 2002; Alesina et al., 2021). Recent work has examined the link between schooling reforms and culture (Bandiera et al., 2019; Cantoni et al., 2017) but has not explored the competitive response to state expansion in education markets, nor its potential to trigger a backlash (Fouka, 2020). In this paper, we examine how the interplay between state and religious schools, the main historical providers of education, affects educational ex-

pansion and cultural change.

We explore the political economy of education reforms in Indonesia, the world's largest Muslim country. Millions of Indonesians were educated in religious institutions historically, and around one-fifth of students attended Islamic schools in 2019. This dual system persisted despite many attempts by the state to reform it. In the 1970s, the country underwent a drastic expansion of its public schooling system through the celebrated *Sekolah Dasar* Presidential Instruction, or SD INPRES (Dufflo, 2001). This policy not only increased access to public primary education, but also aimed to secularize education through the adoption of a single, identity-building national curriculum (Boland, 1982; Kelabora, 1976). We study how Islamic schools adapted to this landmark policy and mitigated its impacts.

We develop a new theoretical framework to guide the analysis. The model first sheds light on the segmentation of education markets before mass public schooling. Public and religious schools target segments of the population with different underlying preferences; the latter prioritize either the more religious markets or any markets underserved by the state. An increase in the state budget allows public schools to enter new markets. This budget expansion also increases the number of markets served by religious schools and leads to greater curriculum differentiation inside religious schools, especially in crowded markets and in markets that were not previously served by the state. Introducing secondary schooling further changes the incentives faced by religious schools, which no longer seek to avoid competition from state schools but actively prioritize markets with large demand for secondary schooling.

Our analysis identifies dynamic effects of SD INPRES on education markets and exposed cohorts. Several novel data sources allow us to explore how the policy shaped multiple dimensions of schooling content and cultural outcomes. Nationally-representative surveys capture Islamic school choice, and administrative data record

the universe of schools with date and location of establishment. The latter comprise nearly 220,000 secular and 160,000 Islamic schools, including day (*madrassa*), boarding (*pesantren*), and Qur’anic study schools (*diniyah*). Additional survey and administrative data help to identify local mechanisms for mobilizing and funding the Islamic sector response to SD INPRES. For some schools, we also observe a breakdown of curriculum hours in 2019, which we use to measure religious instruction and to identify shifts in ideological differentiation. Together, these data enable us to characterize supply- and demand-side responses over the ensuing decades.

Using a suite of difference-in-differences (DID) methods, we evaluate how SD INPRES affected Islamic school entry at different levels of policy variation and market aggregation. The state allocated schools across districts proportional to their non-enrolled-student population. The theory clarifies why such targeting *de facto* implied greater SD INPRES construction in markets with more Islamic schools. Motivated by this insight, we estimate DID specifications that flexibly account for differential trends in Islamic education at the district level and deploy the new synthetic DID approach (Arkhangelsky et al., 2021), which is more robust to potential violations of parallel trends. We also use our granular administrative data to exploit, for the first time, the staggered entry of INPRES schools at the village level.

Islamic school construction increased in areas where the state built more primary schools. We find increased entry at the primary level, where new *madrassa* provided a substitute to newly built public primary schools. Meanwhile, at the secondary level, *madrassa* strategically entered new markets to capitalize on growing demand for continued schooling among INPRES graduates, especially in markets where the state was not building junior secondary schools. This dynamic response ensured that the state expansion in education markets failed to crowd out Islamic schools. Informal boarding schools and afternoon Qur’anic study schools also entered, but

the prevalence of these informal institutions decreased as a fraction of all new Islamic schools. Such formalization, triggered by SD INPRES, further bolstered the resilience of the Islamic school system in the medium to long run.

The new *madrassa* entering high-INPRES districts after the program also provided more religious curriculum. Our model shows that such differentiation was necessary for Islamic schools to remain competitive in the new market equilibrium. We measure differentiation based on classroom hours devoted to religious subjects, e.g., Islamic law, theology, and ethics, as well as Arabic instruction. The increase in Islamic content comes, in part, at the expense of core subjects in the standard curriculum, including study of the national language and *Pancasila*, the secular ideology of the state. While such differentiation may have helped to address heterogeneous preferences for different types of schooling, it also directly undermined the state's efforts to homogenize and secularize education.

The Islamic sector leveraged its own resources and taxation mechanisms to respond to the state's mass schooling effort. While windfall oil revenues allowed the regime to build more than 61,000 schools between 1973–80, a simultaneous spike in the global price of rice increased revenue mobilization inside the largely informal Islamic taxation system. In addition, the Islamic sector leveraged inalienable religious endowments (*waqf*) to expand educational infrastructure. This revenue stream, built on private charity, supports Islamic investments in education markets across the Muslim world. We show that the entry response was stronger in villages with a larger *waqf* base before INPRES and greater exposure to the concurrent rice price shock. Meanwhile, capacity constraints inside public secondary schools likely facilitated the absorption of SD INPRES graduates in the Islamic school system.

As a result of these market dynamics, the policy increased exposure to formal (*madrassa*) Islamic education. Among exposed cohorts, SD INPRES decreased Is-

lamic elementary enrollment. However, *madrassa* absorbed some of the demand for secondary education that resulted from mass primary schooling.<sup>1</sup> The Islamic sector capitalized on this excess demand among INPRES graduates in some markets while also building more primary schools to compete locally with SD INPRES in others. We show that in markets where elementary *madrassa* also entered, the two types of schools acted as substitutes in generating years of education. Overall, demand effects at the secondary level offset substitution effects at the primary level and increased the likelihood that exposed cohorts attended a formal Islamic school. Thus, SD INPRES increased not only years of schooling but also, unexpectedly, exposure to *madrassa* education.

The model suggests that heterogeneous preferences determine the extent of market segmentation before mass schooling and shape demand-side responses thereafter. Empirically, we show that female students exhibit weaker substitution effects at the primary level, where *madrassa* offered an alternative to parents wary of educating their daughters in secular public schools, especially after a ban on female veiling in those schools. While SD INPRES had more limited impacts on total years of schooling among girls (roughly half the size among boys), those impacts might have been even more limited if not for the new Islamic elementary options. Families were also more likely to send their children to an Islamic (secondary) school in high-INPRES regions with deeper historical support for Islamic politics.

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<sup>1</sup>Auxiliary data from the Indonesian Family Life Survey suggest that nearly 80% of students in Islamic secondary schools attended public primary schools, and Indonesia is perhaps not unique in the prevalence of public-to-private transitions. In a series of studies, James (1987a,b, 1993) observed, across many countries, that excess demand for secondary education was an inevitable outcome of mass primary schooling interventions and a potential driver of growth in private secondary schools. An advisor to the Indonesian government observed that “[i]n 1972, any plan that rapidly increased the number of students going beyond grade 6 would have resulted in grave problems of accommodation” (Beeby, 1979, p. 193). Moreover, a budgetary shock in the early 1980s due to declining oil revenue led to cutbacks in education spending, possibly frustrating the state’s planned investments in secondary education. This created an opening for the Islamic sector in the years after SD INPRES.

These results open a new window into the celebrated SD INPRES program and help explain the surprising political and ideological legacy of mass schooling. The school expansion did not benefit the autocratic President Suharto's political party, *Golkar*, in the 1977 and 1982 elections, nor after 1987 when affected cohorts began to vote. In the medium to long run, school-age exposure to SD INPRES did not increase support for *Pancasila*, use of the national language, or affinity with secular principles. Instead, exposed cohorts are more literate in Arabic (a core part of Islamic school curriculum) and exhibit greater piety across a range of Islamic practices. Among legislative candidates in the 2019 election, exposed cohorts are more likely to run with an Islamic party than with *Golkar* and less likely to campaign on nation-building themes. Finally, Arabic literacy among affected cohorts is passed on to children in the next generation. Overall, the policy did not bolster support for the regime nor adoption of a secular Indonesian identity. At the same time, the greater piety among INPRES-exposed cohorts was not accompanied by greater radicalization, measured via support for *sharia* law. Thus, while the state failed to curb religious influence in society, it did successfully stifle Islamism inside the classroom.

Our paper provides a new framework for understanding competition between the state and other providers of public goods over the course of development. While our focus is on education, the dynamics we study apply broadly to, e.g., interactions with informal tax systems or the challenges of imposing a monopoly on violence. Competitive frictions between state and non-state actors are especially salient in development settings, where limited capacity often leads states to outsource service delivery (Banerjee et al., 2019; Romero et al., 2020). Equipped with rich data on both formal and informal schools, we provide original insights on the challenges associated with the formalization process. Our findings have implications for many settings where dual systems of governance involving traditional, informal, or religious authorities

have endured (Acemoglu et al., 2014; Basurto et al., 2020).

Building on research across the social sciences, we also provide novel evidence on the role of education in nation building (Anderson, 1983; Boli et al., 1985; Erasmus, 1516; Gellner, 1983; Green, 1990). Recent work shows that mass schooling is introduced during periods of social conflict (Paglayan, 2022) and describes the strategies used by states to engage with religious schools (Ansell and Lindvall, 2013).<sup>2</sup> Our key innovation lies in understanding how the responses by non-state actors shape the impacts of mass schooling. Squicciarini (2020) shows how Catholic schooling slowed the diffusion of technical knowledge in 19th century France (see also Franck and Johnson, 2016); West and Woessmann (2010) argue that such backlash was pervasive in European states with a large Catholic population but where Catholicism was not the state religion.<sup>3</sup> In contrast, we explore competition between state and non-state schools after one of the largest school expansion programs ever implemented. Ultimately, the Islamic sector response contributed to the program’s limited impacts on secular nation building.

Prior work on SD INPRES has not explored market dynamics or the program’s nation-building consequences. Akresh et al. (2018) and Mazumder et al. (2019) explore intergenerational effects on similar outcomes as Duflo (2001), while Ashraf et al. (2020) study effects on ethnic groups with a bride price tradition. Martinez-Bravo (2017), Roth and Sumarto (2015), and Rohner and Saia (2019) explore impacts on governance, intergroup tolerance, and conflict. We expand the scope of analysis to provide new insights into the political economy of schooling reforms. Our findings

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<sup>2</sup>Alesina et al. (2021), Paglayan (2021), and Testa (2018) study why non-democratic regimes engage in mass schooling. In the U.S., Bandiera et al. (2019) link the rise of compulsory schooling to nation-building efforts in response to mass immigration. Cantoni et al. (2017) study how a curriculum reform affected political attitudes in China. Other studies show that (public and private) education fosters civic values and engagement (Andrabi et al., 2020; Dee, 2004; Larreguy and Marshall, 2017).

<sup>3</sup>On cultural backlash to state schooling policies, see also Fouka (2020) and Sakalli (2019) for examples from the U.S. and Turkey.

on the market consequences of SD INPRES inform our understanding of education policy in societies with a strong non-state schooling sector.

These insights also advance the literature on education and its consequences for religious transmission. Some have explored the returns to Catholic schooling (Altonji et al., 2005; Neal, 1997), while others provide background on Islamic schooling in Muslim societies (Andrabi et al., 2006; Berman and Stepanyan, 2004). Few studies distinguish between private secular and religious schools, which often pursue distinct ideological objectives. Together, our findings suggest that mass public schooling in Indonesia fell short of its ideological objectives through a combination of exposure to religious education and increased transmission of Islamic values (as in Bisin et al., 2020; Carvalho et al., 2022). As a result, religiosity did not wane in the long run. As such, our paper is among the first to link educational expansion to greater piety, at the expense of secularization objectives.<sup>4</sup> We provide a novel answer to the puzzle of enduring religion in modernizing societies: religious institutions vary in their capacity to adapt to secularization, and religious schools can provide a relevant substitute to public education.

### **3.2 Political Economy of Education in Indonesia**

Indonesia’s vibrant Islamic education sector reflects the enduring role of religious schools in a country home to more than 230 million Muslims. This section provides relevant background on the origins and the resilience of the country’s dual education system.<sup>5</sup>

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<sup>4</sup>Many studies show that education weakens religious practice (e.g., Hungerman, 2014), with examples in Germany (Arold et al., 2022; Becker et al., 2017) and Turkey (Cesur and Mocan, 2018; Gulesci and Meyerson, 2016). However, across countries there is considerable heterogeneity in the education–religiosity relationship (see Appendix Figure C.11).

<sup>5</sup>Appendix C.3 presents qualitative accounts from Islamic schools constructed during the mass schooling era. These oral histories provide additional insights into the legacy of competition between religious and state schools.

### 3.2.1 Origins and Characteristics of the Dual Education System

Indonesia's education system has historically been comprised of secular and religious schools. The former were modelled after the Dutch system and first built en masse during the colonial era. After 1945, Indonesia's new leaders sought to solidify the status of these schools. Amidst heated debate about the place of Islam in the young nation, they opted for a state-run secular education system governed by the Ministry of Education and Culture (MEC) and sought to diminish the influence of religious schools.<sup>6</sup>

Islamic schools long predated secular schools. The country's first religious schools were the *pesantren*, a type of boarding school blending Islamic and Javanese pedagogical principles. The oldest *pesantren* in our data was founded in the 15th century. Contemporary *pesantren* are dedicated to the study of Islam, face little regulatory oversight, and offer instruction across multiple ages often in the same classroom.

*Madrassa*, the main type of Islamic school operating today, are day schools that use methods similar to secular schools but offer more religious content. Inspired by reformist influences from Egypt, they appeared in Indonesia in the early 1900s as an attempt to modernize Islamic education and to counter growing Western influence (Kelabora, 1976; Kuipers, 2011). *Madrassa* operate at the same levels as secular schools, from primary to junior secondary to senior secondary, but teach a range of religious subjects that are not covered in the latter. This includes Islamic law (*fiqh*), doctrine (*aqidah*), ethics (*akhlaq*), the Qur'an and traditions of Prophet Muhammad (*hadith*), Arabic language, and history of the Prophets (*qisa al-anbiya*). The data described in Section 3.4 show that *madrassa* devote 26% of instruction hours to religious content on average with considerable variation (standard deviation of 6%).

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<sup>6</sup>In 1958, a reform effort failed to limit religious instruction time to 21–28% of study hours inside Islamic schools. Throughout the Sukarno era (1945–67), “the strong commitment of the Muslim community to having their own education system ... made it impossible for the government to replace Islamic schools with non-religious schools” (Zuhdi, 2006, p. 75).

Meanwhile, only 5% is devoted to *Pancasila* and Civic Education and an additional 5% to Indonesian language and literature. Beyond the formal *madrasa*, more informal schools known as *madrasa diniyah* focus largely on Qur'anic study, often operate in the afternoon, and attract students who attend public schools in the morning.

Although officially under the purview of the Ministry of Religious Affairs (MORA), the Islamic education sector is highly decentralized with most establishments run through autonomous *waqf* endowments. *Waqf* provide the land on which schools are built and some of the revenue to cover construction and operating costs. Under Islamic law, assets held in *waqf* are inalienable and can only be used for a religious or charitable purpose. Bazzi et al. (2020) show how land transfers into *waqf* across much of the country in the 1960s allowed Islamic institutions such as *pesantren* and *madrasa* to thrive and ensured their financial autonomy for decades to come. These types of transfers would prove useful in funding the Islamic sector's response to mass public schooling in the 1970s and beyond. In addition to *waqf*-based financing, voluntary faith-based contributions (*infaq*) and obligatory alms (*zakat*) are important sources of revenue for Islamic schools. Large Islamic organizations run only a small fraction of all Islamic schools, but they are important vehicles for mobilizing these community contributions.<sup>7</sup>

Islamic schools comprise the majority (more than 60% in 2019) of all private schools, and within many markets, private school choice is effectively tantamount to Islamic school choice. Unlike non-religious private schools, Islamic and state schools charge minimal fees. According to 2015 household survey data (*Susenas*), average annual costs of primary *madrasa* were USD 20 compared to USD 21 for primary public, and students report traveling similar distances to attend each type of school. This suggests ample scope for local competition, something observed in the early

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<sup>7</sup>One of the large Islamic organizations, *Muhammadiyah*, operated roughly 1,900 or 3.6% of all *madrasa* in 2019. However, *Muhammadiyah* also controlled over 3,000 hectares of *waqf*-endowed property as of 2004 (Jahar, 2005).

1970s as well: “[e]xcept for the small number who can afford the more expensive private schools, the only significant choice at the primary level is between schools under the Education Department [i.e., SD] and religious schools” (Beeby, 1979).

At the time of writing, Islamic schools enroll 21% of Indonesia’s 60 million students (Appendix Table C.14). More than two-thirds of these students attend formal *madrassa* with the remainder in *pesantren*. The rest attend secular schools, the vast majority of which are public, especially at the primary level.

### 3.2.2 The Politics of SD INPRES

Despite multiple reform attempts, Indonesian governments under President Sukarno failed to homogenize the country’s education system and to achieve universal primary schooling. In the 1960s, the country appeared deeply divided and a new regime, President Suharto’s New Order, took hold after mass violence decimated a burgeoning Communist movement.

Suharto prioritized universal public education as part of a broader secular nation building agenda at odds with organized Islam. Confrontation emerged across multiple domains besides education. In the early 1970s, the state enacted a Marriage Law challenging Islamic marital norms traditionally enforced by Islamic courts (Cammack, 1989). The regime considered formal state recognition of indigenous animist religions, something Islamic leaders had long opposed. In 1973, the regime forced four existing Islamic political organizations into the umbrella United Development Party (*Partai Persatuan Pembangunan* or PPP). In 1977, the regime forced the PPP to drop Islamic symbolism (the Kabah shrine in Mecca) from its party symbol, and in 1984 forced it to adopt *Pancasila* as its official ideological platform.

The regime had tried in 1967 and again in 1972, failing both times, to convince Islamic schools to become state-run and to reduce their religious curriculum in exchange for greater fiscal subsidies. At the same time, Suharto’s political party,

*Golkar*, captured the Association for the Improvement of Islamic Education (known by its acronym, GUPPI). Less than a decade later in 1982, the government effectively banned the Islamic veil for girls inside public schools.

It is in this conflictual period that the government launched SD INPRES. With windfall oil revenues, the regime allocated considerable resources for primary school construction. Presidential Instruction No. 10/1973 and subsequent yearly decrees specified funding allocations to each district as a function of the child population not enrolled in school. In total, up to 61,000 schools were constructed between 1973–80 under the program, with districts receiving between 16 and 824 new elementary schools.<sup>8</sup>

Parallel to the school expansion program, a 1972 decree stipulated that all formal education must be administered by the MEC. This was strongly opposed by Muslim leaders and abandoned in 1975.<sup>9</sup> The regime also intended to expand secondary school construction after SD INPRES implementation. However, due to rapidly declining oil prices in the early 1980s, budgetary resources dried up, leaving the country with far fewer secondary public schools than anticipated by planners in the 1970s.

This vast educational reform agenda aimed at secularizing and homogenizing primary education. Civic education was to supplant certain Islamic subjects, while instruction was to take place in the national language, *Bahasa* Indonesia, rather than local ethnic languages or Arabic. The goal was to build a citizenry steeped in the inclusive *Pancasila* ideology and invested in the national identity. A World Bank (1989) report notes that “...public education was viewed by the Government as a key medium for promoting national unity—first, through instruction in *Pancasila*, and

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<sup>8</sup>The Presidential Decrees for 1973–74 (INPRES 10/1973 and 6/1974), 1975–76 (6/1975 and 3/1976), 1977–78 (3/1977 and 6/1978) and 1979–80 (12/1979 and 6/1980) authorized grants for 6,000, 10,000, 15,000, and 14,000 new schools, respectively.

<sup>9</sup>According to Zuhdi (2006, p. 89), Muslim leaders believed the Decrees “intended, among other things, to weaken the status of the Islamic educational institutions ... they assumed that the government was trying to eliminate these latter ...”

next through instruction in the national language” (p. 14), and that “[i]n so large and dispersed a country . . . policymakers have consistently looked to neighborhood primary schools as vehicles for national integration” (p. 35).

Given its objective to expand public schooling, SD INPRES was prone to confrontation with the Islamic sector. The policy rule allocated resources proportional to the non-enrolled primary-school-age population at the district level within provinces. This meant building more schools in areas with greater unmet demand for formal education, where Islamic schools historically had a higher presence. Section 3.3 offers a rigorous foundation for interpreting SD INPRES allocation across education markets, and Section 3.5.1 provides evidence of targeting of communities long served by Islamic schools.

Yet, it seems unlikely that the state accounted for Islamic enrollment rates in the policy design. The SD INPRES guidelines were vague about how Islamic education should be treated. Decrees were only addressed to the Minister of Education and not the Minister of Religion who oversaw *madrasa*. An important article early in the original decree (10/1973) references students not accommodated in public elementary schools, but later discussions of the proportionality rule merely refer to children who have not been accommodated without specifying the type of school. Furthermore, the proportional targeting was informed by the 1971 Census, which did not distinguish Islamic school enrollment. Observers at the time noted that official “targets have no reference to children enrolled in primary Madrasah” (Beeby, 1979, p. 196) and that the low enrollment rates in official data for some regions “could well be a function of the number of children who attend madrasah instead of sekolah dasar” (Orr et al., 1977, p. 133).

Even though the state may not have been actively trying to target Islamic sector strongholds, this would have been a natural perception among many in the Muslim

community, especially as the authoritarian regime became entrenched. Such tensions emerged in accounts from Islamic school leaders at the time (see Appendix C.3). Islamic school staff were required to take courses in *Pancasila*, accused of mobilizing for the PPP, and pressured to join GUPPI. In some communities, preachers urged congregants not to send their children to SD INPRES, which were derided as “school in hell” (*sekolah dalam neraka*) using a twist on the official acronym (*sekolah dasar negeri* or SDN).

Ultimately, the realized allocation of SD INPRES came from observable policy variation across districts and unobservable decisions by local officials within districts and over time. We prioritize the former variation in much of our analysis while using the latter to characterize hyper-local school entry dynamics. We also microfound and provide empirical evidence for the proposed correlation between Islamic school enrollment and the official enrollment rates used to target SD INPRES.

### 3.3 Theoretical Framework

In this section, we develop a general framework for understanding the interplay between public and religious schools. The extent to which religious schools can mitigate the impact of education reforms depends on the nature of competition in local markets as well as preferences for different types of schooling. We characterize local market conditions before the introduction of mass public schooling, as well as the response of religious schools to a windfall in the state budget allowing it to serve all markets.

This setup offers several new insights that can inform empirical analyses of school reforms in diverse societies. Before the advent of mass education, public and religious schools generally avoid serving the same markets. Budget constraints in each sector lead to market segmentation: religious schools enter (i) markets where the state has not entered, or (ii) markets where the state has entered but preferences are

sufficiently diverse to support both types of schools. Because of this separation, a state-led educational expansion necessarily targets markets with a greater prevalence of religious schools. This expansion creates political frictions as new religious schools further differentiate their curriculum. In Appendix C.2, we show that mass primary schooling also increases demand for secondary education and leads religious schools to prioritize different markets, including those where the state has previously entered.

### 3.3.1 Setup

The model features  $N$  markets each home to a unit mass of students with heterogeneous preferences for religious schooling. The state and religious sectors each aim to maximize total student enrollment, and they compete through market entry and curriculum choices. Each market can support a state school  $s$  and/or a religious school  $r$ . Preferences are uniformly distributed over  $[0, J]$ , and  $J$  varies across markets. Schools compete on a line à la Hotelling (1929) with students ordered from most secular to most religious. Student  $i$  has preferences  $\rho_i \in [0, J]$  and receives fixed utility  $u_{i(k)}$  from school  $k$ :

$$u_{i(k)} = v_k - (x_k - \rho_i)^2$$

where  $x_k$  denotes school curriculum and  $v_k$  school quality. We assume that state schools have higher quality than religious schools but that this quality differential is not large enough to enable the state to capture all demand, i.e.,  $v_r < v_s < 2v_r$ .<sup>10</sup> Student  $i$  attends school  $k$  if  $u_{i(k)} > 0$ , and otherwise chooses the school that maximizes  $u_i$ .

State and religious schools offer different curricula. At one end of the spectrum,  $s$  must provide a secular curriculum,  $x_s = 0$ . This captures the state's objective to standardize and secularize education. Religious schools endogenously choose their

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<sup>10</sup>We further assume  $J > 2\sqrt{v_r}$  to focus on the case where markets are large enough to accommodate at least one school, be it  $s$  or  $r$ . Evidence on test-score differentials support the assumption about average quality differences (see Appendix C.1.3).

curriculum,  $x_r > 0$ .

To enter any market, a school must pay a fixed cost of 1. The state initially has budget  $S < N$ , preventing it from entering all markets. The budget of the religious sector is a constant fraction of the state's budget,  $R = \alpha S$ ,  $\alpha \in (0, 1)$ . Intuitively, the state and the religious sector raise revenue from the same tax base, but the religious sector has inferior tax capacity. We also use  $\alpha$  as a reduced form representation of the strength of Islamic institutions in terms of their capacity to mobilize resources. More generally, this parametrization reflects the idea that income shocks that enable the state to fund mass schooling reforms may also trickle down to other segments of society, including non-state providers of education.

**Timing.** The timing of the game is as follows:

1. The state decides which markets to enter.
2. The religious sector decides which markets to enter.
3. Each religious school  $r$  sets curriculum  $x_r$  in the market where it entered.
4. Students in each market decide which school to attend, if any.

In what follows, we solve the model by backward induction. Then, we consider the effects of an exogenous windfall in the state's education budget. In Appendix C.2.1, we provide all proofs. In Appendix C.2.2, we extend the model to allow religious schools to also provide secondary education.

### 3.3.2 Equilibrium

**Stage 4 (student choice).** In the final stage, each market may be served by a state school  $s$ , a religious school  $r$ , both schools, or no school. In markets with only  $s$ , all students who satisfy  $\rho_i \leq \sqrt{v_s}$  will attend  $s$ , and the total mass of these students

is  $\sqrt{v_s}$ . In markets with only  $r$ , all students who satisfy  $\rho_i \in [x_r - \sqrt{v_r}, x_r + \sqrt{v_r}]$  will attend  $r$ . Given  $J > 2\sqrt{v_r}$ , in stage 3 school  $r$  will choose  $x_r$  such that its enrollment equals  $2\sqrt{v_r}$  in these markets. In markets with both  $s$  and  $r$ , any student satisfying both  $\rho_i \leq \sqrt{v_s}$  and  $\rho_i \in [x_r - \sqrt{v_r}, x_r + \sqrt{v_r}]$  will choose to attend  $s$  over  $r$  if and only if:

$$(v_s - v_r) \geq x_r(2\rho_i - x_r)$$

Intuitively, students compare the benefit of higher schooling quality inside  $s$  with the benefit of more religious education inside  $r$ . Note that this constraint matters if and only if  $x_r < \sqrt{v_s} + \sqrt{v_r}$ .

**Stage 3 (curriculum choice).** In markets where it operates alone,  $r$  can pick from a range of  $x_r$  that yield a payoff of  $2\sqrt{v_r}$ . The range of optimal curricula is given by  $x_r \in [\sqrt{v_r}, J - \sqrt{v_r}]$ . In markets served by both  $s$  and  $r$ , two cases arise. In the more religious markets (satisfying  $J \geq 2\sqrt{v_r} + \sqrt{v_s} \equiv \mathcal{M}$ ), which we call *major* markets,  $r$  is not constrained by competition from  $s$  and can choose any  $x_r$  that yields a payoff of  $2\sqrt{v_r}$ , e.g.,  $x_r = J - \sqrt{v_r}$ . In the less religious markets (satisfying  $J < \mathcal{M}$ ), which we call *minor* markets,  $r$  has a unique optimal choice of  $x_r = J - \sqrt{v_r}$ . In both cases, focusing on the most religious students by setting  $x_r = J - \sqrt{v_r}$  is always a best response for the religious school.

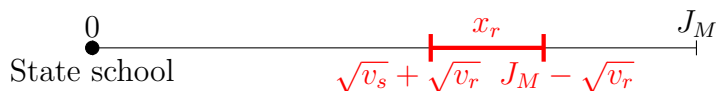
**Stage 2 (religious school entry).** From the perspective of school  $r$ , markets can be split into three groups: (i) major markets, (ii) minor markets with no school  $s$ , and (iii) minor markets with school  $s$ . The first two types of markets have value  $2\sqrt{v_r}$  to school  $r$ . The third market has value less than  $2\sqrt{v_r}$ , which is also increasing in the market's  $J$ . Thus, the religious sector will prioritize the first two types of markets, namely the more religious markets (higher  $J$ ) and less religious markets where the state has not entered. Only then, if it has any budget left over, will it enter remaining

markets in descending order of  $J$ .

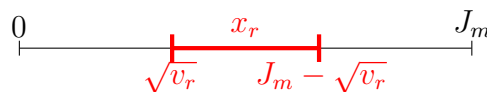
**Stage 1 (state school entry).** The state can enter up to  $S < N$  markets and anticipates that religious schools will be present in  $\lfloor R \rfloor$  markets. From the state's perspective, there are two cases to consider. Let  $m$  be the number of major markets satisfying  $J \geq \mathcal{M}$ . If the combined budget of both sectors is small enough (i.e., if  $S + R \leq N + m$ ), then the two sectors split markets in such a way as to never compete for the same students. That is, there is no minor market where both schools enter—the schools might enter the same major market but would split minor markets without overlap.

If  $S + R > N + m$ , then there are multiple equilibria where both schools enter *all* major markets and  $S + R - N - m$  of the largest minor markets, and split the remaining minor markets in a non-overlapping way. Multiple equilibria come from rearranging how the schools split the smaller minor markets, but all equilibria have them jointly enter every major market and a few of the largest minor markets. The figure below illustrates the equilibrium prevailing in each market where a religious school has entered, with the range of optimal curricula for the religious school highlighted in red:<sup>11</sup>

1. Major markets with a state school:

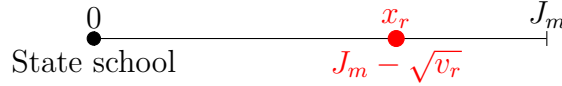


2. Minor markets with no state school:



<sup>11</sup>If  $S + R \leq N + m$ , then there may also be major markets with no state school, in which case school  $r$  sets  $x_r$  as in case 2. If  $S + R < N$ , then there are some markets where neither school  $s$  nor school  $r$  enters.

3. Minor markets with a state school:



Overall, this setup sheds light on the market segmentation that characterizes the education sector before the introduction of mass public schooling. State schools and religious schools target segments of the population with different underlying preferences, with the latter prioritizing either the more religious markets or less religious markets that are underserved by the state. Curriculum differentiation allows religious schools to maximize student attendance in crowded markets, but the absence of state schools in some markets implies that curriculum may be set at a lower (less religious) level in those markets.

### 3.3.3 Budget Windfall

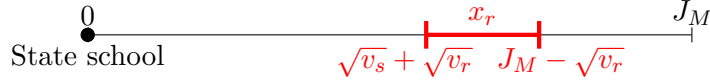
We now consider an exogenous increase in the state's budget to  $N$ . This allows the state to build schools in markets where it had not previously entered. In this case, there is an equilibrium in which the state enters all markets, whereas the religious sector enters  $\lfloor \alpha N \rfloor$  markets. If there are many major markets, where  $m \geq \lfloor \alpha N \rfloor$ , then the religious sector simply enters as many of them as it can afford. If  $m < \lfloor \alpha N \rfloor$ , then the religious sector enters all major markets and  $\lfloor \alpha N \rfloor - m$  of the largest minor markets, and this is a unique equilibrium. Regardless of the exact equilibrium outcome, the increase in the state's budget leads to a corresponding increase of  $\lfloor \alpha N \rfloor - \lfloor \alpha S \rfloor$  in the number of markets that religious schools enter, where  $S$  is the initial state budget before the windfall.

**Religious Curriculum.** The state's budget windfall affects the choice of curriculum for religious school  $r$ . Recall that in the baseline case, the optimal curriculum  $x_r$  depends on the type of market. In any market without  $s$ , any  $x_r \in [\sqrt{v_r}, J - \sqrt{v_r}]$

is optimal. In major markets with  $s$ , any  $x_r \in [\sqrt{v_s} + \sqrt{v_r}, J - \sqrt{v_r}]$  is optimal. In minor markets with  $s$ , the unique optimal choice is  $x_r = J - \sqrt{v_r}$ .

Mass public schooling affects curriculum choice in all markets where  $r$  previously was and  $s$  was not. In major markets where the state could not previously afford to enter, the set of optimal curricula shifts upward from  $[\sqrt{v_r}, J - \sqrt{v_r}]$  to  $[\sqrt{v_s} + \sqrt{v_r}, J - \sqrt{v_r}]$ , i.e., some of the less religious curricula are eliminated. In minor markets, the change is even more pronounced. All less religious curricula are eliminated, and the only optimal choice is the previous upper bound  $x_r = J - \sqrt{v_r}$ . As a result, mass public schooling increases incentives to further differentiate curriculum inside religious schools. The figure below illustrates the new equilibrium prevailing across major and minor markets.

1. Major markets:



2. Minor markets:



**Taking Stock.** The results above guide our analysis of the effects of SD INPRES on Islamic school entry, curriculum differentiation, and students’ school choice. There are four main implications to consider.

First, SD INPRES increases the number of markets where both types of schools compete and coexist. That is, we expect a to see a larger number of markets supporting both types of schools, rather than state schools crowding out religious schools in districts with higher SD INPRES intensity. In order to maximize enrollment, the religious sector continues to prioritize major markets, which are the same markets prioritized by the state in the process of educational expansion. If there were

previously markets served by neither sector, then mass schooling may lead to both sectors jointly entering these markets. Regardless of the exact baseline situation, mass schooling increases religious school entry.

Second, a higher fundraising capacity of the religious education sector (higher  $\alpha$ ) allows the latter to compete in more markets. If we allow  $\alpha$  to vary across markets (e.g., if the funds raised for Islamic school construction are not fully fungible across markets), then the markets with higher taxation capacity should see relatively more religious school entry.

Third, the entry of state schools in new markets induces religious schools to differentiate towards more religious curriculum in those same markets. In the model, such differentiation is needed for the religious sector to minimize the potential loss in enrollment induced by mass public schooling. In practice, if schools face frictions in their ability to adjust curriculum over time, then we expect newer schools founded after SD INPRES to be more differentiated on curriculum than older ones.

Finally, introducing religious secondary education makes it relatively more likely that Islamic schools will locate in the same markets as public schools, as they seek to capture excess demand from primary graduates educated in either sector. This also increases incentives to make curriculum more religious at the primary level. Appendix C.2.2 discusses the formal details underlying this last set of predictions. We turn now to a discussion of the novel data that allow us to test these hypotheses.

### 3.4 Data

We explore the effects of SD INPRES on education markets by combining survey data on Islamic education with administrative data on Islamic school construction and curriculum. Additional data sources, described in Section 3.7, help establish how the policy shaped downstream nation-building outcomes.

**Survey Data on Schooling.** We measure Islamic school attendance and other information on education status using six rounds of the National Socioeconomic Survey (*Susenas*) from 2012–2018. These surveys report breakdowns of *madrassa* and secular education as well as information on birthplace, which is needed to identify childhood exposure to SD INPRES. *Susenas* does not record informal (*pesantren*) Islamic education. Moreover, it only identifies school type for the final level of attainment and hence misses switching across Islamic and secular schools. We revisit this in Section 3.6.1, where we also use the Indonesia Family Life Survey (IFLS) for validation. The IFLS is a longitudinal survey spanning 1993 to 2014, which unlike *Susenas* records schooling type for each year of education. However, the IFLS has limited geographic scope, which complicates analyses of policies with spatial variation like SD INPRES. Appendix Table C.14 reports Islamic schooling rates in the IFLS, *Susenas*, and administrative data.

**School Registries.** We use newly compiled administrative data from MORA comprising the universe of *madrassa* and *pesantren* active in 2019 (see Appendix C.4 for details). In total, there are 52,398 formal *madrassa* across different grade levels, 82,871 informal *madrassa diniyah* (Qur’an study schools), and 25,938 *pesantren* with establishment dates spanning more than 100 years. We rely on an analogous MEC registry of secular schools active in 2019. These data comprise 219,145 schools and include date of establishment, grade level, and private/public status. We address potential concerns about survival bias in these registries using a triennial administrative census of villages (known as *Podes*) beginning in 1980.

While *pesantren* may constitute an important part of the response to SD INPRES, their higher level of informality makes them more difficult to study than *madrassa*. *Susenas* does not record *pesantren* attendance as *pesantren* do not follow the national exams. Nor does the MORA registry clarify the level at which a given *pesantren*

organizes its instruction; many, in fact, teach students of all ages under one roof.

**School Curriculum.** We study curriculum using an online registry of schools, called *Sistem Informasi Aplikasi Pendidikan (SIAP)*. This database includes breakdowns of *madrasa* curriculum with hour-by-hour subject timetables each week. While the data cover nearly 20% of *madrasa*, secular schools do not report to SIAP, in large part because those schools offer much more standardized curricula, leaving little scope for (marketable) differentiation. The timetables provide a unique window into the learning environment at Islamic schools. Our main interest lies in time allocated to (i) Islamic subjects, including Arabic language and literature, (ii) *Pancasila*/civic education, and (iii) Indonesian language and literature.

### 3.5 Religious School Entry and Differentiation

This section establishes how SD INPRES shaped education markets in light of the model in Section 3.3. We begin by clarifying why the program appears to have targeted areas with a larger Islamic school sector. We then show how the Islamic sector responded. First, Muslim society, equipped with a mechanism for quickly mobilizing private resources (*waqf*), expanded religious schooling in locations with greater SD INPRES entry. Second, Islamic schools entering high-INPRES districts after the policy provide a greater volume of religious content. Third, SD INPRES incentivized formalization within the Islamic sector. Together, these results set the stage for understanding subsequent changes in religious school choice.

#### 3.5.1 Initial Placement of Islamic and SD INPRES

Section 3.3 shows that before mass schooling, religious schools mainly serve two types of markets: those without a state school and those with sufficiently heterogeneous preferences to host both religious and state schools. As a result, the introduction

of mass public schooling leads to the state entering many markets previously served solely by religious schools.

We test this conjecture in Figure 3.1. Panel (a) illustrates the policy rule: the number of INPRES schools allocated to a district is proportional to the population of children not enrolled in school in the 1971 Census. Panel (b) shows that, consistent with the model, Islamic primary schools are more likely to operate in areas underserved by the state. The elasticity of Islamic schools with respect to the unenrolled population is 0.84. This induces a strong correlation between the number of SD INPRES schools built and the pre-existing stock of Islamic schools (panel c). The elasticity of SD INPRES built with respect to existing Islamic schools, controlling for province dummies and the population of children not unrolled, is 0.19. The elasticity is similar in panel (d), which controls for the vote share of Islamic parties in the 1955 and 1957 elections, the last democratic contests before our study period.

Table 3.1 validates the graphical evidence in Figure 3.1 and offers additional insights. First, we find similar evidence of endogenous targeting using supply-side (column 1) or demand-side (column 2) measures of Islamic primary education. The latter is consistent with the *de jure* targeting rule not including Islamic school enrollment (see Section 3.2.2). Second, conditional on the prevalence of Islamic education, the vote share of Islamic parties in the 1950s is also positively correlated with SD INPRES allocation (column 4). This aligns with the model's prediction that the state would allocate more schools to markets with a greater range of religious preferences (even if those markets were not served by an Islamic school at baseline). Finally, column 5 provides more localized, village-level evidence on confrontation: INPRES schools were more likely to be built in villages with an Islamic elementary school and less likely in villages with a public or private (non-Islamic) elementary school.

Together, these results support the model's insights about SD INPRES allocation.

The state allocated more schools to areas with lower enrollment in formal educational institutions. It was in these areas that less formal religious schools had been more prevalent prior to SD INPRES. Thus, even though the state may not have explicitly aimed to contest religious schools' market power, this would have been the perception among Muslim leaders witnessing public schools being built in their communities for the first time. Such perceptions underlie the tension between the Islamic sector and the Suharto regime (Section 3.2.2). We turn now to evidence of competitive dynamics induced by the policy.

### 3.5.2 Islamic School Entry

This section characterizes the Islamic sector entry response to SD INPRES using two distinct identification strategies. The first relies on cross-sectional policy variation at the district level. The second exploits the staggered entry of SD INPRES at the village level.

**District Level.** We estimate a balanced panel specification at the district-year level from 1960–99:

$$y_{jt} = \theta_j + \theta_t + \beta \text{INPRES}_{jt} + (\mathbf{X}'_j \boldsymbol{\theta}_t)' \boldsymbol{\eta} + \varepsilon_{jt}, \quad (3.1)$$

where  $y_{jt}$  denotes the number of Islamic schools built in district  $j$  and year  $t$ , per 1,000 children in 1971, and  $\theta_j$  and  $\theta_t$  are corresponding fixed effects.  $\text{INPRES}_{jt}$  equals zero for all districts before 1972 and equals SD INPRES schools per 1,000 children thereafter. With  $\mathbf{X}'_j \boldsymbol{\theta}_t$ , we flexibly account for differential trends by interacting year fixed effects with (i) the INPRES targeting variables (i.e., the district's 1971 child population, school enrollment) and a concurrent governmental water and sanitation program (as in Duflo, 2001), and (ii) the prevalence in 1959 of Islamic elementary, junior secondary, senior secondary, and boarding schools, each separately. Standard errors are clustered at the district level.

We estimate equation (3.1) using a standard difference-in-differences (DID) as well as the new synthetic differences-in-differences (SDID) approach from Arkhangelsky et al. (2021). In the standard DID, we construct  $\text{INPRES}_{jt}$  as the interaction between the number of INPRES schools built per 1,000 children in district  $j$  between 1973–78 and a dummy variable for panel years from 1973 onwards. The synthetic DID approach reweights and matches pre-INPRES trends in Islamic school construction across high- and low-INPRES exposure districts. This delivers estimates that are more robust than standard DID to violations of parallel trends. For implementation, SDID requires a binary regressor; we set  $\text{INPRES}_{jt}$  equal to 1 for districts above the 51st percentile in INPRES school construction (in years  $\geq 1973$ ).<sup>12</sup>

Table 3.2 shows greater entry of Islamic schools in high-INPRES districts: formal *madrasa* at the elementary (column 1), junior secondary (column 2), and senior secondary level (column 3), the informal *pesantren* (column 4) and *diniyah* (column 5), and the total number of Islamic schools of all types (column 6). In the standard DID (panel a), a one standard deviation increase in INPRES schools leads to 0.013 more Islamic schools per district-year and per 1,000 children, i.e, 1.4 additional Islamic school entries in the average district relative to a mean entry of 1.9 Islamic schools per district in 1972. The SDID specification delivers positive and slightly larger estimates (panel b). This suggests that the increased supply of Islamic schools in high-INPRES districts is not an artifact of diverging pre-trends. Rather, the point estimates panels (a) and (b) are consistent with a break in trend around the mid-1970s as religious leaders and organizations mobilized in locations with greater public school entry.

We provide further evidence of this trend break in Figures 3.2 and 3.3, which plot

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<sup>12</sup>We use the 51st percentile rather than the median because the estimator requires the number of control units to be larger than the number of treated units. While SDID uses less INPRES variation, by necessity of this discretization, it offers more compelling “local” comparisons across districts and time periods in which parallel trends are more likely to hold.

event studies showing the dynamic response to the state’s primary school expansion. Figure 3·2 allows  $\beta$  in equation (3.1) to vary by semi-decade in the standard DID, and Figure 3·3 reports an analogous visualization for SDID. The latter tracks the annual variation in the high-INPRES (in red) and low-INPRES districts (in blue), and the straight lines and black arrow indicate the magnitude of the entry differential in the mid-1980s. Across both approaches, high-INPRES districts experience more secondary *madrassa* and *pesantren* entry after 1973. A similar pattern holds for elementary *madrassa*, though the village-based results below offer a clearer, more granular window into the entry response at this grade level.

*Robustness.* Several robustness checks point to a causal interpretation of the Islamic sector response. First, in addition to the SDID results being robust to violations of parallel trends, the formal procedure in Roth and Rambachan (2022) further validates the visual impression from Figure 3·2 of a lack of pre-trends in the standard DID (see Appendix Figure C·1).<sup>13</sup> Second, the patterns are unlikely to be an artifact of survivor bias in the 2019 registry of Islamic schools. Appendix Table C.2 shows that the increase in Islamic school entry after the 1970s can be seen in historical administrative data (from *Podes* 1980, 1983, 1990, 1993) that is not subject to the attrition biases inherent to contemporary administrative registries. Third, we show robustness to interacting year FE with several other factors associated with a stronger

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<sup>13</sup>This new approach departs from the usual visual inspection and testing for the significance of pre-trends—a procedure that has been criticized in recent work for its lack of theoretical foundation. Roth and Rambachan (2022) propose a novel method that formalizes the motivation behind pre-trends tests, namely that the counterfactual post-intervention trends cannot depart too much from the pre-trends. Their method circumvents the need for pre-trends testing, instead allowing for uncertainty over the magnitude of the true trends in the pre-period. In Appendix Figure C·1, we report confidence sets that answer how much the post-INPRES trends in Islamic school entry would need to differ from the pre-trends in order to nullify the findings. We compute these confidence sets allowing this “how much” factor  $\bar{m}$  to vary from 0 to 1.5 and find that for most outcomes the results break down at rather large values of  $\bar{m}$ , suggesting that our findings are unlikely to be driven by non-parallel trends. To invalidate the aggregate Islamic school entry results, we would need to allow for a post-INPRES violation of parallel trends that is more than 1.5 times larger than the maximal pre-treatment violation.

religious schooling sector historically, including the prevalence of *waqf* endowments in 1960, the Muslim population share in the 1972 Census, Islamic political party support in the 1950s, historical Arab minority populations, and the presence of an armed Islamist insurgency in the 1950s.<sup>14</sup> In this set of controls we also include an indicator for districts involved in an experimental compulsory schooling program after 1957 (see Section 3.6.1). Some of these factors shaped the Islamic sector response to SD INPRES as we show later, but Appendix Table C.1 shows that the core results in Table 3.2 are robust to allowing for differential trends with respect to these predetermined controls.

**Village Level.** The district-level estimates capture Islamic sector entry effects averaged across several local education markets. We now use a village-level specification to identify more local entry dynamics:

$$y_{vt} = \theta_v + \theta_t + \sum_{\tau=-5}^{10} \gamma_{\tau} \text{INPRES}_{v,t-\tau} + (\mathbf{X}'_v \boldsymbol{\theta}_t) \boldsymbol{\eta} + \varepsilon_{vt}, \quad (3.2)$$

where  $y_{vt}$  denotes Islamic schools built in village  $v$  in year  $t$  with corresponding fixed effects,  $\theta_v$  and  $\theta_t$ .  $\text{INPRES}_{v,t-\tau}$  is a binary indicator for each year until/after the first SD INPRES school is constructed from 1973 to 1978 (entry is normalized to  $\tau = 0$ ). The  $\mathbf{X}'_v \boldsymbol{\theta}_t$  vector includes the numbers of public and Islamic schools (combining *madrasa* and *pesantren*) in village  $v$  in 1959, each interacted with year FE. Standard errors are clustered at the village level.

We estimate equation (3.2) on a balanced panel from 1960 to 1999 using the robust and efficient estimator developed by Borusyak et al. (2021).<sup>15</sup> In robustness

<sup>14</sup>In the Indonesian context, support for Islamic parties correlates strongly with support for greater religious influence in various public domains including education (see Pepinsky et al., 2018). We draw on data compiled by Bazzi et al. (2020) to measure (i) Islamic political party support in the 1955 and 1957 legislative elections, (ii) ethnic Arab populations in the colonial era, and (ii) the presence of the Darul Islam movement, an insurgency aimed at establishing an Islamic state in Indonesia.

<sup>15</sup>This procedure (i) estimates fixed effects using untreated observations (i.e., villages with no SD

checks, we also use a shorter panel spanning 1968–83. By allowing for arbitrary effect heterogeneity, this estimator addresses the concern that the staggered entry of SD INPRES may have had time-varying effects, which complicates the interpretation of standard DID estimates. Such time-varying heterogeneity could arise if, for example, the Islamic sector responded more effectively later in the 1970s once the government’s secularization effort behind SD INPRES became more widely understood.

Although this specification provides more granular evidence of strategic Islamic school entry, it does so by eschewing the policy variation across districts and instead relying on differences in the timing of SD INPRES entry. While much of this variation at the village level is likely driven by idiosyncratic factors such as local administrative frictions and availability of funds, some of this variation in the timing of entry may also be endogenous with respect to latent and realized differences in religious schooling. Reassuringly, the Borusyak et al. (2021) estimator shows no evidence of pre-trends for Islamic (Figure 3.4) or non-Islamic private schools (Appendix Figure C.4). In Appendix Table C.3, we show that the timing of SD INPRES entry at the village level between 1973–78 is largely uncorrelated with the presence of various types of Islamic schools in 1972, as well as predetermined agricultural productivity (potential crop yields) and natural advantages (e.g., elevation, distance to the coast).

The results in Figure 3.4 provide further evidence of a dynamic Islamic sector response that varies across types and levels of schooling. Following largely flat pre-trends, the construction of an INPRES school is followed by a jump in the likelihood of Islamic school entry (panel a), which is driven in the short run by primary *madrasa* (MI) entry (panel b). The latter persists for roughly six years, and effect sizes imply a doubling of the baseline annual entry rate (roughly 0.002). Six years after SD INPRES entry, we see a reduction in MI entry back to baseline. This suggests that Islamic

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INPRES entry from 1973 to 1978), then (ii) imputes untreated outcomes for treated observations, and finally (iii) computes estimates of  $\gamma_\tau$  parameters as weighted averages over the differences between actual and imputed outcomes.

leaders sought to compete head-on with the newly built public primary schools in their communities.<sup>16</sup> At the same time, Islamic junior secondary school (MTs) entry peaks around year 6–9 after SD INPRES construction (panel b). This is intuitive and in line with the model extension in Appendix C.2.2. As SD INPRES students graduate (alongside those from newly built MI), MTs entered in order to capture some of their demand for continued education. In panel (c), we find smaller responses at the senior secondary (MA) level, perhaps in part because these schools tend to serve multiple villages.

In addition to greater entry of formal *madrasa*, SD INPRES construction is also associated with greater entry of informal Islamic schools. The patterns are stronger for Qur’anic study schools (panel e) than for Islamic boarding schools (panel d). Entry of the former ratchets upwards around the time when SD INPRES students would have acquired sufficient reading skills to engage with the Qur’an (2nd or 3rd grade). This is consistent with the common practice of attending SD INPRES in the morning and *madrasa diniyah* (MD) in the afternoon. Moreover, at the local level, formal elementary MI and informal MD appear to be substitutable: the post-INPRES entry dynamics are mirror images across panels (a) and (e), and 86% of the MD entering from 1973–78 were built in villages without any MI construction, while 91% of the entering MI were built in villages without any MD construction.

Panels (c) and (d) of Table 3.2 summarize the graphical evidence in a single DID estimate, providing similar takeaways as the district-level results in panels (a) and (b). These village-level results hold using a standard DID estimator (panel c) or the Borusyak et al. (2021) estimator (panel d), which suggests limited biases due to time-varying heterogeneity (see also Appendix Figure C.3).<sup>17</sup> This is reassuring as

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<sup>16</sup>The immediate Islamic elementary response, within a year of SD INPRES being built, is consistent with the very short time required to establish an Islamic school at that level through the use of informal financing (see Appendix C.3 for examples).

<sup>17</sup>Appendix Table C.4 shows that the Borusyak et al. (2021) estimates are robust to removing

it supports use of the standard DID estimator when looking below at interactions of SD INPRES entry and Islamic sector supply shifters. Overall, these results suggest that SD INPRES did not displace Islamic schools but instead increased options for both secular and religious education.

### 3.5.3 Financing New Islamic Schools

How did the Islamic education sector finance its expansion in the aftermath of SD INPRES? For decades, private Muslim actors, both individuals and organizations, had funded schools through *waqf* endowments (Bazzi et al., 2020). In addition to endowing as *waqf* the land on which Islamic schools are built, Muslims in rural areas also endow agricultural land and regularly offer harvest revenue to support religious infrastructure (see Section 3.2.1). Given this common practice, large swings in commodity prices might affect the scope for charitable giving. Somewhat fortuitously for Islamic leaders, the initial year of SD INPRES saw a huge spike in the price of rice, Indonesia’s main agricultural commodity.<sup>18</sup>

Using granular village-level data, we show that these informal financing mechanisms fueled the Islamic sector response to SD INPRES. In Table 3.3, we examine the role of *waqf* endowments as well as exposure to the 1970s rice price boom in supporting Islamic school construction. We estimate these heterogeneous effects using

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time-varying controls, using a shorter panel window spanning 1968–83 (as in panel b of Table 3.3), and clustering standard errors by district.

<sup>18</sup>Prices increased by 280% from 1972 to 1973 and remained unprecedentedly high for the remaining years of the 1970s (see Appendix Figure C-6). Although many rice farmers are net consumers, larger, net producers are those most likely to contribute large sums to fund local religious infrastructure and to endow *waqf* properties. Even small net consumers may have contributed to such infrastructure: we encountered several Islamic school founders describe a so-called “cash *waqf*” wherein villagers offer very small contributions out of agricultural income to support local Islamic schools (see Appendix C.3).

the following balanced panel specifications:

$$y_{vt} = \theta_v + \theta_t + \beta_0 \text{INPRES}_{vt} + \beta_1 (\text{INPRES}_{vt} \times \text{rice yield}_{v0}) + \beta_2 (\text{INPRES}_{vt} \times \text{waqf}_{v0}) + (\mathbf{X}'_v \boldsymbol{\theta}_t) \boldsymbol{\eta} + \varepsilon_{vt}, \quad (3.3)$$

where *rice yield* is a standardized measure of potential yield from the FAO-GAEZ based on predetermined agroclimatic characteristics, and *waqf* is a binary indicator equal to one if the village has any *waqf* endowments before the initial year of the panel. The fixed effects, differential trends controls, and inference are otherwise similar to the DID analogue of equation (3.2).

Table 3.3 reveals stronger entry responses in villages with greater capacity to fund new Islamic schools. Panel (a) reports results for 1960–99 as in Table 3.2, and panel (b) restricts to 1968–83. Villages with pre-existing *waqf* endowments and a one-standard-deviation higher potential rice yield exhibit, respectively, a ten- and four-fold greater likelihood of building an Islamic school after the construction of SD INPRES (column 6). Overall, the results point to a mobilization mechanism whereby local institutions and resources enabled the Islamic sector to compete with the rapidly expanding state sector.

**Robustness and Validation Checks.** Several robustness checks corroborate our interpretation of these results. First, the heterogeneous response to SD INPRES entry does not arise in other periods (e.g., 1960–68 or 1990–98, Appendix Table C.6) when the interplay between Islamic leaders and the regime was less conflictual *and* when rice prices were much lower. Second, we find less heterogeneity with respect to the potential yield for maize, which, although also subject to a large price shock, dwarfs in importance relative to rice (Appendix Table C.7).<sup>19</sup> Third, during the SD INPRES period, entry of non-Islamic private schools did not vary systematically with

<sup>19</sup>The rice-price-shock mechanism is also broadly consistent with rice-growing areas having a more collectivistic culture that enables faster community-based mobilization in response to shocks (Geertz, 1963; Talhelm et al., 2014).

the prevalence of *waqf* endowments (Appendix Table C.8).

As further indication of a financing channel, we find evidence that informal private contributions sustained the Islamic sector response to SD INPRES. Appendix Table C.9 reports higher rates of informal taxation to finance educational infrastructure in villages with Islamic schools built during the SD INPRES era. These rates do not vary and may, in fact, be lower in villages with public schools built at that time. These results, based on survey data from 2007–13 (see Olken and Singhal, 2011b), are consistent with religious schools relying more heavily on private funding and faith-based charitable giving.

Finally, we find suggestive evidence of resource constraints as informally-financed religious schools crowd out other local public goods. Appendix Table C.9 reveals crowd-out of non-religious goods: in villages with Islamic schools, informal taxation to finance schools (and houses of worship) crowds out informal financing of roads and bridges. Appendix Table C.10 reveals crowd-out of other religious goods: in districts with greater SD INPRES construction, Islamic schools comprise a larger share of total *waqf*-endowed land as of 2019, and this comes at the expense of mosques.<sup>20</sup> In sum, SD INPRES induced greater mobilization of *waqf* resources to support an expansion of religious schooling, and, in prioritizing education, the Muslim community partially crowded out *waqf*-based religious public goods.

#### 3.5.4 Curriculum Differentiation

Section 3.3 shows that as public schools enter new markets, Islamic schools must adjust their curriculum. We explore such curricular shifts using equation (3.1) and the SIAP data, which allow us to identify differences in the 2018–19 curriculum across

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<sup>20</sup>These results are based on administrative data from the Indonesian *Waqf* Board, which provides detailed breakdown of the type of infrastructure but does not provide reliable measures of the time at which the *waqf* was founded.

*madrassa* built before and after SD INPRES.<sup>21</sup>

Table 3.4 shows that Islamic schools created in high-INPRES districts after 1972 provide more religious content. Each additional SD INPRES is associated with a 1.2 percentage point (p.p.) increase in the share of classroom time devoted to religious content among newly created Islamic schools (panel a, column 1), with increases of 1.3 p.p. and 2.3 p.p. at the primary and junior secondary levels, respectively (panel a, columns 2–3). These are sizable effects relative to curriculum among schools built before 1972, e.g., the 2.3 p.p. increase equals 9% of the mean and 82% of the standard deviation. We find similar effect sizes for Arabic instruction (panel b). Although noisy, the estimates in panels (c) and (d) suggest that some of the increase in Islamic content and Arabic instruction comes at the expense of *Pancasila*/civic education and national language (*Bahasa Indonesia*) instruction.<sup>22</sup> Appendix Table C.12 shows that these general patterns hold when measuring total instruction hours. This is important inasmuch as some Islamic schools may have increased classroom time to accommodate other non-religious subjects.

These findings are generally consistent with a key prediction of the model. As the state built more secular schools, Islamic school curricula became more religious so as to continue attracting students from more conservative families. Appendix Table

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<sup>21</sup>Unlike equation (3.1), these are unbalanced panel specifications where each outcome is a mean across all schools entering in a given district-grade-year. A school's curriculum is closely attached to its ideology, which arguably has persistent features tied to the identity of founders. Moreover, given the legacy of conservative schools' opposition to state oversight, we suspect that the *madrassa* included in the SIAP registry are those with less Islamic content. This could work against our findings if such selective reporting is differential in high-INPRES districts. Yet, we find no evidence of differential reporting: *madrassa* created after 1972 in high-INPRES districts are no more or less likely to report to SIAP.

<sup>22</sup>Despite these shifts at the primary and junior secondary level, we find different patterns at the senior secondary level where SD INPRES is associated with a reduction, albeit statistically insignificant, in Islamic content and an increase in Arabic and *Pancasila* instruction (panels a–c, column 4). This goes against some of the findings elsewhere but may be an artifact of the small number of senior secondary schools in SIAP. It also hints at a possible secularization of senior secondary Islamic schools aimed at capturing junior secondary graduates intent on going on to non-Islamic universities.

C.13 validates this interpretation by showing, especially at the secondary level, a stronger curriculum differentiation response in markets with greater historical support for conservative Islam (again proxied by Islamic political party vote shares in the 1950s).

Ultimately, students in these new religious schools would devote less time to civic education and study of the national language—two important inputs to the homogenizing function of mass schooling. This crowding out of secular subjects may also have broader implications for human capital formation (see Appendix C.1.3 for evidence on the link between curriculum and standardized test scores).

### 3.5.5 Formalization and the Durability of the Dual System

The Islamic education sector adapted to mass public schooling in a way that ensured its survival over the long run. Here, we offer additional insights into this process, documenting a pattern of formalization within the Islamic sector, and comparing entry responses across Islamic and other education providers.

**Formalization of the Islamic Sector.** Prior to the 1970s, *pesantren* and *madrasa diniyah* played a prominent role in Islamic education. After SD INPRES, these informal providers continued to enter systematically (see Section 3.5.2). *Diniyah* offered extracurricular religious instruction in communities where young children were now spending most of their day in secular schools. *Pesantren* offered even more religious content than formal *madrasa* and continued to cater to the most conservative segment of society.

While informal religious education expanded in high-INPRES markets, formal religious education expanded even faster. Figure 3.5 shows that these markets experienced a rise in the influence of *madrasa* at the expense of the more informal *pesantren* and *diniyah*: while entry of the former increased (panel a), the latter de-

clined as a share of all new school entries (panel b). The share of entering *madrassa* was relatively lower in high-INPRES districts during the height of the program in the late 1970s. By the early 1980s, however, formal *madrassa* entry outpaced non-Islamic school entry. The reverse is true for informal Islamic schools. Appendix Table C.5 corroborates this set of results: *madrassa* entry increased as a share of all new school entry (column 1), while the entry of informal Islamic schools (*pesantren* and *diniyah*) declined as a share of all new schools (column 2) and all new Islamic schools (column 3).

Unlike *pesantren*, the formal *madrassa* are organized along the same primary-to-secondary trajectory as state schools. This ensures steady progression across grade levels and allows for switching between public and religious schools, providing option value to moderate but still religious parents.<sup>23</sup> While outpacing *pesantren* entry in many high-INPRES markets, the newly entering formal *madrassa* still introduced more religious curriculum than incumbent *madrassa* (see Section 3.5.4). This ensured that greater formalization of the Islamic sector did not come at the expense of religious instruction. In the end, such formalization contributed to the durability of the Islamic sector.

**Islamic and Other School Entry.** While other types of schools entered in response to SD INPRES, we show here that the Islamic sector’s response appears distinctive and confrontational. First, in Appendix Figure C·2, we consider the district-level entry of private non-Islamic schools, of which there are 41,969 as of 2019. Although some of these secular schools enter in response to SD INPRES, such entry is limited at each instruction level.<sup>24</sup> Appendix Figure C·4 provides further, village-level evi-

<sup>23</sup>Hefner (2009) provides examples of *pesantren* leaders that built formal *madrassa* on *pesantren* grounds in order to attract families who were averse to the informal, religion-centric *pesantren* curriculum but open to the *madrassa* alternative to state schools.

<sup>24</sup>Moreover, the downward pre-trend in panel (a) might suggest that SD INPRES did crowd out non-Islamic primary schools built before the program. This stands in stark contrast with the

dence of distinctive entry by primary *madrassa* when compared to private non-Islamic primary schools.

Alongside these dynamics at the primary level, more secular junior secondary schools entered markets with greater SD INPRES construction (Appendix Figure C.5). Combined with our earlier findings, these results suggest efforts by the three sectors—Islamic, private non-Islamic, and state—to meet the rising demand for secondary education. Yet, these efforts largely took place in distinct markets, avoiding the local confrontation seen at the primary level: among villages with any SD INPRES construction, the correlation between subsequent construction of Islamic and public (private) junior secondary schools is 0.04 (0.05). Put simply, there was enough excess demand for junior secondary education that the Islamic sector could avoid head-on competition with the state while still growing its aggregate market share.

### 3.6 Religious School Choice

Having identified the Islamic sector response to SD INPRES, we now explore demand-side dynamics. We begin with evidence on Islamic school choice mirroring the supply-side patterns. Next, we characterize heterogeneous responses across genders and across regions with varying religious ideologies. Finally, we show that public and Islamic primary schools built in the 1970s act as substitutes in generating years of schooling. This limits the potential for mass schooling to displace religious education.

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corresponding estimates in Figure 3.2: unlike their secular counterparts, Islamic schools proved resilient against the mass entry of public elementary schools.

### 3.6.1 Religious Schooling Response to SD INPRES

We identify effects of SD INPRES on religious school choice based on the following specification:

$$y_{ijt} = +\theta_j + \theta_t + \beta(\text{INPRES}_j \times \text{young}_{it}) + (\mathbf{X}'_j \boldsymbol{\theta}_t)' \boldsymbol{\eta} + \varepsilon_{ijt}, \quad (3.4)$$

where  $y_{ijt}$  is some schooling outcome for individual  $i$  born in district  $j$  in year  $t$ ;  $\text{INPRES}_j$  is measured as either (i) elementary public schools constructed per 1,000 children from 1973–1978, in the DID estimation, or (ii) an indicator for districts above the 51st percentile in SD INPRES intensity, in the SDID estimation;  $\text{young}_{it} = 1$  for individuals aged 2–6 in 1974 and zero otherwise;  $\theta_j$  and  $\theta_t$  are district and cohort FE, respectively; and  $\mathbf{X}'_j \boldsymbol{\theta}_t$  includes cohort FE interacted with the same set of variables as in equation (3.1) with baseline Islamic schools measured as of 1957, the birth year of the oldest comparison cohort. Like Duflo (2001), we compare individuals aged 2–6 with those already of school age, but no older than 17 when the program began. Exposed cohorts were born between 1968–72. In a second specification, we add 15 cohorts to the exposure group, covering one generation of students born between 1968–87. This captures medium-run dynamics, inclusive of the supply response to SD INPRES. In the DID estimation, we exclude partially exposed cohorts, aged 7–11 in 1974, as in Duflo (2001). In the SDID estimation, these cohorts are used in the construction of the synthetic control group.<sup>25</sup>

Table 3.5 reports the effects of SD INPRES on *madrassa* attendance. Panels (a) and (b) report DID and SDID estimates, respectively. The outcomes equal one if the respondent’s highest level of education is Islamic primary (columns 1–2), junior secondary (columns 3–4), senior secondary (columns 5–6), or any (columns 7–8).

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<sup>25</sup>Our core sample comprises 275 districts based on boundaries at the time of SD INPRES in the 1970s. Duflo (2001) reports 283 districts based on boundaries in 1995, by which time four districts from the 1970s had split in two.

SD INPRES pulled students away from primary *madrassa* and pushed them towards non-Islamic schools. Among cohorts aged 2–6 in 1974, one additional SD INPRES reduces the likelihood of Islamic primary by 7% (column 1). At the secondary level, Islamic schools absorbed some of the increased demand for post-primary education (columns 3 and 5). Together, these effects combine to a net increase in exposure to Islamic education: each additional SD INPRES increased the likelihood of attending an Islamic school by roughly 5% (column 7).<sup>26</sup> These patterns persist among later cohorts, for whom we find relatively larger effects on secondary and overall Islamic education (even-numbered columns), which aligns well with the supply-side results in Section 3.5.

**Time-Varying Effects.** These exposure effects are even clearer when looking across cohorts. Figure 3-6 reports cohort-specific Islamic school completion rates separately for high- and low-INPRES districts, and Figure 3-7 reports cohort-specific  $\beta$  from equation (3.4). In both cases, we see SD INPRES leading to a shift away from Islamic primary schools and towards Islamic secondary schools, both in the short (panels a, c, and e) and medium run (panels b, d, and f). The effects grow steadily for younger cohorts who would have had more opportunities to attend newly built Islamic schools. The corresponding graphical evidence for the SDID estimates can be found in Appendix Figure C-8 (panels a, c, and e).

**Islamic Graduation Shares.** One concern with the outcomes in Table 3.5 is that the likelihood of completing an Islamic education could be increasing simply because SD INPRES increases overall education. Thus, in Table 3.6, we look at Islamic schooling conditional on graduating with a degree at the given level of education

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<sup>26</sup>These results are driven in part by those moving from public elementary to Islamic junior secondary. *Susenans* allows us to observe a subset of these transitions, namely for those that attend but do not graduate from Islamic junior secondary. Appendix Table C.15 shows that indeed SD INPRES increased the likelihood of such transitions.

(primary, junior secondary, and senior secondary). These measures capture the share of Islamic graduation at each level and clarify that our results in Table 3.5 are not driven solely by the INPRES-induced increase in overall education. Table 3.6 shows that the same patterns hold in this conditional specification: students shift out of Islamic schools at the elementary level (columns 1–2) and into Islamic schools at the secondary level (columns 3–6) with the net effect being an increase in the likelihood of graduating from Islamic school (columns 7–8). Here, too, the effects are generally larger when considering all cohorts exposed to the Islamic sector supply response (compare even to odd columns), and the standard DID (panel a) and synthetic DID (panel b) agree with few exceptions.

**Accounting for Selection.** SD INPRES increased total years of education *and* Islamic schooling.<sup>27</sup> Tables 3.5 and 3.6 suggest that these outcomes are jointly determined: greater schooling brings more opportunities for exposure to Islamic schools. Framed as a selection issue, only those continuing to secondary education, for example, have the potential to attend Islamic secondary schools. And if those continuing on are more religious, this could introduce bias. In panels (c) and (d) of Table 3.6, we adjust our estimates of Islamic school choice for this type of selection.

We consider parametric (Heckman, 1976) and semiparametric (Newey, 2009) two-step procedures. First, we estimate the likelihood of completing a given level of education. Second, we estimate the likelihood of completing Islamic education for those reaching that level. The second-step includes selection-correction terms. In the Heckman (1976) case, this is the inverse Mills ratio. In the Newey (2009) case, this is a series approximation to the true correction term; in practice, we use a cubic polynomial in first-step probabilities based on flexible covariates (specified by taking

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<sup>27</sup>Column 1 of Table 3.8 shows that each SD INPRES increased years of schooling by 0.14 years. The male-specific estimate of 0.17 in panel (b) of Table 3.7 lies between the range of estimates in Duflo (2001)—0.12 to 0.19—based on the 1995 *Supas* data.

quintiles in each continuous regressor, interacted with cohort FE).<sup>28</sup> Key to both strategies is the exclusion from the second stage of at least one variable correlated with grade completion but otherwise unrelated to Islamic school choice. For this purpose, we rely on measures of exposure to a pilot compulsory schooling program in the 1960s.<sup>29</sup> This program shifted demand for education just prior to SD INPRES and was not systematically related to predetermined Islamic schooling or correlates thereof (see Appendix Table C.18).

The selection-adjusted estimates in panels (c) and (d) of Table 3.6 are in line with the unadjusted estimates in panel (a). Some of the estimates are larger (and noisier), but overall the magnitudes and signs are consistent, especially at the elementary and junior secondary level. Together, the selection-adjusted estimates approximately identify a local average treatment effect of INPRES exposure on Islamic schooling among compliers, namely children who received additional education as a result of the policy. For those induced to reach elementary school, this meant less exposure to Islamic education (columns 1–2), but for those induced to go beyond elementary, INPRES exposure increased the likelihood of attending Islamic junior secondary (columns 3–4). This is again intuitive and in line with the excess demand for continued education among new primary graduates being met by newly built Islamic schools.

**Robustness Checks.** We first address two identification concerns. First, we account for district-specific factors correlated with SD INPRES intensity and latent

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<sup>28</sup>We select the polynomial order based on consistency results in Newey (2009), which imply an upper bound of 3 on the order of the approximating power series in a sample with effective size of 275 (i.e., the level of policy variation). We conduct inference with a percentile- $t$  bootstrap shown to work well with two-step selection estimators (Yamagata, 2006).

<sup>29</sup>This compulsory primary education (*Wajib belajar*) pilot program, which applied to children aged 8 to 14, was rolled out in 35 pilot districts in the late 1950s and early 1960s (Sarumpaet, 1963). We identified in government reports from 1958–1960 the 35 affected districts. In the first step of the selection-correction procedure, we include interactions of cohort FE with the extensive and intensive margin (total teachers and schools allocated) of the program in respondents' district of birth. Appendix Tables C.1 and C.17 show that our results on Islamic school entry and choice, respectively, are robust to these controls as well.

potential for Islamic schooling. Recall that cohort FE interacted with Islamic schools in 1957 are already in our baseline specification. In Appendix Table C.17, we also include interactions of cohort FE with proxies for the potential strength of the Islamic sector prior to SD INPRES (see the discussion of Appendix Table C.1 in Section 3.5.2). With a few minor exceptions, the key finding of increased Islamic school choice in high-INPRES regions remains intact.

Second, we show that SD INPRES was not systematically allocated towards districts with different preexisting trends in Islamic schooling. Figure 3.7, described above, shows little indication of systematic pre-trends in Islamic school attainment (and, in fact, exhibits a similar *S*-shaped exposure curve as the original Duflo, 2001, figure for years of schooling). Thus, although the state built more SD INPRES in districts with more Islamic schools (see Section 3.5.1), they did not and arguably could not—given available statistical information at the time—target areas where Islamic choice was growing faster. Furthermore, the synthetic DID estimates in Appendix Figure C.8 are robust to any residual differential trends.

One additional concern with the results in Tables 3.5 and 3.6 is the low Islamic enrollment shares reported in *Susen*s. Appendix Table C.14 shows that exposure to Islamic schooling is considerably higher in other sources.<sup>30</sup> There are three reasons why the *Susen*s data may lead to underestimates of SD INPRES effects on Islamic education. First, *Susen*s indicates whether the highest graduation level and/or the final year of education took place in a *madrasa*; it therefore misses individuals who attended Islamic schools earlier in their educational trajectory. Second, *Susen*s does not allow respondents to indicate *pesantren* education. Third, many students attend state schools in the morning and *madrasa* in the afternoon while, for enumeration

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<sup>30</sup>In the IFLS, Islamic education rates range from 11% in primary to 23% in junior secondary (20% overall). Administrative enrollment records for 2019 show rates ranging from 13% in primary to 23% in junior secondary (21% overall).

purposes, only the former is deemed official.<sup>31</sup> Given that informal Islamic schools also entered to compete with SD INPRES, our estimates plausibly provide a lower bound on the total effect of SD INPRES on Islamic schooling. The strong *pesantren* entry results in Section 3.5.2 make it unlikely that the growth in *madrasa* enrollment arose through an absolute decline in *pesantren*. Lacking historical *pesantren* attendance data, we nevertheless show, in Appendix Figure C.9, that *pesantren* entering in response to SD INPRES enroll more students in the long run.

As a validation exercise, we estimate the effects of SD INPRES in the IFLS (Appendix Table C.16). Unlike *Susenas*, the IFLS reports the type of education completed at every level. SD INPRES decreased the likelihood and total years of Islamic elementary (columns 1–2 and 5–6, respectively) and increased the likelihood and total years of Islamic junior secondary (columns 3–4 and 7–8, respectively). Although noisy given the coverage limitations of IFLS, these results mirror those in *Susenas*. Moreover, the point estimates are roughly 10 times larger, which is what one would expect given the ten-fold difference in mean Islamic schooling rates across the two surveys.

### 3.6.2 Heterogeneity: Gender and Ideology

The model in Section 3.3 highlights the important role of heterogeneous preferences in determining school entry decisions and, hence, school choices. We characterize here two important sources of heterogeneity in gender norms and ideology, both of which speak to salient cultural divides in diverse societies.

**The Gender Dimension.** Table 3.7 shows that SD INPRES led to smaller gains in total years of education for women in exposed cohorts (column 1). At the same time, the INPRES-induced decline in Islamic elementary attendance is less pronounced

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<sup>31</sup>We learned about this during conversations with officials at the Ministry of Education in July 2019.

(columns 3–4), and effects on overall Islamic school choice are roughly 50% larger for women (columns 9–10). One explanation for these patterns is that some parents were reluctant to send their daughters to the newly built INPRES schools while viewing Islamic schools as an acceptable alternative. With its more conservative approaches to gender relations at school, the Islamic sector would have appealed to such families.<sup>32</sup>

These gender norms became especially salient in the early 1980s when the Suharto regime imposed a ban on the Islamic veil (*hijab*) in public schools. A 1982 decree standardized the use of school uniforms, which amounted to a crackdown on veiling (Jo, 2020; Shofia, 2020). Women who veiled thus faced a choice between transferring to a *madrassa* or dropping out of school. In Appendix Table C.19, we explore how this policy shaped the effects of SD INPRES on Islamic school choice for girls. We interact equation (3.4) with exposure to the ban, effectively comparing INPRES-exposed girls who were too young to complete their primary education before the ban to those that already completed primary school by 1982 (with boys as an additional control group).<sup>33</sup> The top row in Appendix Table C.19 shows that women exposed to the ban were more likely to complete Islamic elementary relative to other cohorts exposed to SD INPRES. Thus, Islamic schools helped to address Indonesia’s diverse gender norms.

**The Ideological Dimension.** Although 90% Muslim, Indonesia has long been home to diverse views on the role of religion in public life. Beyond gender norms, elections offer another lens on this diversity that we explore here, again using the 1950s vote share for Islamic parties to proxy for conservative ideology.

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<sup>32</sup>An early insight into this possibility comes from Oey-Gardiner (1991), who reports strongly female-biased sex ratios in religious schools and male-based ratios in public schools, especially at the primary level, in administrative data from 1984–5. She interprets this difference as evidence of more conservative parental preferences for schooling girls than boys. We find a similar sex ratio differential among exposed cohorts in our *Susenans* data.

<sup>33</sup>Appendix Table C.19 interacts INPRES intensity and the exposed cohort indicator (aged 2–6 in 1974) with a gender dummy and a dummy for age less than 12 in 1982. All relevant two- and three-way interactions are included.

In Table 3.7, we find a stronger Islamic school choice response to SD INPRES in districts with deeper historical support for Islamic politics. In districts with one standard deviation higher support for Islamic parties, exposed cohorts are nearly 50% more likely to attend Islamic schools (columns 9–10). Moreover, such heterogeneity materializes at the secondary level (columns 5–8), which is where we identified the strongest average responses. While Islamic school choice is more affected in these conservative areas, total years of schooling is not (column 1). This is consistent with the model in Section 3.3: Islamic school construction and curriculum differentiation ensured that religiously conservative parents would have greater scope to educate their children in religious schools as mass public schooling expanded.

### 3.6.3 SD INPRES and Islamic Elementary Schools as Substitutes

Although Islamic and public schools cater to different groups in theory, it is important to understand whether schools from the two sectors are substitutes or complements in raising overall education. At the secondary level, it is clear from results above that Islamic schools generated some complementarities as they addressed excess demand for continued education among INPRES graduates that could not be met by the public sector.<sup>34</sup> At the primary level, this question is more ambiguous as elementary *madrasa* entry could have been market stealing or market expanding. In Table 3.8, we augment equation (3.4) to allow for entry of Islamic primary schools alongside and interacted with SD INPRES entry ( $\times$  exposed cohorts). A negative interaction term implies that the two types of schools are substitutes.

We begin with an OLS specification treating the entry of Islamic schools as exogenous conditional on the policy variables that determined SD INPRES allocations. We

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<sup>34</sup>The context laid out in Section 3.2 suggests that such complementarities did not arise from active cooperation between the state and Islamic leaders. Moreover, while this does not preclude head-on competition between Islamic and non-Islamic secondary schools, we showed in Section 3.5.5 that schools from the two sectors largely avoided direct competition at that level.

then treat Islamic sector entry as endogenous and construct instrumental variables (IV) based on the mobilization mechanisms uncovered in Section 3.5.3. We instrument Islamic elementary school construction ( $\times$  exposed cohort and *INPRES*) with the *waqf* endowment base, potential rice yields, and the Muslim population share ( $\times$  exposed cohort and *INPRES*). These instruments are collectively strong (see the weak-IV diagnostics in Table 3.8).

The estimates in Table 3.8 point to strong substitutability between public and Islamic elementary schools entering 1973–78. Although each type of school is associated with more education for exposed cohorts (columns 2 and 5), there are counteracting effects when the two enter simultaneously (columns 3 and 5). Taking the IV estimates in column 5 at the mean Islamic and INPRES school entry (0.08 and 2.1 per 1,000 children, respectively), we find similar effect sizes of around 0.35 additional years of education when each school enters on its own. These gains are reduced by 0.25 years of education when the two types enter jointly. This suggests that the baseline estimate of around 0.13 additional years of education (column 1) might have been much larger if not for competition from new elementary *madrassa*.

Across specifications, the IV estimates are significantly larger than the OLS (p-value < 0.01). This may admit a LATE interpretation: elementary Islamic entry has the greatest impact on Islamic school choice in places where resource constraints in the Islamic sector were binding. The instruments capture, in part, supply shifts due to resource availability for Islamic organizations and leaders. In places where those entry decisions materialized, the latent demand for religious schooling would have been realized more quickly, giving rise to the larger own and substitution effects seen in the IV columns of Table 3.8.

Overall, these results provide further evidence of contestation between the Islamic sector and the state. We saw in Section 3.5.2 that Islamic elementary schools entered

markets right after the state built SD INPRES. The estimates in Table 3.8 suggest that these sequential entry decisions were partially redundant from the perspective of generating additional years of schooling. However, because the learning environments were so different across the two sectors, a given year of education in public and religious schools would likely have been less substitutable in terms of impacts on identity and ideology. These downstream political consequences of school competition are the focus of the next section.

### 3.7 Mass Schooling and Nation Building

Like most mass schooling reforms, Indonesia's entailed significant ideological objectives. This section shows that such ambition fell short, likely frustrated by the response of the Islamic education sector (Section 3.5) and families' corresponding efforts to educate their children in religious schools (Section 3.6).

In the short run, SD INPRES failed to increase support for the Suharto regime. Appendix C.1.5 provides suggestive evidence of an electoral backlash: districts with greater SD INPRES intensity saw a larger decline in the vote share for Suharto's party, *Golkar*, between 1971—the last election prior to mass schooling and the first in which *Golkar* ran—and subsequent quinquennial elections. Some of these losses accrued to the main Islamic opposition party, the PPP, and appear to be driven by community reactions in the immediate aftermath of the program rather than by SD INPRES graduates coming of voting age.

These electoral shifts went hand in hand with deeper shifts in religious identity and culture that ultimately worked against the state's use of mass schooling as a tool for secular nation-building. In what follows, we explore the individual-level foundations of these changes. These results suggest that religion played a significant role in shaping the cultural legacy of SD INPRES.

### 3.7.1 National and Religious Identity

Table 3.9 provides evidence on the cultural impacts of SD INPRES over the long run. Panel (a) explores dimensions of secular identity, while panel (b) examines religious piety and practice.

We first examine a standard marker of attachment to the national identity in multilingual countries: the use of the national language at home. This is distinct from speaking ability. Nearly 90% of Indonesians can speak *Bahasa* Indonesia. Only 20% use it as the main language at home, which reflects greater attachment to national as opposed to ethnic or religious identity (see Bazzi et al., 2019, for validation).

We find null effects of SD INPRES using the 2010 census with 32 million individuals in cohorts aged 2–6 and 12–17 in 1974 (column 1). Behind this null lies a religious divide: 15% of Muslims prefer using Indonesian at home compared to 28% of non-Muslims.<sup>35</sup> Among Muslims, exposed cohorts report slightly less home use of *Bahasa* Indonesia (column 2), while non-Muslims exhibit a smaller response (column 3). These weak effects are striking given that INPRES schools aimed to promote a single Indonesian identity built around one language. Although SD INPRES increased Indonesian proficiency (Appendix Table C.20, columns 1–3), it did not increase vernacular attachment to the national language.

For those exposed to Islamic education, immersion in *Bahasa* Indonesia may have been crowded out by Arabic study. Table 3.4 showed that schools created in high-INPRES districts after 1972 devote more classroom time to Arabic and less to Indonesian. Table 3.9 shows that SD INPRES increased Arabic knowledge among exposed cohorts (column 4). This effect is driven by those with some Islamic education (two-thirds of whom report Arabic literacy, compared to one-third with secular

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<sup>35</sup>Using this same data, we find a precise zero effect of SD INPRES on the likelihood of being Muslim: -0.0003(0.0011).

education).<sup>36</sup> While SD INPRES increased literacy in the Latin alphabet on which Indonesian is based, it did not do so for other languages besides Arabic (Appendix Table C.20, columns 4–9). This is consistent with the unique role of Arabic among Muslims and the importance of Islamic education in transmitting such knowledge (see Appendix Table C.21 on the strong association of Islamic education with Arabic literacy).

These language shifts are accompanied by broader changes in piety. In panel (b) of Table 3.9, we look at Islamic practices using a nationally-representative survey conducted in 2008 by Pepinsky et al. (2018). These include praying 5 times a day (column 1), fasting during Ramadan (column 2), reading the Qur’an (column 3), attending Friday prayer (column 4), performing *Sunna* prayers (column 5), joining prayer groups known as *pengajian* (column 6), and paying *zakat* (column 7). Respondents’ practices vary widely. For example, 62% report praying 5 times daily, while only 25% always regularly read the Qur’an. We find positive exposure effects across most measures, and each additional INPRES school is associated with a sizable 19% increase in a mean index across all practices (column 8).

Together, the results in Table 3.9 suggest that SD INPRES generated cultural resistance and increased religious identity at the expense of a secular national identity. For those attending Islamic schools, this could have occurred through learning Arabic and Islamic thought. For those attending state schools, this could have occurred through greater exposure to Islamic-educated peers in one’s community or engagement with the Islamic sector outside formal schooling (e.g., through parental inputs or attendance of *madrassa diniyah* or mosque-based youth groups). We explore some of these mechanisms in Section 3.7.3.

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<sup>36</sup>Conditional on years of schooling fixed effects, Arabic literacy is 20–30 p.p. higher for those with Islamic education (Appendix Table C.21). We switch between sample splitting on religion and on religious schooling across outcomes in panel (a) because *Susenas* does not record religion, and the 2010 Population Census does not report type of schooling.

### 3.7.2 Political Attitudes and Ideology

Table 3.10 explores downstream effects of SD INPRES on political attitudes among citizens (panel a) and politicians (panel b). First, we consider citizen support for *Pancasila*, the secular national ideology advanced through state schools. The Pepinsky et al. (2018) survey asks whether *Pancasila* is the most suitable ideology for the nation. Column 1 in panel (a) shows that SD INPRES had a null effect on support for *Pancasila*, which stands at 85% across the population.

At the same time, SD INPRES did not increase support for conservative Islamist ideology as an alternative. We use several measures of support for Islamic legal principles from Pepinsky et al. (2018). Subjective measures in columns 2 and 3 indicate whether individuals report strong or very strong support for Islamic principles to govern public life. The index in column 4 combines these two questions with two others about support for *sharia* law. The final, objective measure in column 5 averages across six dimensions of *sharia*: corporal punishment for crime, prohibition of interest, mandatory *hijab*, legalized polygamy, stoning for adultery, and death for apostates (see Appendix Table C.22 for sub-component analysis). Across measures, we find null effects of SD INPRES on exposed cohorts of Muslim citizens.

The bottom panel (b) of Table 3.10 provides analogous evidence among 2019 legislative candidates. INPRES-exposed cohorts are significantly less likely to run with *Golkar* and more likely to run with the Islamic PPP (columns 1 and 2); no other party affiliations admit significant effects. In other words, the short-run electoral backlash against *Golkar* and support for the PPP (see Appendix C.1.5) persisted over the long run among affected cohorts running for legislative office. This is despite both parties being much less popular than in the repressive era of New Order politics. Hence, SD INPRES may have played a role in sustaining Suharto-era political cleavages over the long run.

Furthermore, INPRES-exposed candidates, across all parties, are less likely to campaign on *Pancasila* and related nation-building themes (column 3) and yet are no more likely to campaign on Islamist themes (column 4), which do not co-occur with nation-building themes (column 5). We construct these binary outcomes using text from online campaign documents, identifying appeals to the faith (e.g., Islam, Muslim, *umma*, *sharia*) and references to Indonesian nation-building concepts.<sup>37</sup> Putting together the results in Table 3.10, we conclude that political candidates look broadly similar to the citizens they represent in terms of the long-term effects of exposure to SD INPRES during their childhood.

### 3.7.3 Intergenerational Transmission of Religious Values

In this final section, we highlight the role of intergenerational cultural transmission in shaping the legacy of SD INPRES. Exposure to SD INPRES increased Islamic school attendance and deepened religious identity. Two generations after INPRES schools were built, attendance in Islamic schools remains very high: 21% of pupils were enrolled in *madrassa* or *pesantren* in 2019. This suggests that the shifts in religious values set in motion by SD INPRES were likely passed on to future generations.

Table 3.11 examines household-based mechanisms for such transmission, focusing on whether parents directly exposed to SD INPRES changed their investments in religion. For example, parents might engage in greater religious socialization at home for fear that children would lose religious values in a fast-secularizing society. We explore here two main pathways for vertical religious transmission, which, in theory, could either complement or substitute for religious school choice.

First, men exposed to SD INPRES as kids were more likely to marry women with Islamic schooling (column 1). This could be explained by many forces including

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<sup>37</sup>Nation-building appeals include, e.g., “[defending] the just nation according to *Pancasila* and the 1945 constitution,” and “defending and maintaining *Pancasila* ideology and the existence of the unity of the Republic of Indonesia”. See Appendix C.4.

assortative matching among the religiously educated. It could also be an indirect consequence of the slightly larger effect of SD INPRES on *madrasa* education for girls (see Section 3.6.2). Yet, the effects are null for women’s marital choice (column 2), perhaps because women face greater constraints in selecting partners (see Rubio, 2014, for background on arranged marriages in Indonesia). Regardless, the greater presence of religiously educated people in the marriage market could have increased vertical religious transmission.

In the remaining columns of Table 3.11, we show how such transmission flows within the household. We proxy for engagement with Islam using the Arabic literacy of parents and children measured in *Susenas*. We saw in Section 3.7.1 that SD INPRES increased Arabic literacy. In columns 3–4, our dependent variable is a dummy for all three members of a nuclear household (the father, the mother, and the child) being literate in Arabic. Both a father’s and a mother’s exposure to SD INPRES increase the likelihood that the entire household is literate in Arabic, which is consistent with assortative mating and greater religious cultural transmission to children.

Finally, we examine the child’s Arabic literacy among parental respondents who are literate in Arabic and whose child has received no Islamic schooling (columns 5–6). Among Arabic-literate parents, children formally educated in non-Islamic schools are more likely to be literate in Arabic when the parents were directly exposed to SD INPRES. While such a sample split is endogenous to INPRES exposure, this provides further suggestive evidence of religious transmission outside the Islamic school system. Such transmission could be due to instruction inside the home, extracurricular education at the local mosque or *madrasa diniyah*, or both. Overall, parents exposed to mass public schooling ensured that their children maintain a strong religious identity through socialization choices at home.

### 3.8 Conclusion

One of the most ambitious educational policies ever implemented, SD INPRES pursued developmental as well as ideological objectives. A large literature documents the policy's long-lasting effects on human capital. In contrast, we provide the first comprehensive investigation of the response by the state's historical competitor in the provision of education, the Islamic school system. Before the 1970s, the Indonesian state sought to diminish the influence of Islamic schools in order to facilitate the emergence of a secular national identity. SD INPRES was designed with this goal in mind. As much as the program itself, the Islamic sector response not only shaped education markets for years to come but also plausibly counteracted the advance of secular nation building over the long run.

Our findings point to some surprising consequences of mass public schooling. The policy failed to crowd out religious schools; instead, we uncover evidence of a robust response by the Islamic education sector. The Muslim community raised funds locally to build new schools in response to the state's unprecedented investments in primary education. These Islamic schools, in turn, adapted to state competition by increasing the religious content of their curriculum, and by prioritizing formal pedagogy that allowed students to switch in and out of the public system. In this way, children raised in the Muslim faith could continue to gain exposure to formal Islamic teachings during at least some of their impressionable years. These shifts were especially beneficial to more conservative families and to their daughters, whose education levels increased due in large part to the presence of Islamic schools as a substitute to secular public schools. This allowed many Indonesian families to reconcile the challenges of "modernization" with a strong continued adherence to religious values.

Our paper raises important questions for countries striving to find the optimal mix between centralizing and outsourcing public goods provision and its corollary,

the legitimacy to tax service recipients. On the one hand, Islamic schools helped the central state cater to heterogeneous preferences for different types of schooling and to meet the excess demand for secondary schooling coming from universal primary education. This is reminiscent of the “division of responsibility for education” in diverse societies conceptualized by James (1987a,b). Furthermore, while the increased piety and related cultural shifts we document may have weakened the push towards a secular Indonesian identity, they did so without posing a genuine threat to the legitimacy of the Indonesian state.

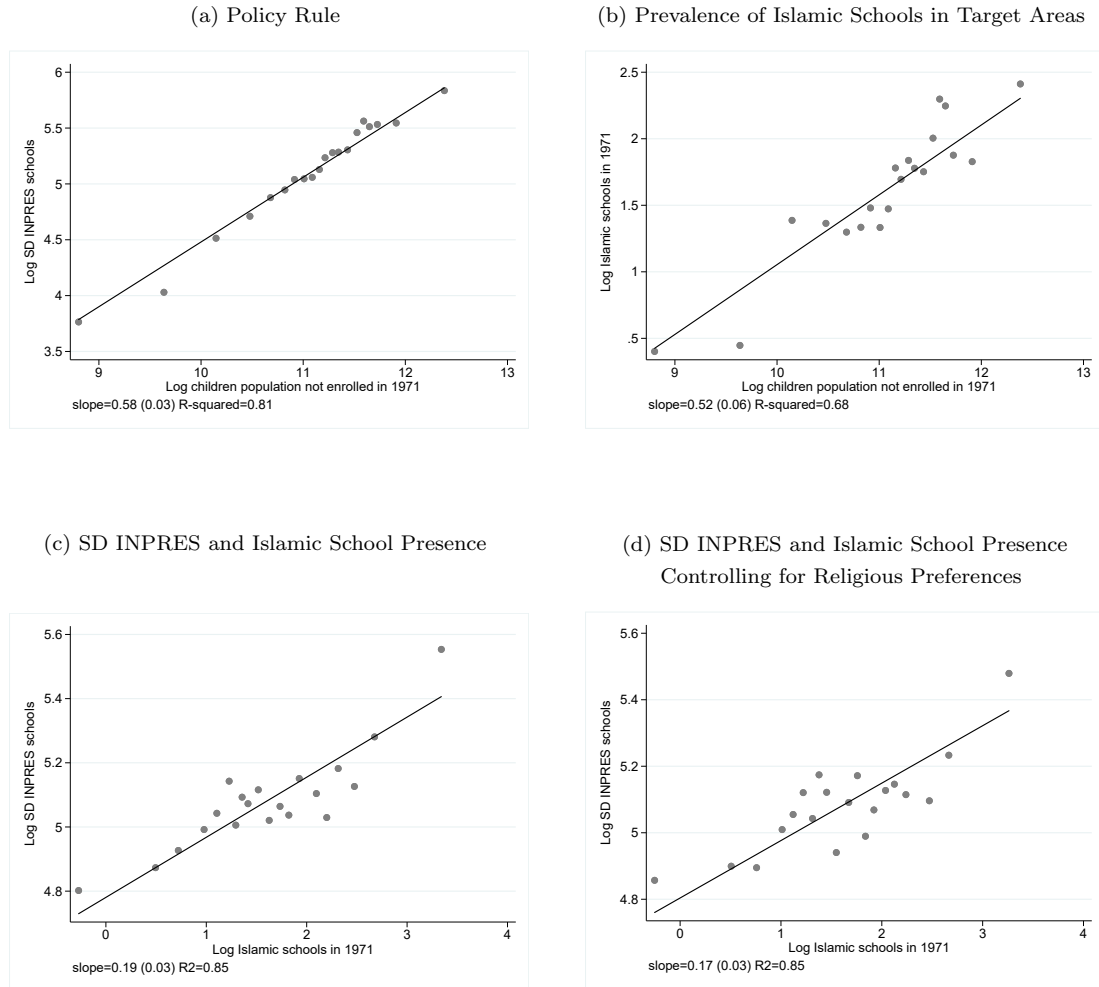
At the same time, this robust response by local Muslim communities illustrates the persistent challenges of designing and implementing centralized policy in settings with limited state capacity. These challenges were already salient during our period of interest in Indonesia: as a leading education expert noted, “the existence of two parallel and relatively independent [school] systems . . . poses very real problems for the reform and modernization of education” (Beeby, 1979, pp. 34-35). A recent literature has begun to explore why an uneasy coexistence between the state and informal authorities has endured in developing countries, and what this implies for policymaking and welfare. In much of Africa, for example, dual systems of government have persisted as a way to preserve the autonomy of local communities and continue to wield vast legitimacy and power (Robinson, 2022).

In Muslim societies, the challenges associated with such dual systems are especially pronounced because religion provides a strong alternative source of political legitimacy to that of the state. Like traditional institutions elsewhere, Islamic institutions are often perceived to be more compatible with local preferences than institutions bequeathed by colonization or Western influence. The organizations that derive their legitimacy from strict adherence to the Islamic faith actively compete with central authorities by providing alternative forms of justice, taxation and service provision

mechanisms (Cammett and Luong, 2014; Livny, 2018; Revkin, 2020). Our paper offers a framework for understanding how these competitive frictions unfold, and what this implies for future state-building efforts in diverse societies.

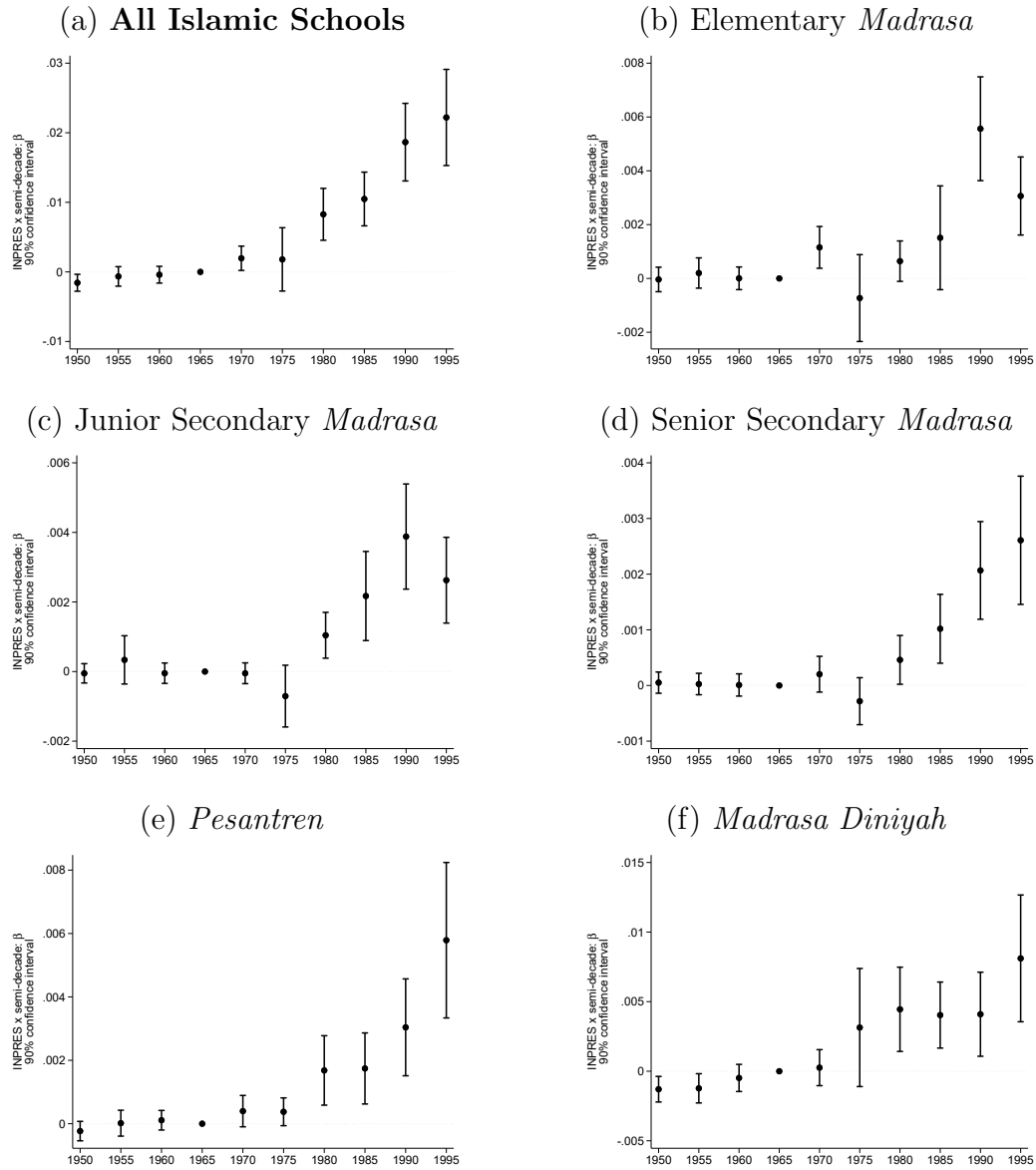
### **3.9 Figures and Tables**

**Figure 3.1:** Targeting of INPRES School Construction



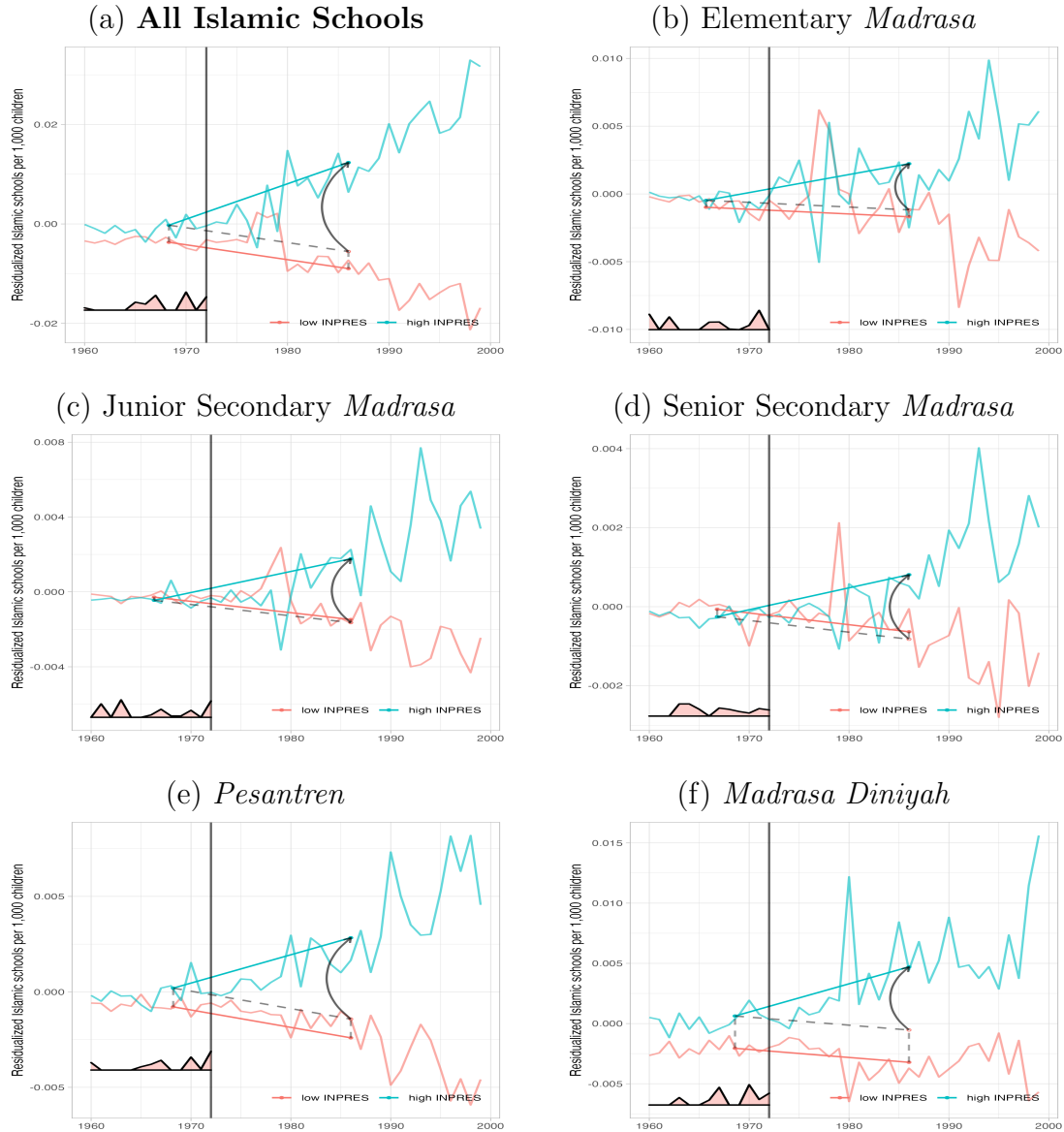
*Notes:* This figure displays district-level binscatter plots between SD INPRES school construction, the population of children not enrolled in school in 1971, and the baseline presence of Islamic schools (elementary *madrasa* and *pesantren*) measured in 1971. Panel (a) illustrates the government’s policy rule: SD INPRES school construction is proportional to the population of children not enrolled in 1971. In Panel (b), we regress the log of Islamic schools in 1971 on the log population of children not enrolled in 1971. In Panel (c), we regress log SD INPRES school construction on the log of Islamic schools in 1971, controlling for the population of children not enrolled and province dummies. In Panel (d), we estimate the same regression controlling for the vote share of Islamic parties in the 1955 and 1957 legislative elections, the last before the Suharto era.

**Figure 3.2: INPRES Intensity and Entry of Islamic Schools**  
New schools per 1,000 children

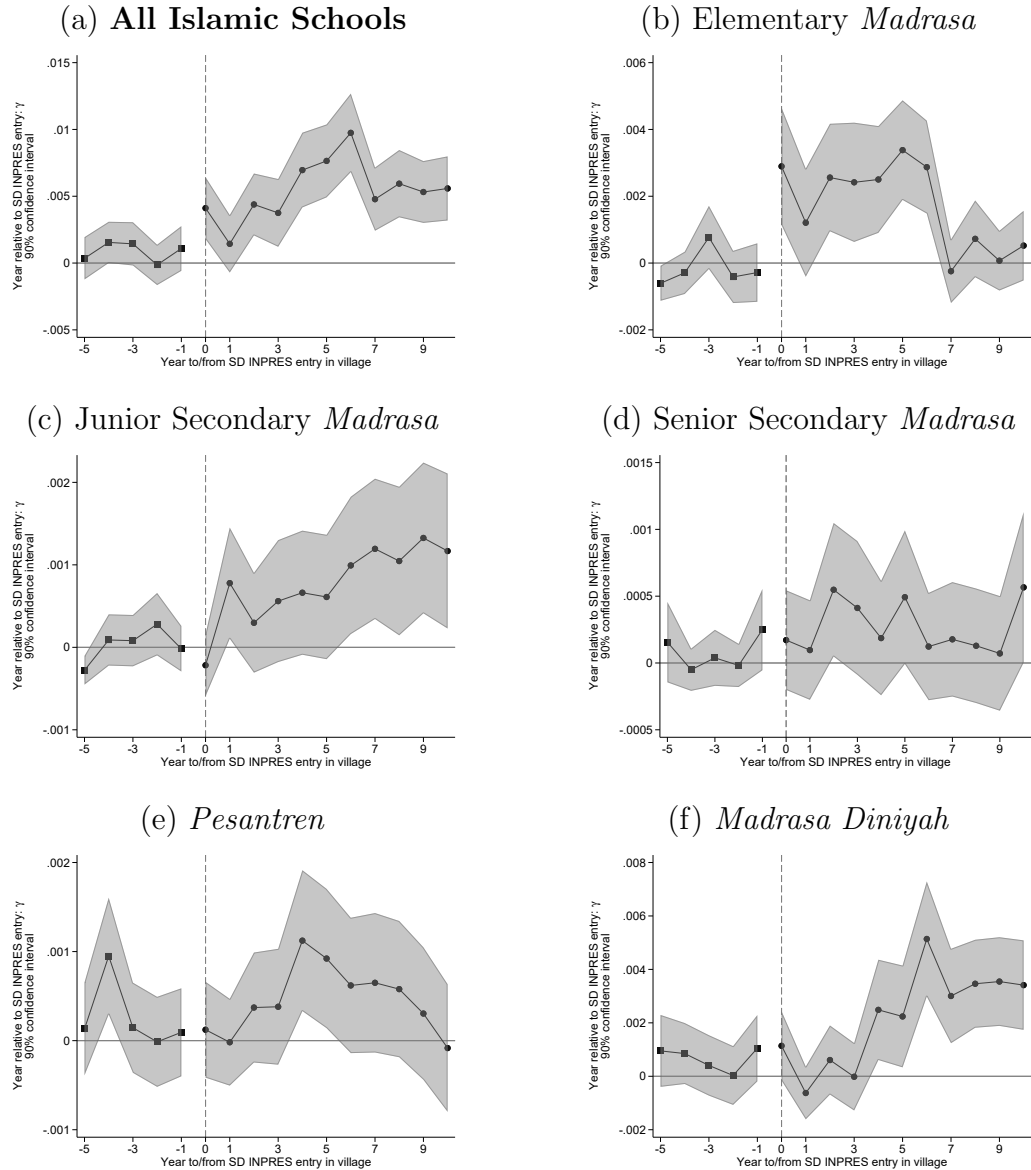


*Notes:* This figure reports semi-decade-specific estimates of  $\beta$  in equation (3.1) on a balanced district-year panel. INPRES intensity is defined as the number of SD INPRES schools constructed from 1973–78 per 1,000 children in 1971. The dependent variable measures the total number of Islamic schools (panel a), elementary *madrasa* (b), junior secondary *madrasa* (c), senior secondary *madrasa* (d), *pesantren* (Islamic boarding schools across all levels) (e), and *madrasa diniyah* (Qur'anic afternoon schools) (f) established by semi-decade and by district per 1,000 children in 1971. The 1965–69 period is the reference period given district fixed effects. The dots correspond to the period-specific  $\beta$ , and the bars to 90% confidence intervals with standard errors clustered by district, of which there are 275. All specifications include district fixed effects and year fixed effects interacted with the 1971 children population, the 1971 enrollment rate, district-level exposure to the water and sanitation program, the number of elementary, junior secondary, senior secondary *madrasa* in 1949, and the number of *pesantren* in 1949.

**Figure 3-3:** Islamic School Entry: Synthetic Difference-in-Differences

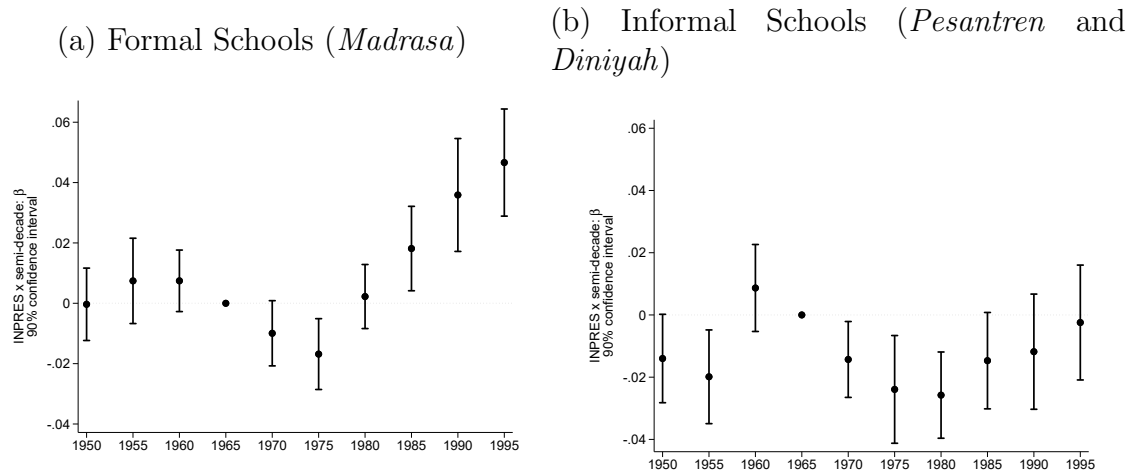


*Notes:* This figure reports synthetic difference-in-differences (SDID) estimates of the effect of SD INPRES on Islamic school entry at the district-year level from 1960–99. Each figure shows trends in entry of Islamic schools over time for districts above the 51st percentile of SD INPRES intensity (“high INPRES” in blue) and the relevant weighted average of comparison districts below the 51st percentile (“low INPRES” in red), with the weights used to average pre-INPRES time periods at the bottom of each panel (in red). The dashed diagonal line indicates the counterfactual parallel trend, and the arrow indicates the estimated effect. Following Arkhangelsky et al. (2021), we apply the SDID estimator to the residuals from equation (3.1):  $y_{jt}^{res} = y_{jt} - (\mathbf{X}'_j \boldsymbol{\theta}_t)' \hat{\boldsymbol{\eta}} - \hat{\theta}_j - \hat{\theta}_t$ , where  $y_{jt}$  is the total number of Islamic schools (panel a), elementary *madrasa* (b), junior secondary *madrasa* (c), senior secondary *madrasa* (d), *pesantren* (e), and *madrasa diniyah* (f) built per district-year and per 1,000 children in 1971;  $\mathbf{X}'_j \boldsymbol{\theta}_t$  includes year fixed effects interacted with the 1971 children population, the 1971 enrollment rate, exposure to the water and sanitation program, the number of elementary, junior secondary, senior secondary *madrasa*, and the number of *pesantren* in 1959.

**Figure 3.4:** Islamic School Entry at the Village Level

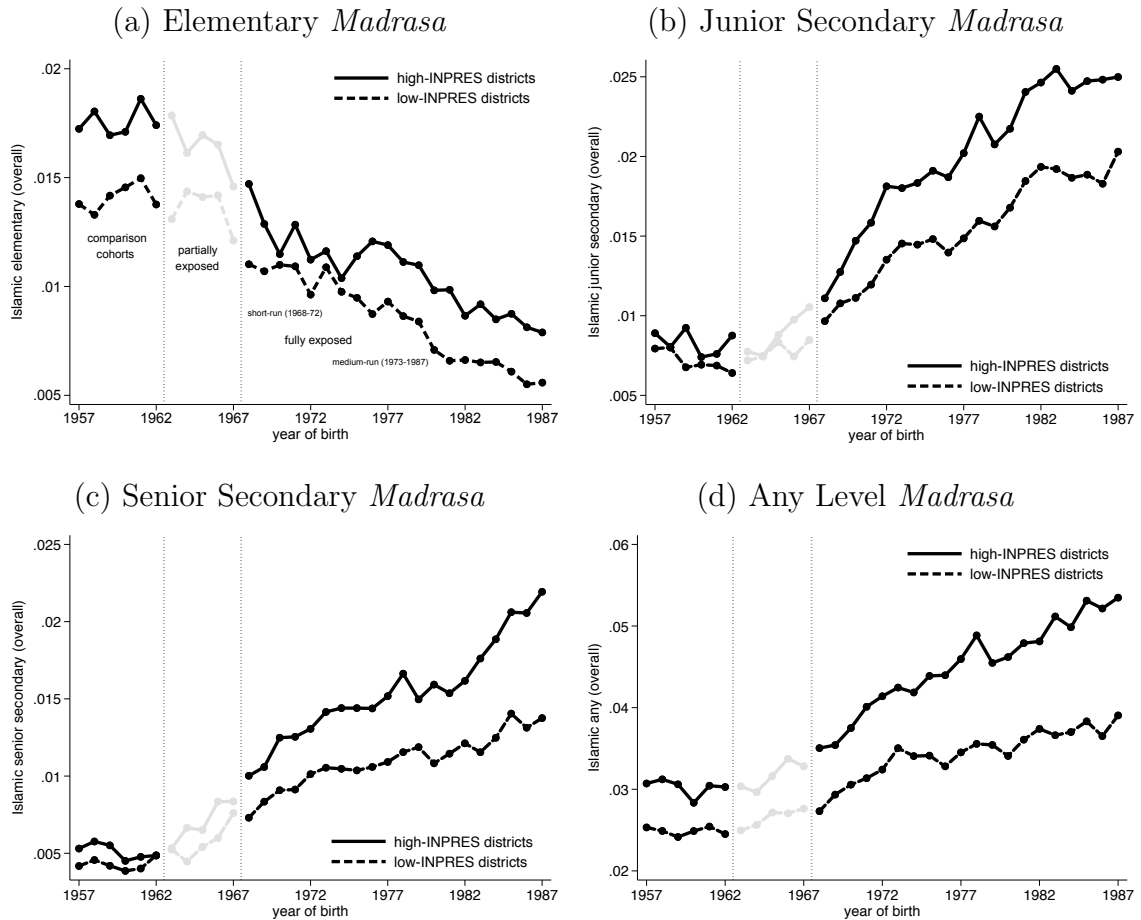
*Notes:* This figure reports estimates of  $\gamma$  in equation (3.2) using the robust and efficient estimator from Borusyak et al. (2021) and a balanced panel of villages spanning 1960–99. The dependent variable measures the total number of Islamic schools (panel a), elementary *madrasa* (b), junior secondary *madrasa* (c), senior secondary *madrasa* (d), *pesantren* (e), and *madrasa diniyah* (f) established per village–year. All specifications include village fixed effects and year fixed effects interacted with the number of secular elementary schools and Islamic schools in the village as of 1959. The gray shading corresponds to 90% confidence intervals with standard errors clustered by village.

**Figure 3.5:** Entry of Formal and Informal Islamic Schools  
As a Share of All School Entry



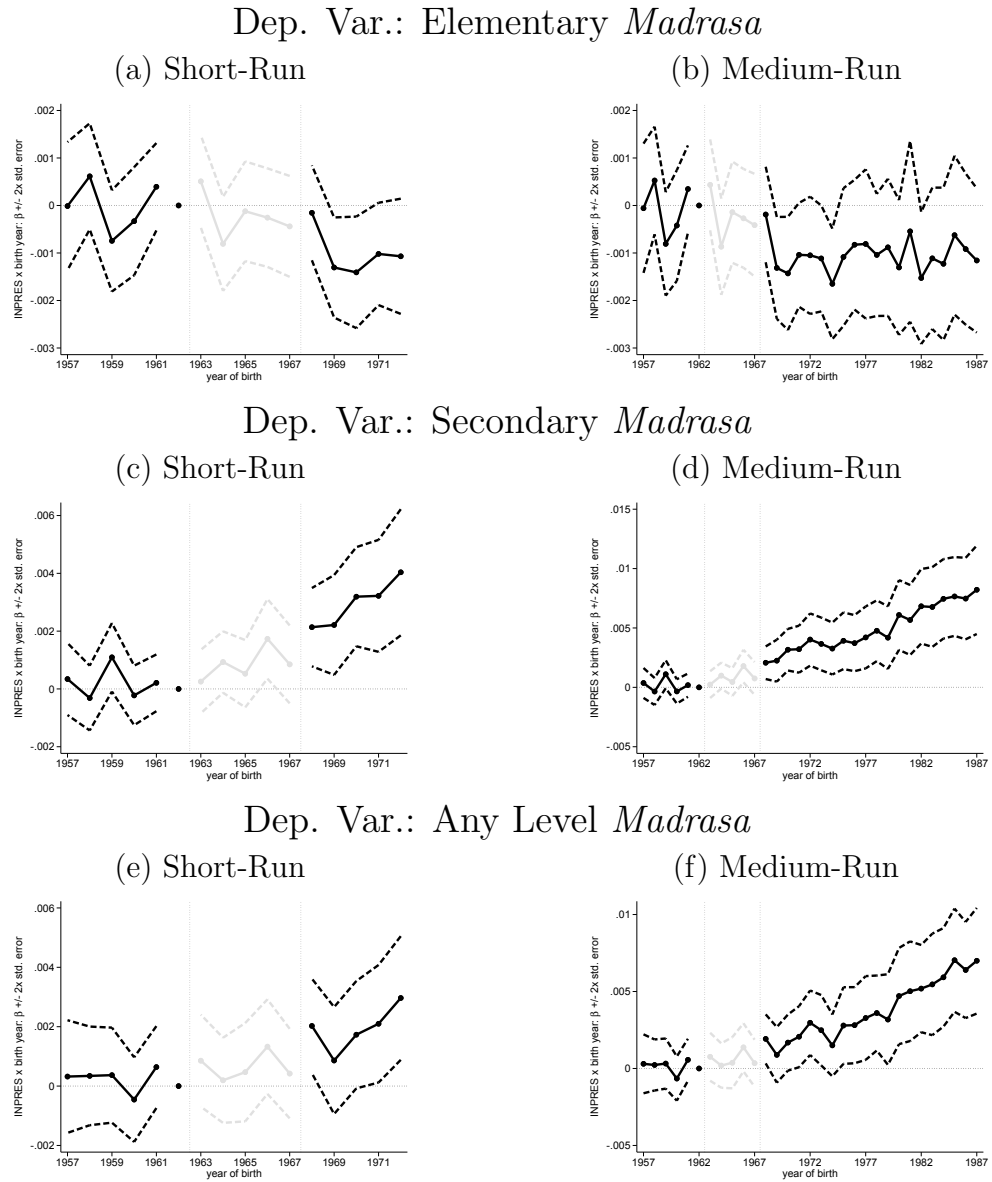
*Notes:* This figure reports semi-decade-specific estimates of  $\beta$  in equation (3.1). The dependent variable measures: (a) *madrasa* at all instruction levels built per district-year as a fraction for all formal schools (including secular public, private, and Islamic schools), and (b) *pesantren* and *madrasa diniyah* built per district-year as a fraction of all schools (including formal and informal schools). As in Figure 3-2, the 1965–69 period is the reference period given district fixed effects. The dots correspond to the period-specific  $\beta$ , and the bars to 90% confidence intervals with standard errors clustered by district. All specifications include district fixed effects and year fixed effects interacted with the 1971 children population, the 1971 enrollment rate, district-level exposure to the water and sanitation program, the number of elementary, junior secondary, senior secondary *madrasa* in 1949, and the number of *pesantren* in 1949.

**Figure 3.6:** INPRES Exposure and Islamic Schooling – Raw Summary



*Notes:* This figure reports mean Islamic school completion rates over time for districts with above-median (high) and below-median (low) INPRES intensity from 1973–78. INPRES intensity is defined as the number of SD INPRES schools constructed from 1973–78 per 1,000 children in 1971. The rates are computed for cohorts from 1957 to 1987, pooling across annual *Susenas* data from 2012 to 2018, and they indicate whether the final level of education is (a) elementary *madrasa*, (b) junior secondary *madrasa*, (c) senior secondary *madrasa*, and (d) any level *madrasa*. The outcomes are the same as those in Table 3.5. The cohorts born before 1963 would have fully completed primary schooling before SD INPRES was rolled out in 1973. The cohorts born from 1968 onwards would have been fully exposed to SD INPRES given that they would have been no more than 6 years old just prior to school construction ensuing. The cohorts born from 1963 to 1967 (greyed out) correspond to the partially-exposed cohorts. See Section 3.6 for further discussion of these distinctions across cohorts.

**Figure 3·7:** INPRES Exposure and Islamic Schooling – Estimated Effects by Cohort



*Notes:* This figure reports age-specific estimates of  $\beta$  in equation (3.4). INPRES intensity is defined as the number of SD INPRES schools constructed from 1973-78 per 1,000 children in 1971. The dependent variable in panels (a) and (b) is an indicator equal to one if the individual's final year of schooling was completed in an Islamic elementary school. Panels (c) and (d) are for an Islamic secondary school, and panels (e) and (f) for any Islamic school. Panels (a), (c), and (e) correspond to the original cohort specification: fully-exposed born 1968–1972 (black), partially-exposed born 1963–1967 (gray), and unexposed born 1957–1962 (black). Panels (b), (d), and (f) expand exposed cohorts to 1987. The 1962 cohort serves as the reference age, given age fixed effects, in both the short- and long-run specifications. All specifications include survey year  $\times$  district of birth dummies and year of birth with the 1971 children population, the 1971 enrollment rate, district-level exposure to the water and sanitation program, the number of elementary, junior secondary, senior secondary *madrasa* in 1957, and the number of *pesantren* in 1957. The dashed lines correspond to 90% confidence intervals with standard errors clustered by district of birth.

**Table 3.1:** Correlates of INPRES Elementary School Allocation

	Dependent Variable:				
	log SD INPRES in district				SD INPRES in village (5)
<i>District Level</i>	(1)	(2)	(3)	(4)	
% Islamic primary enrollment, 1967–72	0.039*** (0.009)	0.028*** (0.009)		0.011 (0.008)	
log school-aged children not enrolled, 1971	0.684*** (0.076)		0.622*** (0.080)	0.628*** (0.072)	
% Non-Islamic primary enrollment, 1967–72		-0.016*** (0.005)		-0.014*** (0.005)	
log Islamic primary schools, 1971			0.130*** (0.030)	0.079*** (0.025)	
Islamic parties vote share, 1950s				0.004*** (0.001)	
<i>Village Level</i>					
any public elementary in village, 1971					-0.028** (0.012)
any private non-Islamic elementary in village, 1971					-0.046*** (0.015)
any private Islamic elementary in village, 1971					0.052*** (0.019)
Number of Districts or Villages	275	275	275	275	75,208
Targeting Policy Controls	✓	✓	✓	✓	✓
R <sup>2</sup>	0.872	0.812	0.872	0.893	0.030

*Notes:* This table reports correlates of SD INPRES school construction at the district and village levels. The dependent variable is the log number of INPRES elementary schools constructed at the district level between 1973–78 (columns 1–4) and an indicator for any SD INPRES built in the village during that same period (column 5). All regressions control for the variables that informed the policy rule for INPRES school allocations: province fixed effects, the 1971 children population, the 1971 enrollment rate, and exposure to the water and sanitation program.

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01. Robust standard errors in parentheses, clustered by district in column 5.

**Table 3.2:** SD INPRES Intensity and Islamic School Entry

	Formal <i>Madrassa</i>			Informal		All Islamic (6)
	Elementary (1)	Junior Sec. (2)	Senior Sec. (3)	<i>Pesantren</i> (4)	<i>Diniyah</i> (5)	
(a) Difference-in-Differences, District Level						
INPRES $\times$ post-1972	0.0017*** (0.0005)	0.0016*** (0.0004)	0.0009*** (0.0002)	0.0021*** (0.0005)	0.0041** (0.0016)	0.0105*** (0.0023)
(b) Synthetic Difference-in-Differences, District Level						
INPRES $\times$ post-1972	0.0034*** (0.0013)	0.0034*** (0.0009)	0.0016*** (0.0004)	0.0043*** (0.0010)	0.0052* (0.0027)	0.0179*** (0.0039)
1959 Islamic Schools $\times$ Year FE	✓	✓	✓	✓	✓	✓
District FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Number of District–Years	11,000	11,000	11,000	11,000	11,000	11,000
Dep. Var. Mean	0.007	0.005	0.002	0.007	0.018	0.039
R <sup>2</sup> (panel a)	0.179	0.169	0.169	0.313	0.564	0.463
(c) Difference-in-Differences, Village Level						
SD INPRES Entry	0.0021*** (0.0004)	0.0018*** (0.0002)	0.0007*** (0.0001)	0.0017*** (0.0003)	0.0043*** (0.0007)	0.0105*** (0.0012)
(d) Robust Difference-in-Differences Estimator, Village Level						
SD INPRES Entry	0.0022*** (0.0002)	0.0017*** (0.0001)	0.0008*** (0.0001)	0.0013*** (0.0002)	0.0035*** (0.0003)	0.0094*** (0.0005)
1959 Islamic Schools $\times$ Year FE	✓	✓	✓	✓	✓	✓
Village FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Number of Village–Years	3,334,560	3,334,560	3,334,560	3,334,560	3,334,560	3,334,560
Dep. Var. Mean	0.0009	0.0001	0.0001	0.0005	0.0025	0.0011
R <sup>2</sup> (panel c)	0.035	0.029	0.028	0.068	0.063	0.045

*Notes:* The dependent variables are measured as new schools of a given type created per district–year and per 1,000 children in 1971 in panels (a) and (b) and per village–year in panels (c) and (d). Panel (a) reports difference-in-differences estimates of  $\beta$  in equation (3.1). INPRES refers to SD INPRES schools constructed from 1973–78 per 1,000 children in 1971. Panel (b) reports synthetic DID estimates computed using Arkhangelsky et al. (2021); see the notes to Figure 3-3 for details on the implementation. In panels (a) and (b), all specifications include district fixed effects and year fixed effects interacted separately with the 1971 children population, the 1971 enrollment rate, exposure to the water and sanitation program, the number of elementary, junior secondary, senior secondary *madrassa* in 1959, and the number of *pesantren* in 1959. Both (a) and (b) are estimated on a panel at the district–year level spanning 1960–99. Panels (c) and (d) report estimates of the average of post-SD-INPRES-entry coefficients  $\tau$  in equation (3.2). Panel (c) reports standard difference-in-differences estimates and panel (d) reports estimates computed using the robust imputation method from Borusyak et al. (2021). SD INPRES Entry is a binary indicator equal to one in the first year of public primary school construction from 1973–78 and remains one in all years thereafter. All specifications include village fixed effects and year fixed effects interacted separately with the number of secular elementary schools and Islamic schools in the village as of 1959.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Robust standard errors are clustered by district in panel (a), and using the cluster bootstrap described in Algorithm 2 of Arkhangelsky et al. (2021) in panel (b). Robust standard errors are clustered by village in panels (c) and (d).

**Table 3.3:** SD INPRES Intensity and Heterogeneous Entry of Islamic Schools, Village Level

	Formal <i>Madrasa</i>			Informal		All Islamic (6)
	Elementary (1)	Junior Sec. (2)	Senior Sec. (3)	<i>Pesantren</i> (4)	<i>Diniyah</i> (5)	
(a) 1960–1999						
SD INPRES Entry	0.0011*** (0.0003)	0.0011*** (0.0002)	0.0004*** (0.0001)	0.0009*** (0.0003)	0.0025*** (0.0006)	0.0059*** (0.0011)
SD × potential rice yield	0.0015*** (0.0004)	0.0013*** (0.0003)	0.0004*** (0.0001)	0.0009** (0.0004)	0.0033*** (0.0008)	0.0074*** (0.0013)
SD × any <i>waqf</i> , predetermined	0.0041*** (0.0007)	0.0027*** (0.0004)	0.0013*** (0.0003)	0.0049*** (0.0011)	0.0073*** (0.0018)	0.0202*** (0.0023)
1959 Islamic Schools × Year FE	✓	✓	✓	✓	✓	✓
Village FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Number of Village–Years	3,007,920	3,007,920	3,007,920	3,007,920	3,007,920	3,007,920
Dep. Var. Mean	0.0013	0.0001	0.0001	0.0006	0.0026	0.0047
R <sup>2</sup>	0.036	0.029	0.029	0.068	0.063	0.075
(b) 1968–1983						
SD INPRES Entry	0.0001 (0.0005)	0.0002 (0.0001)	0.0001 (0.0001)	0.0001 (0.0002)	0.0006 (0.0005)	0.0011 (0.0007)
SD × potential rice yield	0.0023*** (0.0007)	0.0006*** (0.0002)	0.0000 (0.0001)	-0.0000 (0.0001)	0.0011** (0.0005)	0.0041*** (0.0009)
SD × any <i>waqf</i> , predetermined	0.0069*** (0.0012)	0.0007 (0.0005)	0.0004** (0.0002)	0.0006 (0.0004)	0.0023*** (0.0009)	0.0109*** (0.0017)
1967 Islamic Schools × Year FE	✓	✓	✓	✓	✓	✓
Village FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Number of Village–Years	1,203,168	1,203,168	1,203,168	1,203,168	1,203,168	1,203,168
Dep. Var. Mean	0.0013	0.0001	0.0001	0.0006	0.0026	0.0047
R <sup>2</sup>	0.077	0.068	0.066	0.085	0.107	0.105

*Notes:* The dependent variables are measured as new schools of a given type created per village-year. We report estimates over the period 1960–99 (panel a) or the period 1968–1983 (panel b). Both panels report estimates of the average of post-SD-INPRES-entry coefficients  $\tau$  in equation (3.2) estimated via standard DID. SD INPRES Entry is a binary indicator equal to one in the first year of public primary school construction from 1973–78 and remains one in all years thereafter. “potential rice yield” is a time-invariant measure from FAO-GAEZ and averages over dry and wet rice yields; this measure is standardized prior to interacting with SD INPRES Entry. We do not have reliable measures of potential yield for some villages and districts and hence the slightly smaller sample size relative to panel (c) and (d) in Table 3.2. “any *waqf*, predetermined” is a binary indicator equal to one if the village had any *waqf* endowments prior to 1960 in panel (a) and prior to 1968 in panel (b). All specifications include village fixed effects and year fixed effects interacted separately with the number of secular elementary schools and Islamic schools in the village as of 1959.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Robust standard errors clustered by village.

**Table 3.4:** SD INPRES Intensity and Curriculum Differentiation in Islamic Schools

	All Levels (1)	Primary (2)	Jun. Sec. (3)	Sen. Sec. (4)
(a) Islamic Subject Share				
INPRES $\times$ post-1972	0.012* (0.007)	0.013** (0.006)	0.023*** (0.008)	-0.040 (0.025)
Dep. Var. Mean	0.246	0.238	0.261	0.242
Dep. Var. Std. Dev.	0.047	0.033	0.028	0.036
(b) Arabic Share				
INPRES $\times$ post-1972	0.002* (0.001)	0.003** (0.001)	0.008** (0.002)	0.017*** (0.002)
Dep. Var. Mean	0.053	0.050	0.068	0.054
Dep. Var. Std. Dev.	0.013	0.009	0.010	0.007
(c) <i>Pancasila</i> /Civic Share				
INPRES $\times$ post-1972	-0.001 (0.001)	n/a	-0.003 (0.003)	0.008*** (0.002)
Dep. Var. Mean	0.012		0.060	0.039
Dep. Var. Std. Dev.	0.023		0.008	0.004
(d) <i>Bahasa</i> Indonesia Share				
INPRES $\times$ post-1972	-0.004** (0.002)	0.000 (0.003)	-0.005 (0.004)	0.002 (0.002)
Dep. Var. Mean	0.027	0.001	0.123	0.084
Dep. Var. Std. Dev.	0.047	0.008	0.016	0.008
District FE	✓	✓	✓	✓
Grade-Level FE	✓	✓	✓	✓
Year-of-Entry FE	✓	✓	✓	✓
Number of Observations	4,128	1,404	1,662	1,046
Number of Districts	239	213	213	178

*Notes:* This table presents estimates from a modified version of equation (3.1). We use an unbalanced panel at the school–grade (primary, jun. sec., sen. sec.)  $\times$  district  $\times$  year level, including only years in which the given district had any school–grades enter. The estimating equation is  $y_{sjt} = \beta(INPRES_j \times Post1972_t) + (\mathbf{X}_j \times Post1972_t)' \Theta + \delta_s + \delta_j + \delta_t + \varepsilon_{sjt}$ , where  $s$  is a school–grade level and other terms are defined as in equation (3.1). The dependent variable measures the mean share of weekly instruction time devoted to Islamic subject material in panel (a), Arabic instruction in panel (b), *Pancasila* and civic education in panel (c), and instruction of the national language and literature, *Bahasa* Indonesia in panel (d). The measures come from the SIAP registry for the 2018–19 school year, and we categorize subject material using a procedure detailed in Appendix C.4. It is not possible to identify *Pancasila* and civic subjects for primary schools as such hours are not recorded in the database and hence the omission of column 2 in panel (b). All specifications include district  $\times$  grade-level fixed effects, year-of-entry fixed effects, and a post-1972 dummy interacted with the 1971 children population, the 1971 enrollment rate, exposure to the water and sanitation program, and the baseline number of elementary, junior secondary, senior secondary *madrassa*, and *pesantren*.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Robust standard errors clustered by district.

**Table 3.5:** SD INPRES Exposure and Islamic School Choice

	Elementary		Highest Education Level: Junior Secondary		[...] Senior Secondary		Madrasa Any Level	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(a) Difference-in-Differences							
INPRES × young	-0.0010** (0.0004)	-0.0010 (0.0006)	0.0018*** (0.0004)	0.0031*** (0.0007)	0.0010*** (0.0003)	0.0018*** (0.0004)	0.0017** (0.0007)	0.0037*** (0.0012)
	(b) Synthetic Difference-in-Differences							
INPRES × young	-0.0025*** (0.0008)	-0.0049*** (0.0012)	0.0034*** (0.0008)	0.0031** (0.0015)	0.0020*** (0.0007)	0.0025** (0.0010)	0.0026* (0.0014)	0.0002 (0.0025)
District × Survey Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓	✓	✓	✓	✓
1957 Islamic Schools × Cohort FE	✓	✓	✓	✓	✓	✓	✓	✓
Cohorts born 1968–72 vs. 1957–62	✓	✓	✓	✓	✓	✓	✓	✓
Cohorts born 1968–87 vs. 1957–62		✓		✓		✓		✓
Number of Individuals	839,026	2,315,949	839,026	2,315,949	839,026	2,315,949	839,026	2,315,949
Number of Districts	275	275	275	275	275	275	275	275
Dep. Var. Mean	0.014	0.011	0.011	0.016	0.008	0.012	0.031	0.038
R <sup>2</sup> (panel a)	0.031	0.024	0.014	0.021	0.009	0.011	0.033	0.037

*Notes:* This table reports estimates of equation (3.4) based on annual *Susenas* data from 2012 to 2018. INPRES refers to SD INPRES schools constructed from 1973–78 per 1,000 children in 1971. The dependent variables include an indicator equal to one if the individual’s final year of schooling took place in an Islamic elementary (columns 1–2), junior secondary (columns 3–4), senior secondary (columns 5–6), or any level Islamic (columns 7–8). Panel (a) reports standard DID estimates. All specifications include district of birth times survey–year fixed effects and cohort fixed effects interacted separately with the 1971 children population, the 1971 enrollment rate, exposure to the water and sanitation program in the district of birth, the number of elementary, junior secondary, senior secondary *madrassa* in 1957, and the number of *pesantren* in 1957. In odd-numbered columns, the sample is composed of all individuals aged 2–6 (young) or 12–17 in 1974. In even-numbered columns, the young group additionally includes cohorts born between 1973 and 1987. Robust standard errors are clustered by district of birth. Panel (b) reports synthetic DID estimates. The dependent variables are residualized outcomes obtained using the same set of covariates as in panel (a); see Figure 3-3 for generic details on SDID implementation. Analogous to Appendix Figure C-8, partially exposed cohorts aged 7–11 in 1974 are used in the construction of the synthetic control group; thus the sample is composed of all individuals aged 2–6 (young) or 7–17 in 1974 in odd-numbered columns, and the young group additionally includes cohorts born between 1973 and 1987 in even-numbered columns.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Standard errors are clustered by district of birth in both panels and, in panel (b), are computed using the cluster bootstrap described in Algorithm 2 of Arkhangelsky et al. (2021).

**Table 3.6:** SD INPRES Exposure and School Choice, Conditional Estimates

	Highest Education Level: [...] <i>Madrassa</i>				Graduating at that Level			
	Elementary (1)	(2)	Junior Secondary (3)	(4)	Senior Secondary (5)	(6)	Any Level (7)	(8)
(a) Difference-in-Differences (DID)								
INPRES × young	-0.0017** (0.0007)	-0.0016* (0.0009)	0.0057*** (0.0020)	0.0059*** (0.0021)	-0.0001 (0.0014)	0.0030** (0.0014)	0.0011* (0.0007)	0.0024*** (0.0009)
(b) Synthetic Difference-in-Differences								
INPRES × young	-0.0043*** (0.0016)	-0.0088*** (0.0023)	0.0117*** (0.0044)	0.0027 (0.0060)	-0.0004 (0.0028)	0.0020 (0.0040)	0.0016 (0.0017)	-0.0011 (0.0025)
(c) DID with Selection Correction (Parametric)								
INPRES × young	-0.0029** (0.0012) [0.049]	-0.0042** (0.0012) [0.020]	0.0037 (0.0027) [0.347]	0.0055* (0.0020) [0.068]	0.0017 (0.0021) [0.481]	0.0028 (0.0017) [0.202]	0.0002 (0.0008) [0.731]	0.0022 (0.0009) [0.222]
Selection Term, p-value	0.245	0.013	0.367	0.592	0.353	0.970	0.134	0.745
(d) DID with Selection Correction (Semiparametric)								
INPRES × young	-0.0017*** (0.0007) [0.001]	-0.0021*** (0.0008) [0.001]	0.0053*** (0.0020) [0.001]	0.0059*** (0.0020) [0.001]	0.0001 (0.0015) [0.986]	0.0018 (0.0013) [0.249]	0.0004 (0.0007) [0.479]	-0.0001 (0.0009) [0.575]
Selection Terms, p-value	0.902	0.034	0.002	0.000	0.155	0.000	0.111	0.000
District × Survey Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓	✓	✓	✓	✓
1957 Islamic Schools × Cohort FE	✓	✓	✓	✓	✓	✓	✓	✓
Cohorts born 1968–72 vs. 1957–62	✓	✓	✓	✓	✓	✓	✓	✓
Cohorts born 1968–87 vs. 1957–62	✓	✓	✓	✓	✓	✓	✓	✓
Number of Individuals	283,359	726,561	100,874	373,064	130,546	471,076	543,748	1,680,217
Number of Districts	275	275	275	275	275	275	275	275
Dep. Var. Mean	0.024	0.024	0.070	0.086	0.044	0.053	0.036	0.044

*Notes:* This table estimates the specifications in Table 3.5 on dependent variables defined conditional on graduating from a given level of education. These binary outcomes equal one for *madrassa* among elementary graduates (columns 1–2), among junior secondary graduates (columns 3–4), among senior secondary graduates (columns 5–6), and any level graduates (columns 7–8). The sample only includes individuals at the given graduation level. In panels (a) and (b), specification details for the DID and the SDID estimation are otherwise identical to those in panels (a) and (b) of Table 3.5, respectively. In panels (c) and (d), we report estimates from the second step of a two-step selection model that adjusts for the non-random sample selection, i.e., conditioning on those that reached the given level. Panel (a) estimates a parametric Heckman (1976) two-step procedure, which includes the inverse Mills Ratio in the second-step. Panel (b) estimates a semiparametric Newey (2009) procedure, which includes a cubic polynomial in flexibly estimated first-step probabilities; the cubic order is based on consistency results in Newey (2009), which imply an upper bound of 3 on the order of the approximating power series in a sample with effective size of 275 (i.e., the level of policy variation). In both cases, we exclude from the second step a set of covariates that capture exposure to a compulsory schooling pilot program in the 1950s and early 1960s: cohort FE times (i) an indicator equal to one if the individual’s district of birth was one of 35 pilot sites, (ii) the number of schools allocated to the district as part of the program, and (iii) the number of teachers allocated to the district as part of the program. In panel (d), to better approximate the true selection correction function, we create quintiles of all continuous regressors in the first step estimation, i.e., (ii) and (iii) plus the continuous regressors in the baseline specification.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Robust standard errors clustered by district of birth in all specifications. Panels (c) and (d) deploy a percentile- $t$  cluster bootstrap procedure proposed by Yamagata (2006) and shown to work well with two-step selection estimators. The standard errors in those panels are based on non-bootstrap inference, but the significance levels on the coefficients and p-values reported below the standard errors are based on the asymmetric percentile- $t$  confidence intervals derived from 250 cluster bootstrap repetitions.

**Table 3.7:** Heterogeneity in the Effects of SD INPRES on Islamic School Choice

	Years of School		Elementary		Highest Education Level: Junior Sec.		[...] <i>Madrasa</i> Senior Sec.		Any	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(a) Ideological Heterogeneity										
INPRES $\times$ young	0.1329*** (0.0254)	0.2044*** (0.0358)	-0.0007 (0.0005)	-0.0004 (0.0008)	0.0019*** (0.0005)	0.0032*** (0.0008)	0.0010*** (0.0004)	0.0017*** (0.0004)	0.0021*** (0.0008)	0.0042*** (0.0013)
INPRES $\times$ young $\times$ Islamic vote (1950s)	-0.0112 (0.0267)	0.0389 (0.0341)	0.0003 (0.0007)	0.0006 (0.0010)	0.0010* (0.0005)	0.0018** (0.0009)	0.0006* (0.0003)	0.0010** (0.0005)	0.0017* (0.0010)	0.0033** (0.0016)
(b) Gender Heterogeneity										
INPRES $\times$ young $\times$ male	0.1788*** (0.0306)	0.1969*** (0.0359)	-0.0012*** (0.0004)	-0.0013** (0.0005)	0.0017*** (0.0004)	0.0023*** (0.0006)	0.0010*** (0.0003)	0.0020*** (0.0005)	0.0014** (0.0007)	0.0029*** (0.0010)
INPRES $\times$ young $\times$ female	0.0984*** (0.0288)	0.1921*** (0.0419)	-0.0008 (0.0005)	-0.0006 (0.0008)	0.0020*** (0.0005)	0.0038*** (0.0009)	0.0010** (0.0005)	0.0016*** (0.0005)	0.0021** (0.0008)	0.0045*** (0.0014)
male=female, p-value	0.007	0.890	0.435	0.239	0.425	0.004	0.902	0.223	0.277	0.032
District $\times$ Survey Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1957 Islamic Schools $\times$ Cohort FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cohorts born 1968–72 vs. 1957–62	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cohorts born 1968–87 vs. 1957–62	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Individuals	839,019	2,315,933	839,026	2,315,949	839,026	2,315,949	839,026	2,315,949	839,026	2,315,949
Dep. Var. Mean (overall)	7.5	8.4	0.014	0.011	0.011	0.016	0.008	0.012	0.031	0.038
Dep. Var. Mean (male)	8.1	8.8	0.011	0.009	0.010	0.014	0.008	0.011	0.027	0.033
Dep. Var. Mean (female)	6.9	8.2	0.016	0.012	0.011	0.018	0.007	0.012	0.034	0.042

*Notes:* This table reports estimates of a modified version of equation (3.4). Compared to the baseline DID specification, panel (a) interacts INPRES  $\times$  young with the standardized vote share of Islamic parties in the 1950s elections, which is also separately interacted with cohort FE, and panel (b) interacts INPRES  $\times$  young separately with male and female dummies while also interacting all baseline controls (and interactive FE) with a female indicator, i.e., all coefficients and FE are allowed to vary with gender. With the exception of columns 1–2, which looks at total years of education, the specifications in both panels are otherwise identical to those in Table 3.5 (see the notes therein). Panel (b) also reports the p-value from an  $F$  test of coefficient equality between genders.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Robust standard errors clustered by district of birth.

**Table 3.8:** Substitution between SD INPRES and Islamic Elementary Schools

	Dep. Var.: Years of Education ( <i>mean</i> = 7.5)				
	OLS			IV	
	(1)	(2)	(3)	(4)	(5)
INPRES $\times$ young	0.133*** (0.029)	0.131*** (0.029)	0.154*** (0.032)	0.107*** (0.031)	0.176*** (0.043)
Islamic elementary $\times$ young		0.137 (0.163)	1.264** (0.504)	1.687*** (0.577)	4.167*** (1.413)
INPRES $\times$ Islamic elementary $\times$ young			-0.567*** (0.206)		-1.485** (0.685)
District $\times$ Survey Year FE	✓	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓	✓
1957 Islamic Schools $\times$ Cohort FE	✓	✓	✓	✓	✓
Number of Individuals	839,019	839,019	839,019	839,019	839,019
KP 1st stage Wald statistic				23.0	10.9
KP 1st stage LM test, p-value				< 0.01	< 0.01

*Notes:* This table reports estimates of equation (3.4) with years of schooling as the dependent variable and the regressors augmented with Islamic elementary school entry in the same period as SD INPRES entry 1973–78. Like the latter, Islamic elementary equals the total new Islamic school constructions during that period normalized by the district’s child population in 1971. Columns 1–3 are estimated by OLS and column 4–5 by IV. The instruments in column 4 include the exposed cohort indicator, young, times the district-level Muslim population share in 1972, the *waqf* endowment in 1972, and the predetermined potential rice yield from the FAO-GAEZ. The instruments in column 5 expand that set to include the triple interactions with INPRES. The OLS and IV specifications are otherwise identical to the baseline specification in the odd-numbered columns of Table 3.5 (see the notes therein). The KP 1st stage Wald statistic in column 4 is just the standard cluster-robust F statistic and column 5 is the Kleibergen and Paap (2006) multivariate Wald analogue. Sanderson and Windmeijer (2016) tests on the separate first stages in column 5 reject the null of weak instruments with p-values < 0.01. The KP 1st stage LM (Lagrange Multiplier) tests the null of underidentification. A Hausman GMM test strongly rejects the null (p-value < 0.01) that the OLS and IV are identical (i.e., that the regressors are endogenous).

\* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01. Robust standard errors clustered by district.

**Table 3.9: SD INPRES Exposure, Identity, and Religiosity**

(a) Identity, Proxied by Language						
	National Language Use at Home			Arabic Literacy		
	All	Muslims	Non-Muslims	All	Islamic-Educated	Secular-Educated
	(1)	(2)	(3)	(4)	(5)	(6)
INPRES $\times$ young	-0.0011 (0.0015)	-0.0029* (0.0018)	-0.0018 (0.0018)	0.0112*** (0.0026)	0.0144 (0.00108)	0.0023 (0.0025)
Number of Individuals	31,680,947	27,811,517	3,869,430	839,026	25,935	813,087
Number of Districts	273	273	273	275	275	275
Dep. Var. Mean	0.166	0.150	0.275	0.343	0.688	0.332

(b) Islamic Piety and Practice								
	Pray 5x daily	Fast during Ramadan	Reads the Qur'an	Friday	Prayer: <i>Sunna</i>	Group	Pay <i>Zakat</i>	Index
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
INPRES $\times$ young	0.1344** (0.0604)	-0.0041 (0.0503)	0.0977** (0.0470)	0.1559** (0.0611)	0.0954* (0.0485)	0.0348 (0.0466)	0.0370 (0.0466)	0.0781*** (0.0294)
Number of Individuals	1,282	1,283	1,281	1,276	1,268	1,280	1,281	1,284
Number of Districts	144	144	144	144	144	144	144	144
Dep. Var. Mean	0.623	0.797	0.251	0.187	0.140	0.230	0.834	0.415

*Notes:* This table reports estimates of equation (3.4) using data from multiple sources. The dependent variable in columns 1–3 of panel (a) is an indicator for whether the individual speaks the national language, *Bahasa* Indonesia, as his/her main language at home. The data come from the complete-count 2010 Population Census. Columns 4–6 in panel (a) look at an indicator for whether an individual reports literacy in Arabic in the annual *Susenas* data from 2012 to 2018. Panel (a) sample splits across Muslims and non-Muslims in the Population Census (where we do not observe Islamic education) and across Islamic-educated and non-Islamic-educated in *Susenas* (where we do not observe religion). The specifications in panel (a) are restricted to mothers and fathers (husbands and wives) that fall within the original birth cohorts: aged 2–6 (young) or 12–17 in 1974. The dependent variables in panel (b) include indicators for whether an individual reports partaking in a range of Islamic practices as reported in the Pepinsky et al. (2018) survey data from 2008. The final column is a mean index across all 7 prior outcomes. The sample in panel (b) is restricted to Muslim respondents from 1957 to 1987, excluding the partially exposed cohorts born 1963–67. The specification is otherwise identical to panel (a) in Table 3.5, which includes district of birth (times survey–year) fixed effects and cohort fixed effects interacted separately with the 1971 children population, the 1971 enrollment rate, exposure to the water and sanitation program in the district of birth, the number of elementary, junior secondary, senior secondary *madrassa* in 1957, and the number of *pesantren* in 1957 (see the notes therein).

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Robust standard errors clustered by district of birth.

**Table 3.10: SD INPRES Exposure and Ideology**

	(1)	(2)	(3)	(4)	(5)
(a) Citizens					
	<i>Pancasila</i>	Politics	Respondent Supports ... Islamic Economics	<i>Sharia</i> (Index) Subjective	Objective
INPRES × young	0.0194 (0.0424)	-0.0005 (0.0875)	0.0365 (0.0615)	-0.0122 (0.0581)	0.0143 (0.0288)
Number of Individuals	1,444	1,284	1,297	1,377	1,286
Number of Districts	159	156	157	157	144
Dep. Var. Mean	0.857	0.616	0.732	0.637	0.434
(b) Candidates					
	Golkar Party	United Development Party (PPP)	Nation Building	Platform Appeals to Islam	Nation Building Excl. Islam
INPRES × young	-0.0109* (0.0061)	0.0103** (0.0044)	-0.0106* (0.0059)	0.0028 (0.0023)	-0.0110* (0.0056)
Number of Candidates	17,123	17,123	17,123	17,123	17,123
Number of Districts	273	273	273	273	273
Dep. Var. Mean	0.118	0.045	0.116	0.027	0.110

*Notes:* This table reports estimates of equation (3.4) for ideological outcomes. The data in panel (a) come from the Pepinsky et al. (2018) survey data. The dependent variable in column 1 of panel (a) is an indicator for whether the individual supports the national, inclusive secular ideology of *Pancasila*, or thinks some other ideology would be preferable. We next look at measures of support for a greater role of Islamic principles in politics (column 2) or in economic life (column 3). Columns 4 and 5 consider measures of support for application of the *sharia* law. Column 4 is an indicator for whether the Muslim respondent express strong or very strong support for the implementation of *sharia* law. Column 5 is a mean index across several specific components of *sharia* law (e.g., prohibiting interest, mandating *hijab* for women), each of which is elaborated in Appendix Table C.22. The sample in panel (a) is restricted to Muslim respondents from 1957 to 1987, excluding the partially exposed cohorts born 1963–67. The dependent variables in panel (b) are based on legislative candidates in 2019. Columns 1 and 2 are indicators for whether the candidates are running on the party tickets of *Golkar* (former President Suharto’s party) and the Islamic United Development Party (PPP), respectively. Columns 3–5 are indicators for whether the candidate’s campaign platform mentions concepts that appeal to Indonesian nation building and *Pancasila* (column 3), to Islam and religious themes (column 4), and nation building exclusive of Islam and religious themes (column 5). The specifications in panel (b) are restricted to the original birth cohorts: aged 2–6 (young) or 12–17 in 1974. The specifications in both panels is otherwise identical to panel (a) in Table 3.5, which includes district of birth (times survey–year) fixed effects and cohort fixed effects interacted separately with the 1971 children population, the 1971 enrollment rate, exposure to the water and sanitation program in the district of birth, the number of elementary, junior secondary, senior secondary *madrasa* in 1957, and the number of *pesantren* in 1957 (see the notes therein).

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01. Robust standard errors clustered by district.

**Table 3.11: SD INPRES Exposure and Religious Cultural Transmission**

	<i>Marriage Matching</i>		<i>Arabic Literacy</i>			
	Islamic-Educated Partner		Arabic in the Home Parents & Children		Child's Arabic No Islamic Schooling	
	(1)	(2)	(3)	(4)	(5)	(6)
INPRES × young (Father)	0.0020** (0.0009)		0.0044* (0.0025)		0.0073** (0.0036)	
INPRES × young (Mother)		-0.0001 (0.0007)		0.0049* (0.0026)		0.0054 (0.0046)
Number of Individuals	725,803	544,174	304,048	246,060	95,678	77,068
Number of Districts	275	275	275	275	272	272
Cohorts born 1968–72 vs. 1957–62	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	0.039	0.024	0.213	0.268	0.877	0.887
R <sup>2</sup>	0.038	0.026	0.112	0.138	0.048	0.043

*Notes:* This table reports estimates of a modified version of equation (3.4) where *young* now denotes the INPRES exposure of a parent (father or mother). INPRES refers to SD INPRES schools constructed from 1973–78 per 1,000 children in 1971. The dependent variable in columns 1–2 is an indicator for whether the spouse has an Islamic education, in columns 3–4 an indicator for all 3 members of the household (father, mother, and child) being literate in Arabic, and in columns 5–6 an indicator equal to 1 if the child is literate in Arabic, conditional on the parent being literate in Arabic and the child having received no Islamic schooling. All specifications are restricted to children with mothers and fathers (or to husbands and wives) that fall within the original birth cohorts: aged 2–6 (young) or 12–17 in 1974. We restrict to co-resident children that are at least 18 years old and hence likely to have completed their secondary schooling. The regressions additionally control for child birth cohort fixed effects. The specification is otherwise identical to panel (a) in Table 3.5 (see the notes therein).

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01. Robust standard errors clustered by the parent's district of birth.

## Appendix A

# Supplementary materials for Chapter 1

**Table A.1: Summary statistics – Supplementary**

	Mean	SD	Min	Max	Obs.
<b>A. Other Migrant Panel Variables from Doi et al. (2014)</b>					
Remittances since last follow up (IDR)	7,149,120	7,953,597	60,000	90,000,000	418
Remittance transactions since departure	4.54	3.79	1	23	418
Work in Hong Kong	0.58	0.49	0	1	418
Work in Taiwan	0.41	0.49	0	1	418
Work in Singapore	0.01	0.12	0	1	418
IDR exchange rate per 1 Hong Kong Dollar	1138.23	21.06	1095	1166	242
IDR exchange rate per 1 Taiwan New Dollar	297.15	3.66	284	302	170
IDR exchange rate per 1 Singapore Dollar	6990.25	72.87	6903	7080	6
Days since migration departure	160.81	217.18	0	1100	418
Month(s) to next Eid al-Fitr	7.81	2.46	1	11	418
<b>B1. Alternative District-level Regressors</b>					
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
<b>B2. Time-varying Regressors Common to All Districts</b>					
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
<b>C. Other Household Outcomes</b>					
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
<b>D. Other District-level Education Characteristics</b>					
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
<b>E. District Finances</b>					
Total district revenues	27.10	1.25	0.00	29.47	2326
Tax sharing rev. with central govt (log IDR)	23.98	3.19	0.00	28.64	2326
Own district rev. (local taxes and fees, log IDR)	24.01	2.55	0.00	28.46	2326
Share central govt tax sharing out of total rev.	0.07	0.06	0.00	0.86	2322
Share of own revenues out of total rev.	0.07	0.06	0.00	1.00	2322

**Table A.2:** Major Migration Destination Countries

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

**Table A.3:** Remittance Estimates from Survey Data

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

**Table A.4:** Effect of Currency Exchange Fluctuations on Remittances Frequency

	(1)	(2)	(3)	(4)
	Remittances Frequency	Remittances Frequency	Remittances Frequency	Remittances Frequency
XR shock	1.400*** (0.191)	0.896* (0.502)	0.903* (0.510)	0.929* (0.504)
Time abroad			-0.000 (0.001)	-0.000 (0.001)
Time to next Eid				0.478 (0.396)
Dep. Var. Mean	4.5	4.5	4.5	4.5
HH FE, Wave FE		✓	✓	✓
HH	183	183	183	183
Observations	418	418	418	418

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

**Table A.5:** Placebo Effects on School Enrollment

	(1)	(2)	(3)
	Elementary School Enrollment Among 19-24 yo.	Jr. Sec School Enrollment Among 19-24 yo.	Sr. Sec School Enrollment Among 19-24 yo.
A. Boys and Girls			
Migration <sub>d</sub> <sup>o</sup> × XRShock <sub>dt-1</sub>	-0.12 (0.09)	-0.12 (0.18)	-0.79 (0.79)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	0.03	0.20	2.86
Districts	353	353	353
Observations	2411	2411	2411
B. Boys			
Migration <sub>d</sub> <sup>o</sup> × XRShock <sub>dt-1</sub>	-0.10 (0.10)	0.11 (0.20)	-0.34 (0.88)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	0.03	0.23	3.44
Districts	353	353	353
Observations	2411	2411	2411
C. Girls			
Migration <sub>d</sub> <sup>o</sup> × XRShock <sub>dt-1</sub>	-0.19 (0.15)	-0.36 (0.27)	-1.21 (0.97)
District FE, Year FE	✓	✓	✓
Dep. Var. Mean	0.03	0.16	2.29
Districts	353	353	353
Observations	2411	2411	2411

Notes: This table reports the estimates of equation (1.5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with the record of returnees from airport arrival data. The interaction variable Migration<sub>d</sub> × XRShock<sub>t-1</sub> proxies for remittances and is standardized to have a mean of zero and standard deviation of one. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. The district-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total number of migrants and total population from the 2005 village census. Outcomes data comes from the Susenas household surveys. Other outcomes data details are as described in Appendix A.1. \* p ≤ 0.10, \*\* p ≤ 0.05, \*\*\* p ≤ 0.01. Standard errors are clustered at the district level in parentheses.

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

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

Notes: This table reports the estimates of equation (1.5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with the record of returnees from airport arrival data. The interaction variable  $\text{Migration}_d \times \text{XRShock}_{t-1}$  proxies for remittances and is standardized to have a mean of zero and standard deviation of one. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. The district-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total number of migrants and total population from the 2005 village census. Outcomes data comes from the Susenas household surveys, aggregated to the district level with the survey weight. Other outcomes data details are as described in Appendix A.1. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ . Standard errors are clustered at the district level in parentheses.

**Table A.7:** Effects on Household Assets Ownership

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

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

**Table A.8:** Use of Increased Remittances

	(1)	(2)	(3)	(4)	(5)	(6)
	Electronics	Durables	Migration Loan	School	Consumption	Other
XR shock	0.58*** (0.21)	0.43** (0.19)	0.44* (0.26)	0.15 (0.32)	-0.10 (0.39)	0.96** (0.39)
Dep. Var. Mean	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: The sample is the migrant household panel from Doi et al. (2014) who reported receiving remittances during more than one of the follow-up surveys (March 2011-January 2012). Remittances are total received remittances since the migrant's departure as reported during the first follow-up, and the difference from the previous response in subsequent follow-ups. Remittances are expressed in log IDR, and XR shock is the exchange rate to IDR relative to March 2011. Exchange rate data are from Refinitiv Datastream. Standard errors are clustered at the household level. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

**Table A.9:** Indonesia's Major Trading Partners

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

**Table A.10:** Migration Destination and Trade Countries

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

Notes: Standard errors are in parentheses. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.10$ .

**Table A.11:** Correlation between Commodity Production and Migration

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

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

**Table A.12:** Effects on Development and Education Outcomes, Interacted with Pre-period Commodity Production

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

Notes: This table reports the estimates of equation (1.5), modified to include an interaction with pre-period commodity production. In Panel A the baseline trend is the 2004 Agriculture GDP per capita interacted with a set of year dummies. In Panel B the baseline trend is 2004 public schools per 10,000 population interacted with a set of year dummies, each level of schooling added separately. The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with records of returnees from the airport arrival data. XRShock is the district-level yearly average of migrant-weighted foreign currency exchange rate between host country currency and IDR, relative to June 2007. District-level migrant stock abroad for XRShock is reconstructed based on the departure and arrival dates in the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and the total population from the 2005 village census. GDP per capita are expressed in logarithm of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. \* p ≤ 0.10, \*\* p ≤ 0.05, \*\*\* p ≤ 0.01. Standard errors are clustered at the district level in parentheses.

**Table A.13:** Effects on Development and Education Outcomes, Robustness with Island-specific Trends

	(1)	(2)	(3)	(4)	(5)	(6)
A. Development Indicators						
	Household Expenditure	Household Exp Bottom 20%	Asset Index	Poverty Rate	GDP Total	GDP Agriculture
<i>A1. Main Estimates</i>						
Migration <sub>d</sub> <sup>o</sup> × XRShock <sub>dt-1</sub>	0.04 (0.04)	0.10*** (0.03)	0.03*** (0.01)	-3.93*** (0.76)	0.09* (0.05)	0.13*** (0.04)
<i>A2. With Island Trends</i>						
Migration <sub>d</sub> <sup>o</sup> × XRShock <sub>dt-1</sub>	0.05 (0.04)	0.11*** (0.03)	0.05*** (0.01)	-4.14*** (0.85)	0.05 (0.05)	0.13*** (0.05)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	12.83	12.08	0.19	15.13	15.50	13.98
Districts	350	350	327	350	350	350
Observations	2060	2060	907	2392	2399	2399
B. Net Enrollment Rate (%) and Education Facilities (per 10,000 People)						
	Elementary Enrollment (Ages 6-12)	Junior Secondary Enrollment (Ages 13-15)	Senior Secondary Enrollment (Ages 16-18)	Elementary School (Grades 1-6)	Junior Secondary School (Grades 7-9)	Senior Secondary School (Grades 10-12)
<i>B1. Main Estimates</i>						
Migration <sub>d</sub> <sup>o</sup> × XRShock <sub>dt-1</sub>	3.17*** (0.76)	4.37** (2.14)	7.48*** (2.21)	0.85*** (0.28)	0.27*** (0.09)	0.02 (0.03)
<i>B2. With Island Trends</i>						
Migration <sub>d</sub> <sup>o</sup> × XRShock <sub>dt-1</sub>	2.63*** (0.83)	5.03** (2.21)	6.74*** (2.40)	0.66** (0.30)	0.25*** (0.08)	0.04** (0.02)
District FE, Year FE	✓	✓	✓	✓	✓	✓
Dep. Var. Mean	88.98	66.76	46.55	6.39	1.18	0.31
Districts	353	353	353	353	353	353
Observations	2411	2411	2411	2417	2417	2417

Notes: This table reports the estimates of equation (1.5) with the addition of island trends on the right hand side. The sample is from the 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. The district-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and total population from the 2005 village census. GDP per capita is expressed in log of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01. Standard errors are clustered at the district level in parentheses.

**Table A.14:** Effects on Development and Education Outcomes, Robustness with Baseline Trends

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

Notes: This table reports the estimates of equation (1.5) with the addition of baseline trends on the right hand side. In Panel A the baseline trend is the 2004 Agriculture GDP per capita interacted with a set of year dummies. In Panel B the baseline trend is 2004 public schools per 10,000 population interacted with a set of year dummies, each level of schooling added separately. The sample is the 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with recorded returnees from airport arrival data. XRShock is the exchange rate between migrants' host country currencies and IDR, relative to June 2007, averaged at the district-year level. The district-level migrant stock abroad for XRShock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and total population from the 2005 village census. GDP per capita is expressed in log of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. \* p ≤ 0.10, \*\* p ≤ 0.05, \*\*\* p ≤ 0.01. Standard errors are clustered at the district level in parentheses.

**Table A.15:** Effects on Development and Education Outcomes, Robustness Checks Using Podes 2005, 2008, 2011 migrant count

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

Notes: This table reports estimates of equation (1.5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with records of returnees from the airport arrival data. XRShock is the district-level yearly average of migrant-weighted foreign currency exchange rates between host country's currency and IDR, relative to June 2007. District-level migrant stock abroad for XRShock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and the total population from the 2005 village census. GDP per capita are expressed in logarithm of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ . Standard errors are clustered at the district level in parentheses.

**Table A.16:** Effects on Development and Education Outcomes, Robustness Checks using Village Plurality Destinations in Podes 2005

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

Notes: This table reports estimates of equation (1.5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with records of returnees from the airport arrival data. XRShock is the district-level yearly average of migrant-weighted foreign currency exchange rates between host country's currency and IDR, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and the total population from the 2005 village census. GDP per capita are expressed in logarithm of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ . Standard errors are clustered at the district level in parentheses.

**Table A.17:** Effects on Development and Education Outcomes, Robustness with Lagged Outcome Variables

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

Notes: This table reports estimates of equation (1.5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with records of returnees from the airport arrival data. XRShock is the district-level yearly average of migrant-weighted foreign currency exchange rates between host country's currency and IDR, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and the total population from the 2005 village census. GDP per capita are expressed in logarithm of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. \* p ≤ 0.10, \*\* p ≤ 0.05, \*\*\* p ≤ 0.01. Standard errors are clustered at the district level in parentheses.

**Table A.18:** Effects on Development and Education Outcomes, Two-way Clustering Checks

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

Notes: This table reports estimates of equation (1.5). The sample is 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with records of returnees from the airport arrival data. XRShock is the district-level yearly average of migrant-weighted foreign currency exchange rates between host country's currency and IDR, relative to June 2007. District-level migrant stock abroad for XRshock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total migrant and the total population from the 2005 village census. GDP per capita are expressed in logarithm of 2010 IDR. Other outcomes data sources and details are as described in Appendix A.1. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ . Standard errors are clustered by district and year in parentheses.

**Table A.19:** 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
International Transfer (Log IDR)	0.01 (0.02)	0.43** (0.18)	0.03* (0.02)
Observations	170	92	170

Notes: The sample is made up of households in the Indonesia Family Life Survey (2007) panel that reported receiving non-zero transfer from parent(s)/child(ren) abroad in the past 12 months. The 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 response based on 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. Only children who are still/will be at school were asked about their expectation of years of education. Transfer is expressed in log IDR. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

**Table A.20:** Effects of Remittances on Village Informal Taxation

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

Notes: This data from Generasi SPKP survey (Olken et al, 2014). The respondents are households. This table presents the regression coefficients of the 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. The outcomes are participation in and contribution to building and maintenance activities in the village. All regressions include village fixed effects, survey wave fixed effects, and subdistrict-trend terms. Standard errors are clustered at the subdistrict level. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

**Table A.21:** Effects of Remittances on Voting Behavior

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

Notes: This data is from the Generasi SPKP survey (Olken et al, 2014). The respondents are households for Columns 1-3 and village head for Column 4. The table presents the regression coefficients of the outcome variables on the 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. The outcomes are voting turnout for the presidential, mayoral, and village head elections in Columns 1-3, and complaints to the village head about the implementations of anti-poverty programs in Column 4. Presidential elections are cross-section regressions in 2009 with subdistrict fixed effects. Regressions of mayoral and village head elections use survey waves 2009 and 2013 as well as subdistrict and survey wave fixed effects. The regression of complaints to the village head use survey waves 2009 and 2013 as well as village fixed effects, survey wave fixed effects, and subdistrict trend terms. Standard errors are clustered at the subdistrict level. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

**Table A.22:** Effects of Remittances on Household Participation in Community Groups

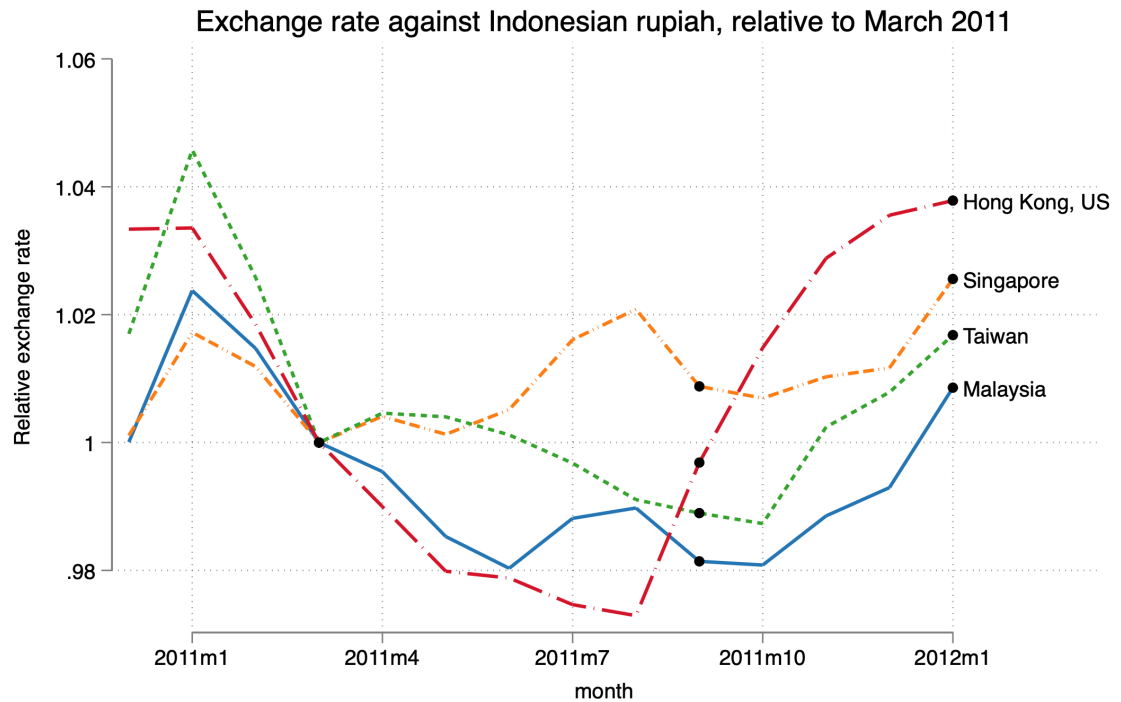
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Religious Groups	Social Service Groups	Credit Groups	Production Groups	Governance Groups	Recreation Groups	Political Groups
Migration x $XRShock^{t-1}$	-0.0414 (-0.88)	0.0455 (1.01)	0.0799* (1.67)	-0.0470* (-1.66)	-0.0114 (-0.43)	0.0268* (1.79)	0.00874 (1.15)
mean(y)	0.58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

Notes: This data is from the Generasi SPKP survey (Olken et al, 2014). The respondents are households. This table presents the regression coefficients of outcome variables on the 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. The outcomes are participation in various community groups. All regressions include village fixed effects, survey wave fixed effects, and subdistrict trend terms. Standard errors are clustered at the subdistrict level. \*  $p \leq 0.10$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.01$ .

**Table A.23:** Impact on Employment Outcomes

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

Notes: This table reports the estimates of equation (5). The sample is the 2005-2012 panel of Indonesian districts in the Indo-Dapoer dataset with records of returnees from airport arrival data. The interaction variable Migration<sub>d</sub> × XRShock<sub>t+2</sub> proxies for remittances and is standardized to have a mean of zero and a standard deviation of one. XRShock is the district-level yearly average of the migrant-weighted foreign currency exchange rates between the host country's currency and IDR, relative to June 2007. District-level migrant stock abroad for XRShock is reconstructed based on the departure and arrival dates from the migrant terminal data. Migration (intensity) is the natural log of the ratio between the total number of migrants and the total population from the 2005 village census. Other outcomes data sources and details are as described in Appendix A.1. \* p ≤ 0.10, \*\* p ≤ 0.05, \*\*\* p ≤ 0.01. Standard errors clustered at the district level in parentheses.

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

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

## Appendix B

# Supplementary materials for Chapter 2

Tables and Figures

Table B.1: Sample of appeals

Ask, occupation	Appeal (Indonesian/translation)
US\$100, Guest Relation Officer	<i>"Restaurant tempat saya kerja ditutup sampai waktu yang belum ditentukan, saya dipaksa diPHK"</i> / "The restaurant where I work is closed until further notice, I was laid off."
US\$100, Principal in a private kindergarten	<i>"Di PHK karena murid sekolah berkurang sehingga, sekolah tidak sanggup bayar gaji."</i> / "I was laid off because my school enrollment has dropped, the school could not pay for my salary."
US\$100, Server/Attendant	<i>"hotel saya tutup dan saya termasuk yang terkena dampak dan harus resign/PHK"</i> / "My hotel was closed and I was among those affected and had to resign/be laid off"
US\$200, Motorcycle Rideshare Driver	<i>"Sebelum adanya wabah ini pendapatan hasil ojol saya 250 sehari tetapi untuk saat ini hanya 15 sehari ini pun haru muter muter cari orderan"</i> / "Before the pandemic my earning from driving is 250 per day but now only 15 daily, even after driving around everywhere to get customers"
US\$67, Drink shop attendant	<i>"Saya kehilangan pekerjaan karena Kedai minuman tempat saya kerja tutup. Padahal istri saya baru saja melahirkan. Saya membutuhkan bantuan untuk membeli kebutuhan anak saya."</i> / "I lost my job because the drink shop where I work is closed. My wife recently gave birth. I need help to buy my child's needs."
US\$100, Hotel Steward	<i>"Saya sudah 1 tahun putus kontrak, dan saya blom bisa bekerja lagi. Sya butuh tambahan biaya buat orang tua saya yg sedang sakit stroke"</i> / "I've been out of contract for 1 year, and I could not find work. I need additional help for my parents who suffered from a stroke"
US\$100, Coffeeshop attendant	<i>"semenjak adanya pandemi covid19 melanda,tempat kerja kami sepi pengunjung.sedangkan saya harus membiayai kedua anak saya yang telah ditinggal ibunya meninggal dunia,mereka semua masih kecil,dan sebentar lagi anak2 mendaptar sekolah TK dan PAUD."</i> / "Since the covid-19 pandemic hit, our coffeeshop has been empty. Meanwhile, I have to pay for my two children whose mothers have died, they are all still small. Soon the children will enroll in kindergarten and PAUD."
US\$47, Social Media Officer	<i>"Kantor saya tutup di bulan Juli. Sejak saat itu saya belum dapat kerja hingga hari ini. Saya sudah melamar ke berbagai kantor, namun masih belum mendapatkan kabar baik. Saya memperdalam kemampuan desain dan ilustrasi dan Copywriting, mengumpulkan portofolio terbaru agar mendapatkan peluang dari Freelance."</i> / "My office closed in July. Since then I have not been able to work. I have applied to various offices, but still have not received any good news. I deepen my design and illustration and copywriting skills, building updated portfolios to get freelance opportunities."
US\$67, Chef	<i>"Sy bkrja di resto sbg staf dapur yg saat ini sdh tdk lg brproduksi akibat dampak epidemi covid19. Sy memiliki 5 anak. 2 putri dn 3 putra. Sy tdk tau smpai kpn epidemi ini brakhir. Sy tdk miliki apa2 selain brgantung pd pkerjaan sy."</i> / "I work as a kitchen staff in a restaurant which is currently no longer open due to covid19. I have 5 children, 2 daughters and 3 sons. I don't know how long this epidemic will last. I have nothing but my job."
US\$100, Housekeeping	<i>"Saya housekeeping dikawal pesiar.Setahun lebih tak ada kejelasan kontrak.Tabungan habis untuk kontrakan dan biaya kuliah anak sulung saya.Tunggakan spp anak kedua 7 bulan.Sudah 5 tahun kami mempunyai shelter straycats,ada 21 kucing yg kami rawat.Ini adalah salahsatu ihtiar saya demi mereka.Doakan kami mampu bertahan ya."</i> / "I am housekeeper on a cruise ship. For more than a year there is no clarity on the contract. My savings are used up for rent and my eldest child's college fees. The tuition for my second child is late for 7 months. We also have a shelter for stray cats for 5 years, with 21 cats. This is an appeal for their sake. Pray for us to survive."

**Table B.2:** Summary of visits, assignments by donation outcome

	Set = 3			Set = 8			Set = 10			Overall		
	Mean	Med	N	Mean	Med	N	Mean	Med	N	Mean	Med	N
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Total set seen by visitors												
Non-donating	3.8	1	642	3.0	1	669	2.3	1	668	3.0	1	1979
Donating	8.5	5	132	3.8	2	155	4.0	2	139	5.3	3	426
All visitors	4.6	1	774	3.2	1	824	2.6	1	807	3.4	1	2405
When are donation made												
The earliest set	3.9	2	132	1.9	1	155	2.1	1	139	2.6	1	426

*Notes:* Table showing the mean set seen by visitors, disaggregated by eventual donation outcomes (donating visitors vs non-donating visitors) and assignment to treatment arms (choice set size). Columns show the mean number of sets, median number of sets, and the number of visitors in each category.

**Table B.3:** Impact of choice set size on donation indicator, selected sample regression

	(1)	(2)	(3)	(4)	(5)
	All	Only first set	1-3	1-8	1-10
set=3	0.0179*** (0.00517)	0.0139** (0.00600)	0.0104 (0.00680)	0.0211*** (0.00620)	0.0222*** (0.00603)
set=8	0.00700 (0.00466)	0.0117** (0.00490)	0.0120* (0.00630)	0.0109** (0.00511)	0.0135*** (0.00487)
Constant	0.0162*** (0.00208)	0.0220*** (0.00289)	0.0262*** (0.00388)	0.0230*** (0.00312)	0.0220*** (0.00295)
FE	beneficiary	beneficiary	beneficiary	beneficiary	beneficiary
Observations	52081	16873	6813	16788	19423

*Notes:* Regression of donation outcomes on choice set size. Observation unit is a dyad. Sample excludes outliers. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table B.4:** Platform Users Charity Destinations in the Past Year

	All	Donors	Recipients	Survey only
Religious org.	.79	.76	.77	.8
Natural disasters	.49	.67	.45	.47
Health causes	.32	.58	.27	.28
Education causes	.34	.57	.27	.31
Humanitarian issues/conflicts	.3	.32	.25	.3
Spontaneous donations	.79	.72	.88	.8
Other organizations	.34	.59	.23	.31
Observations	1708	216	60	1430

*Notes:* Survey responses from Oct 2020-July 2021.

**Table B.5:** Platform Users Self-Declared Reasons for Charity Donations

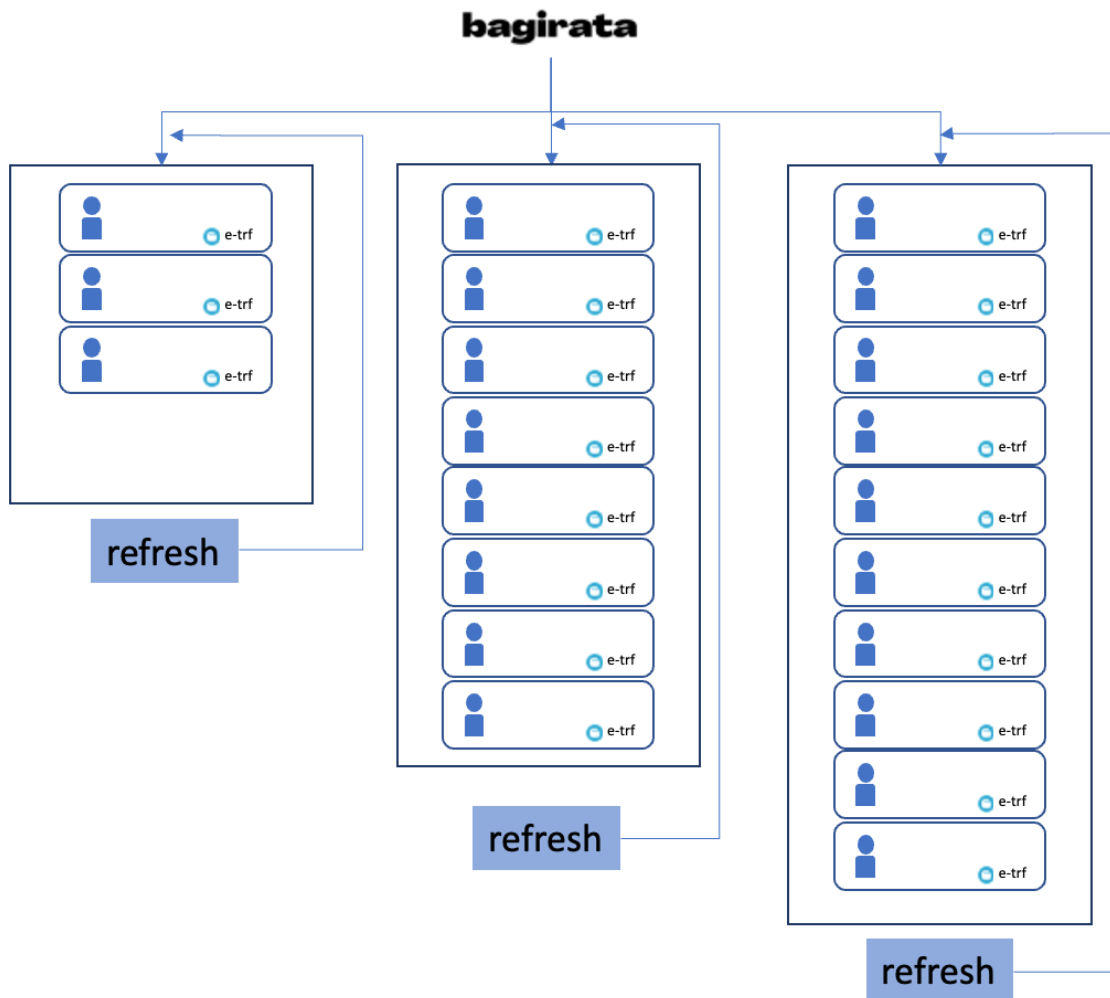
	All	Donors	Recipients	Survey only
Following religious teaching	.55	.43	.58	.57
Organization is trustworthy	.42	.56	.35	.4
Organization effectively uses donations	.27	.5	.35	.23
Beneficiary needs my donation	.26	.58	.2	.21
Supporting humanitarian causes	.3	.54	.32	.26
Supporting disaster reliefs	.21	.4	.22	.18
Supporting education causes	.18	.41	.15	.15
Supporting health causes	.19	.41	.17	.16
Supporting other causes	.16	.38	.15	.13
To stop being bothered	.03	.023	.067	.029
Observations	1716	216	60	1438

*Notes:* Survey responses from Oct 2020-July 2021.

**Table B.6:** Donor-Recipient characteristic match

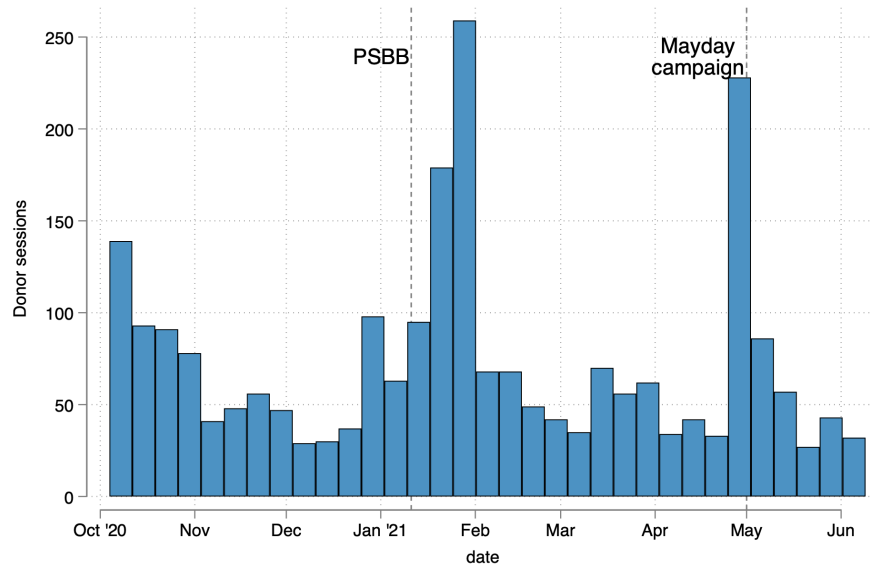
	1[donate]	Donation	N	1[donate]	Donation	N
	Recipient name not muslim			Recipient name muslim		
Donor is not muslim	<b>0.12</b> (0.33)	<b>27,194</b> (123,226)	<b>556</b>	0.11 (0.32)	20,710 (76,814)	169
Donor is muslim	0.10 (0.30)	11,159 (53,491)	1,045	<b>0.05</b> (0.22)	<b>6,787</b> (37,510)	<b>333</b>
	Recipient name male			Recipient name female		
Donor is male	<b>0.08</b> (0.28)	<b>10,358</b> (45,023)	<b>446</b>	0.12 (0.33)	30,795 (128,780)	220
Donor is female	0.08 (0.28)	12,974 (68,816)	965	<b>0.13</b> (0.34)	<b>18,276</b> (90,133)	<b>472</b>

*Notes:* Summary statistics of donation outcomes by donor and recipient characteristics. Donor informations from user survey, beneficiary informations from recipient database.

**Figure B.1:** Randomization scheme for platform visitors.

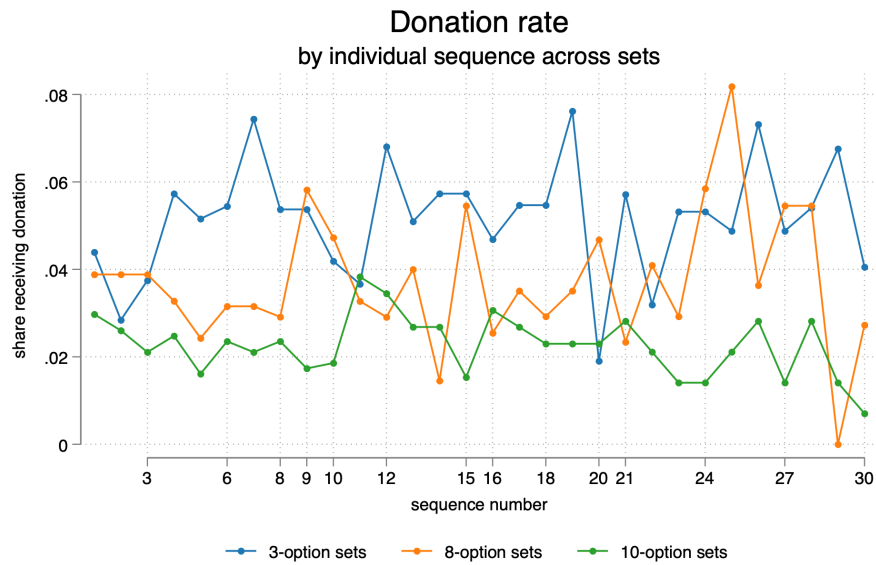
Note: Visitors are randomly assigned to one of the treatment arms with equal chance.

**Figure B.2:** Unique sessions to platform over time.



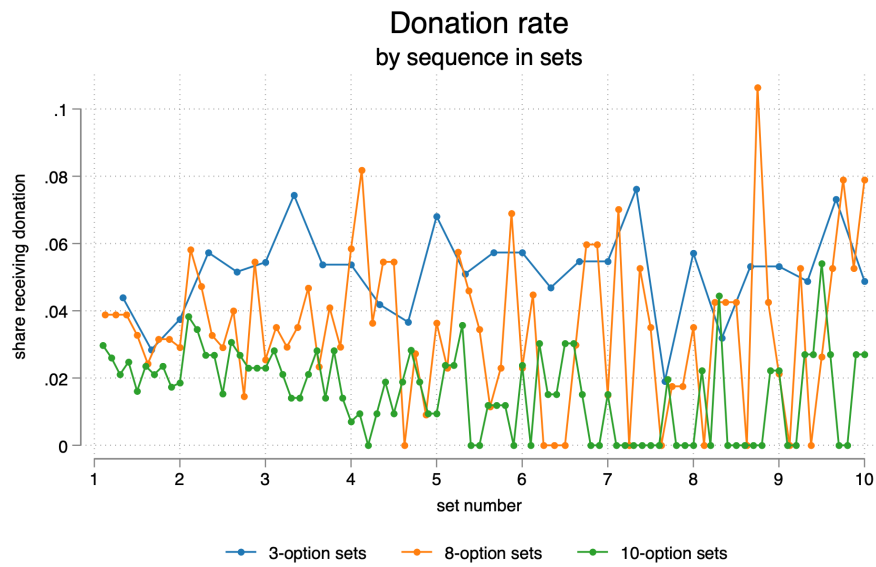
Note: the two spikes correspond to the large-scale mobility restriction (*Pembatasan Sosial Berskala Besar*/PSBB) implemented in January 2021 and a labor day/Mayday donation drive campaign. Randomization remains ongoing during these two events.

**Figure B-3:** Donation rate for beneficiaries, ordered in individual sequence display



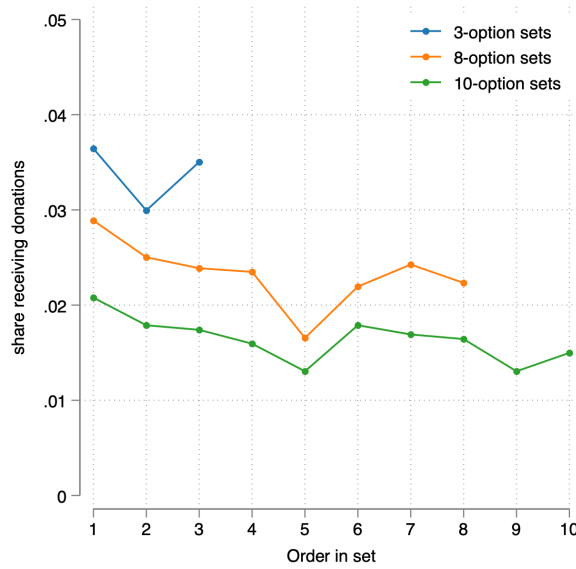
Note: display sequence is counted sequentially across sets. For example, the sequence number 9 refers to the bottom card in a third set for a visitor assigned to 3-beneficiary treatment arm, the top card in the second set for a visitor assigned to the 8-beneficiary treatment arm, and the penultimate card in the first set for a visitor assigned to the 10-beneficiary treatment arm.

**Figure B-4:** Donation rate for beneficiaries, ordered in set display



Note: set number refers to placement within sets as seen by the donors. For a donor in the 3-beneficiary treatment arm (blue line), they will see three cards, with the leftmost point plot refers to the beneficiary cards display at the top in the set. The immediate point following an integer thus refers to the top beneficiary cards in the next sets.

**Figure B·5:** Donation rate for beneficiaries, by position in a set



Note: Order in set refers to placement of cards within each set, in descending/sequential order. Number 1 thus is the topmost displays for all three treatment groups, with number 3 at the bottom for the 3-beneficiary treatment arms. Number 8 and 10 refer to the bottom display in the 8- and 10-beneficiary displays, respectively.

## Appendix C

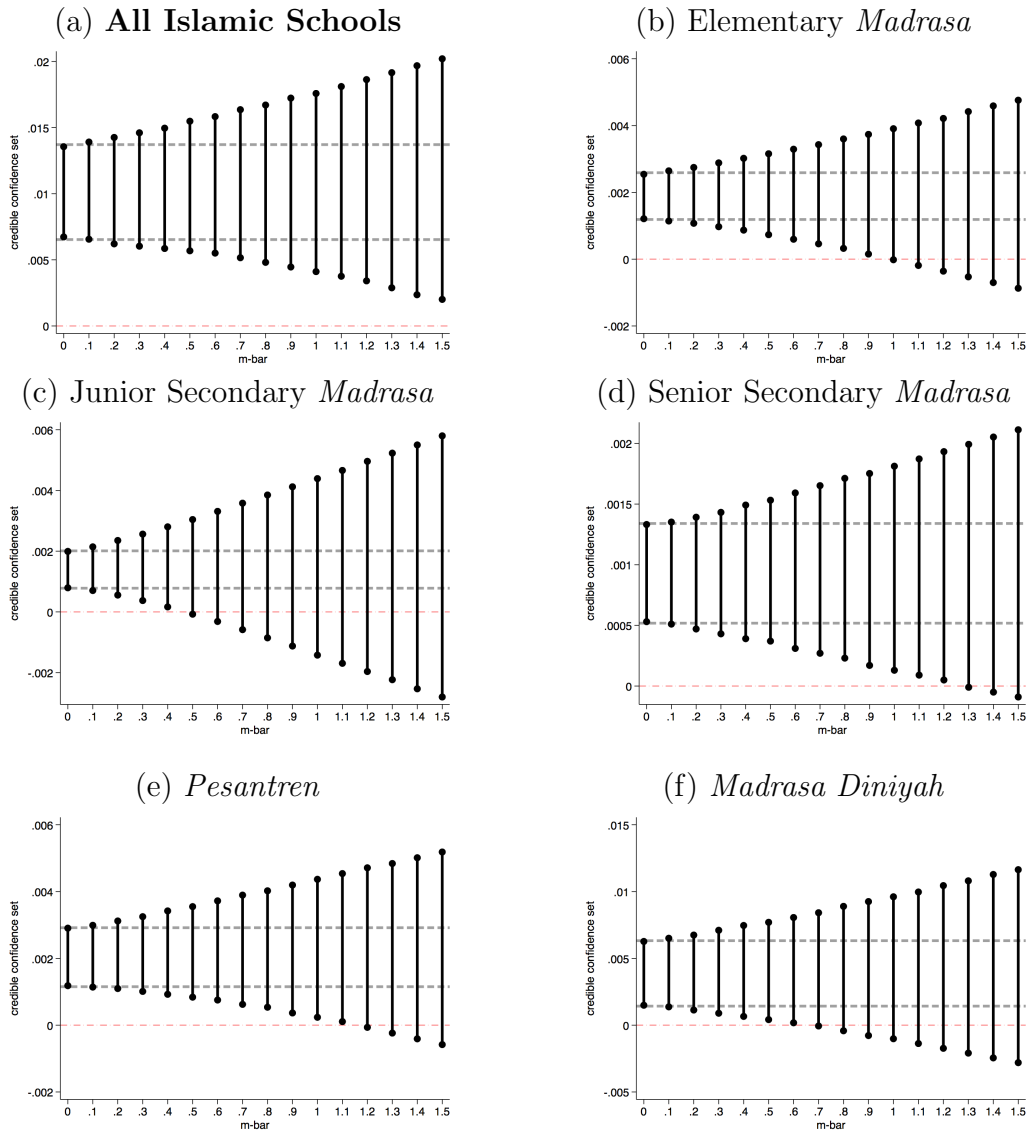
# Supplementary materials for Chapter 3

### C.1 Additional Empirical Results

#### C.1.1 Additional Results on School Entry

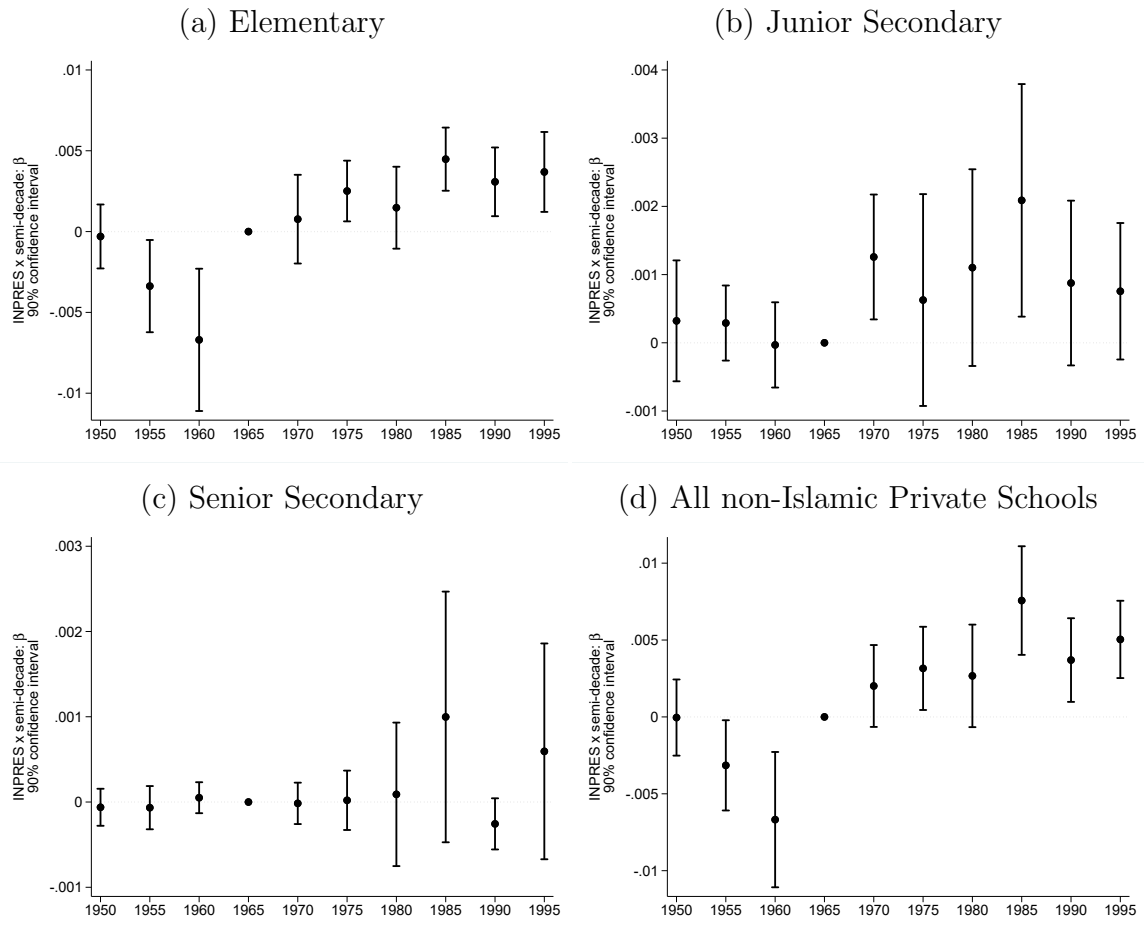
## Figure C-1: Credible Confidence Sets under Varying Departure from Parallel Trends

Robustness Check on District-Level Supply Results in Figure 3-2



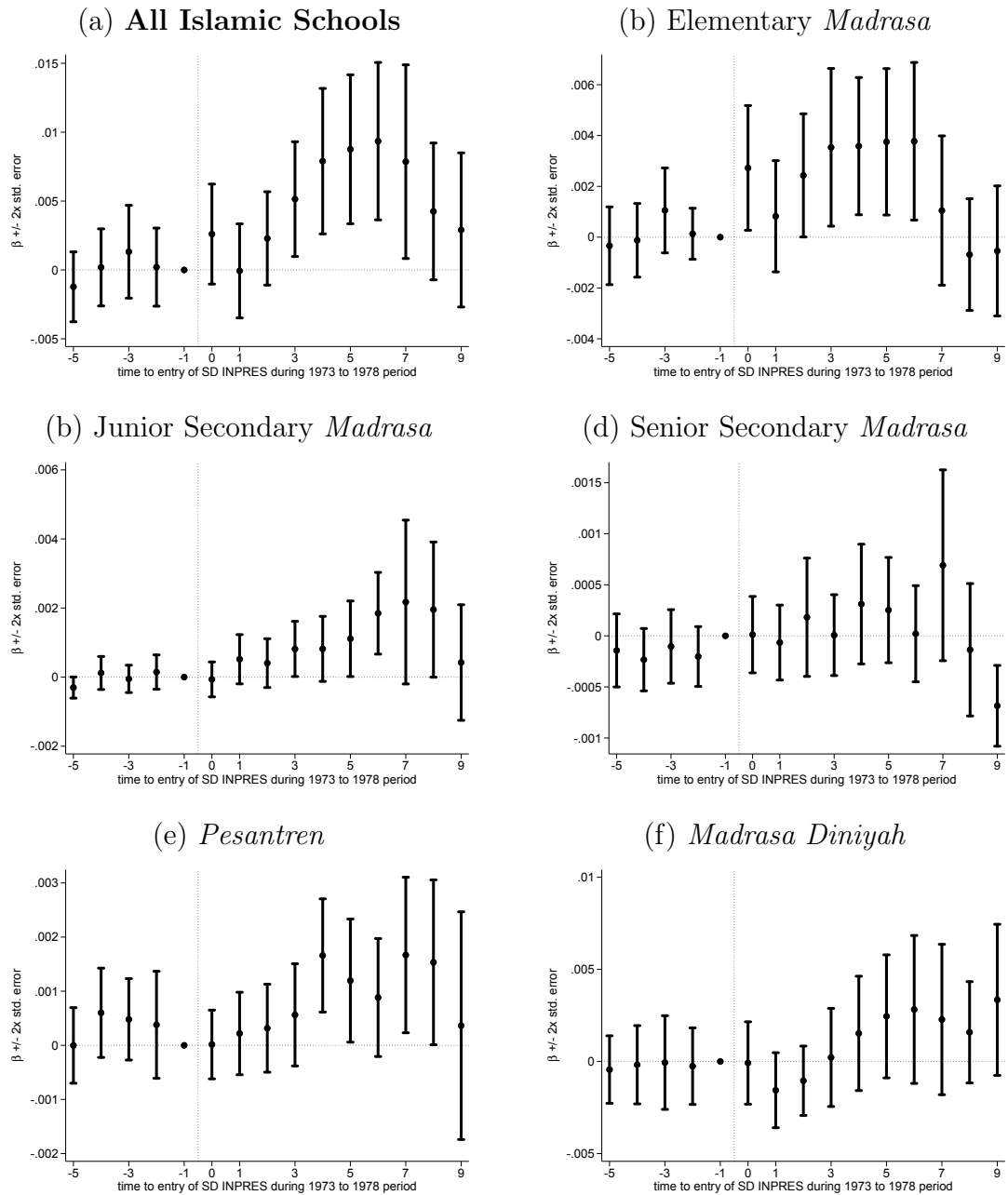
*Notes:* This figure reports credible 90% confidence sets based on Roth and Rambachan (2022). These sets allow the post-INPRES maximum violations of parallel trends to be up to  $\bar{m}$  times larger than the maximum pre-treatment violation for different values of  $\bar{m}$  that answer how much the post-INPRES trends in Islamic school entry would need to differ from the pre-trends in order to nullify the findings at zero (horizontal, red dashed line). The horizontal, gray dashed lines, and the credible confidence set at  $\bar{m} = 0$ , correspond to the baseline 90% confidence intervals from Table 3.2.

**Figure C.2:** SD INPRES Intensity and Entry of Private non-Islamic Schools



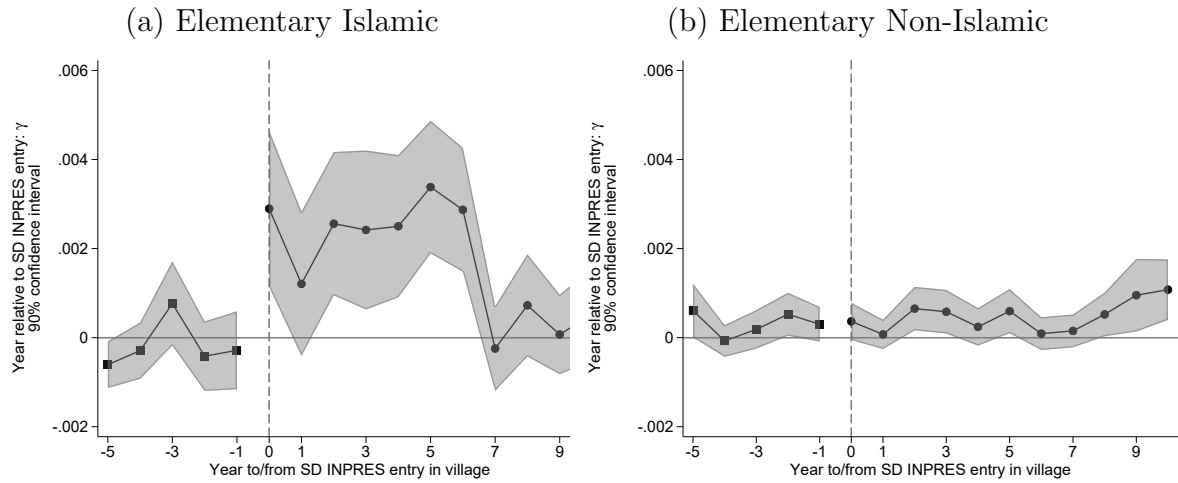
*Notes:* This figure reports semi-decade-specific estimates of  $\beta$  in equation (3.1) on a balanced district-year panel. The dependent variable measures: the number of entering private non-Islamic schools at the elementary (a), junior secondary (b), and senior secondary (c) level, or across all levels (d), each normalized per 1,000 children in 1971. All other specification details are as in Figure 3.2. Appendix C.4 describes how we identify private non-Islamic schools in the MEC registry. The figure reports 90% confidence intervals with standard errors clustered at the district level.

**Figure C-3:** Islamic School Entry at the Village Level, Standard DID



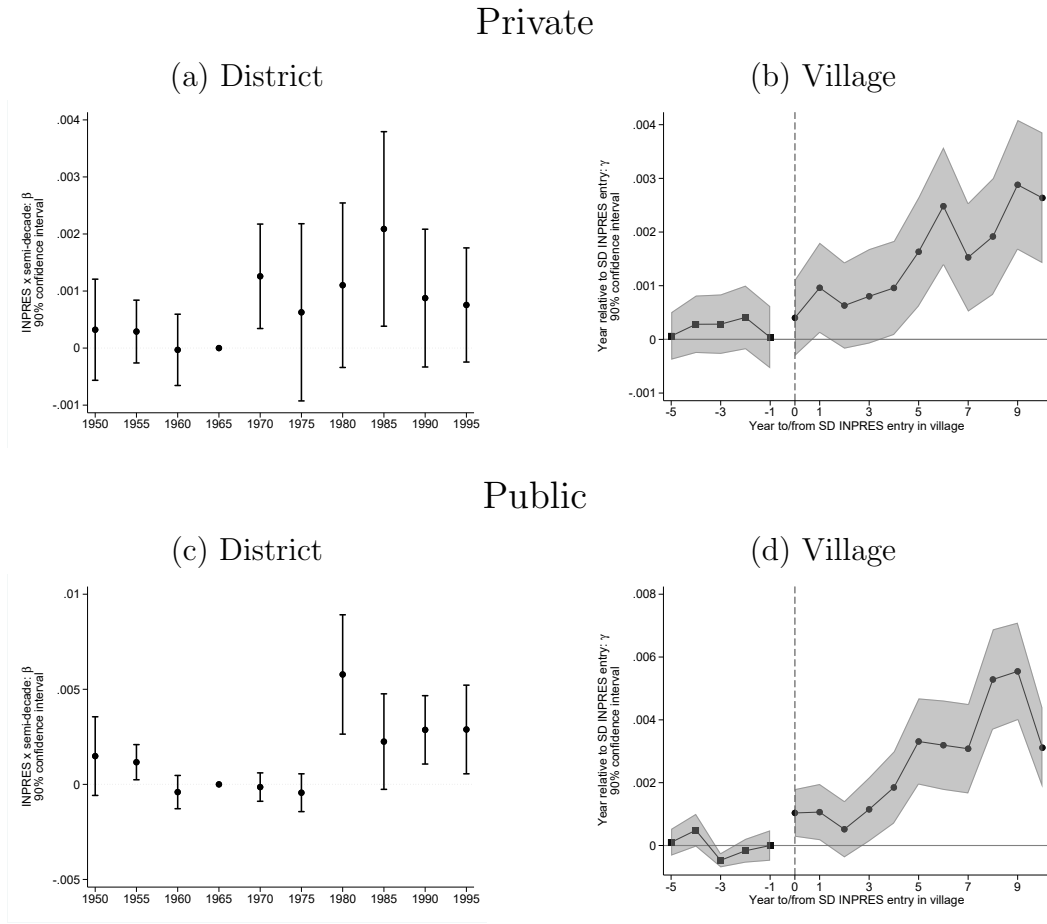
*Notes:* This figure reports the event-study analogue to the standard DID estimates in panel (c) of Table 3.2, based on equation (3.2). The event-study setup and controls are otherwise similar to the one in Figure 3-4. The figure reports coefficients +/- two times the standard errors, which are clustered at the village level.

**Figure C·4:** Islamic versus Secular Private School Entry at the Village Level



*Notes:* This figure reports estimates of  $\gamma$  in equation (3.2). All the specification and estimation details are as in Figure 3·4. In panel (a), the dependent variable measures the number of elementary *madrassa* built per village-year, as in panel (a) of Figure 3·4. In panel (b), the dependent variable measures the number of private non-Islamic elementary schools built per village-year. The gray shading corresponds to 90% confidence intervals with standard errors clustered by village.

**Figure C-5: Entry of non-Islamic Junior Secondary Schools**



*Notes:* Panels (a) and (c) report semi-decade-specific estimates of  $\beta$  in equation (3.1). The dependent variable is the number of junior secondary private (panel a) or public schools (c) built by semi-decade and by district per 1,000 children in 1971. All specification details are as in Figure 3-2. Panels (b) and (d) report estimates of  $\gamma$  in equation (3.2). The dependent variable is the number of private (panel b) or public junior secondary school (d) built per village-year. The specification and estimation details are as in Figure 3-4.

**Table C.1:** SD INPRES Intensity and Entry of Islamic Schools (Robustness)  
 Additional Controls: Latent Potential Growth in Islamic Education

	Formal <i>Madrasa</i>			Informal		All
	Elementary	Junior Sec.	Senior Sec.	<i>Pesantren</i>	<i>Diniyah</i>	Islamic
	(1)	(2)	(3)	(4)	(5)	(6)
INPRES $\times$ post-1972	0.0016*** (0.0004)	0.0016*** (0.0003)	0.0008*** (0.0002)	0.0022*** (0.0005)	0.0041*** (0.0016)	0.0103*** (0.0020)
1959 Islamic Schools $\times$ Year FE	✓	✓	✓	✓	✓	✓
Additional Controls $\times$ Year FE	✓	✓	✓	✓	✓	✓
District FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Number of District–Years	10,920	10,920	10,920	10,920	10,920	10,920
Dep. Var. Mean	0.007	0.005	0.002	0.007	0.018	0.039
R <sup>2</sup>	0.232	0.237	0.218	0.343	0.584	0.502

*Notes:* This table augments the baseline specification from panel (a) of Table 3.2 with the following predetermined controls interacted with year fixed effects: the prevalence of *waqf* endowments in 1960, the Muslim population share in the 1972 census, Islamic political party support in the 1955 elections, historical Arab minority populations, the occurrence of an Islamist armed insurgency in the 1950s, and an indicator for districts involved in an experimental compulsory schooling program after 1957. The dependent variables are measured as new schools of a given type created per district-year and per 1,000 children in 1971. INPRES refers to SD INPRES schools constructed from 1973–78 per 1,000 children in 1971. All specification details are as in panel (a) of Table 3.2; in particular, all specifications also include district fixed effects and year fixed effects interacted with the 1971 children population, the 1971 enrollment rate, exposure to the water and sanitation program, the number of elementary, junior secondary, senior secondary *madrasa* in 1959, and the number of *pesantren* in 1959. \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. Robust standard errors are clustered by district.

**Table C.2:** New Islamic Schools Over Time in Historical Administrative Data

	Islamic Schools				Secular Schools		
	Prim.	Jun. Sec.	Sen. Sec.	<i>pesantren</i>	Prim.	Jun. Sec.	Sen. Sec.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Effect of No. of INPRES Schools on...							
1980 level	0.258*** (0.063)	–	–	0.044* (0.023)	0.492*** (0.088)	-0.064*** (0.020)	-0.060*** (0.015)
Δ 1980 - 1983	0.022 (0.019)	–	–	0.008 (0.006)	-0.077 (0.056)	0.023 (0.016)	-0.006 (0.008)
Δ 1983 - 1990	0.126*** (0.032)	–	–	0.015 (0.012)	0.282*** (0.086)	0.011 (0.030)	0.005 (0.021)
Δ 1990 - 1993	0.015 (0.022)	0.009* (0.005)	0.012*** (0.004)	0.011** (0.004)	-0.028 (0.047)	0.015 (0.017)	0.011 (0.013)
Number of Districts	273	273	273	273	273	273	273
Mean 1980 level	93.4	–	–	19.1	424.1	46.9	18.7
Mean Δ1980 - 1983	-0.05	–	–	0.7	47.5	15.2	9.9
Mean Δ1983 - 1990	20.5	–	–	9.1	52.9	8.9	11.6
Mean Δ1990 - 1993	-4.3	1.8	0.9	2.0	0.3	-1.3	-2.3

*Notes:* This table examines supply-side responses to INPRES using historical administrative data from the 1980, 1983, 1990 and 1993 rounds *Podes*, which asked about the number of schools of different types. Each cell shows the coefficient from a separate district-level cross-sectional regression of the given outcome on the number of SD INPRES primary schools constructed from 1973 to 1978. The first row looks at the number of schools of each level in 1980, and subsequent rows look at the difference in the stock reported between the initial and final year of the difference. The district-level number of *pesantren* are computed by adding up the number of villages that report having any *pesantren*. Secondary Islamic schools were not recorded until the 1990 round of *Podes*. The regressions control for the 1971 children population, the 1971 enrollment rate, and exposure to the water and sanitation program.

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01. Robust standard errors.

**Table C.3:** Exogeneity of Timing of SD INPRES Entry at the Village Level

	Year of entry	Early entry:	Entry in:	Late entry:
	1973-78	1973-74	1975-76	1977-78
	(1)	(2)	(3)	(4)
Elementary <i>madrassa</i>	-0.0906 (0.1079)	0.0051 (0.0308)	0.0297 (0.0340)	-0.0349 (0.0328)
Secondary <i>madrassa</i>	0.0812 (0.2071)	-0.0330 (0.0581)	0.1213 (0.0779)	-0.0883 (0.0697)
<i>Pesantren</i>	0.0535 (0.0970)	0.0072 (0.0222)	-0.0239 (0.0219)	0.0167 (0.0261)
<i>Waqf</i> land	-0.0467 (0.0424)	0.0164 (0.0117)	0.0011 (0.0131)	-0.0175 (0.0133)
Potential rice yield	-0.0360 (0.1961)	0.0260 (0.0519)	0.0167 (0.0587)	-0.0428 (0.0616)
Potential palm oil yield	0.0190 (0.0514)	0.0020 (0.0139)	-0.0168 (0.0164)	0.0148 (0.0167)
Potential cocoa yield	-0.5372 (0.4569)	0.0850 (0.1242)	0.1217 (0.1437)	-0.2067 (0.1508)
Potential coffee yield	1.1607* (0.6183)	-0.2593 (0.1675)	-0.1263 (0.1906)	0.3856* (0.1999)
Potential maize yield	0.3156 (0.2199)	-0.0343 (0.0588)	-0.0200 (0.0672)	0.0542 (0.0680)
Coastal location	-0.0214 (0.0677)	-0.0013 (0.0177)	0.0036 (0.0207)	-0.0023 (0.0209)
Elevation	0.0125 (0.0325)	0.0038 (0.0085)	-0.0113 (0.0099)	0.0075 (0.0102)
Land area	-0.0000 (0.0000)	0.0000 (0.0000)	-0.0000 (0.0000)	0.0000 (0.0000)
F statistic: joint significance	0.36	0.41	0.78	0.77
p-value	0.93	0.90	0.60	0.61
R <sup>2</sup>	0.082	0.081	0.068	0.074

*Notes:* This table reports cross-sectional correlations between the timing of SD INPRES entry and observable characteristics at the village level measured as of 1972. The dependent variable is measured as the year of construction of the first SD INPRES school in the village between 1973–78 (column 1) or as a dummy for the first SD INPRES school being built in the village between 1973–74 (column 2), 1975–76 (column 3), or 1977–89 (column 4). Elementary *madrassa* (MI), secondary *madrassa* (MTs and MA), and *waqf* land are measured as of 1972, and *waqf* land is trimmed at the 95th percentile. Crop yields are measured as standardized measures of potential yield from the FAO-GAEZ based on predetermined agroclimatic characteristics. Geographic characteristics (coastal location, elevation, and village land area) are from *Podes*. The bottom panel reports the F-statistic and corresponding p-value from a test of joint significance of all right-hand side regressors. All regressions include district fixed effects.

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01. Robust standard errors in parentheses.

**Table C.4:** Islamic School Entry at the Village Level

	Formal <i>Madrassa</i>			Informal		All
	Elementary	Junior Sec.	Senior Sec.	<i>Pesantren</i>	<i>Diniyah</i>	Islamic
	(1)	(2)	(3)	(4)	(5)	(6)
(a) Baseline estimates (Table 3.2, panel d)						
SD INPRES Entry	0.0022*** (0.0002)	0.0017*** (0.0001)	0.0008*** (0.0001)	0.0013*** (0.0002)	0.0035*** (0.0003)	0.0094*** (0.0005)
(b) Removing time-varying controls						
SD INPRES Entry	0.0021*** (0.0002)	0.0016*** (0.0001)	0.0008*** (0.0001)	0.0012*** (0.0002)	0.0032*** (0.0003)	0.0088*** (0.0005)
(c) Shorter panel 1968-1983						
SD INPRES Entry	0.0026*** (0.0004)	0.0005*** (0.0002)	0.0002* (0.0001)	0.0004* (0.0002)	0.0015*** (0.0004)	0.0052*** (0.0007)
(d) Clustering by district						
SD INPRES Entry	0.0022*** (0.0004)	0.0017*** (0.0002)	0.0008*** (0.0001)	0.0013*** (0.0003)	0.0035*** (0.0008)	0.0094*** (0.0012)
Village FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Number of Village-Years	3,334,560	3,334,560	3,334,560	3,334,560	3,334,560	3,334,560
Dep. Var. Mean	0.0009	0.0001	0.0001	0.0005	0.0025	0.0011

*Notes:* This table reports estimates of the average of post-SD-INPRES-entry coefficients  $\tau$  in equation (3.2) computed using the robust imputation method from Borusyak et al. (2021). The dependent variables are measured as new schools of a given type created per village-year. Panel (a) reports the baseline estimates shown in panel (d) of Table 3.2. The following panels report estimates obtained after: removing the time-varying controls included in the baseline estimation, i.e., public and Islamic schools in the village by 1959 (panel b), using a shorter panel window spanning 1968–1983 (c), and clustering standard errors by district (d). In panel (c), we control for interactions of year FE with public and Islamic schools in the village as of 1967, and there are 1,333,824 village-year observations.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Robust standard errors are clustered by village in panels (a)–(c) and by district in panel (d).

**Table C.5:** Formalization of the Islamic Education Sector

As a share of:	Formal <i>Madrassa</i>	Informal schools	
	New Formal Schools	All New Schools	New Islamic Schools
	(1)	(2)	(3)
INPRES $\times$ post-1972	0.0164*** (0.0052)	-0.0196*** (0.0075)	-0.0605*** (0.0148)
1959 Islamic Schools $\times$ Year FE	✓	✓	✓
District FE	✓	✓	✓
Year FE	✓	✓	✓
Number of District–Years	9,951	10,201	6,368
Dep. Var. Mean	0.158	0.203	0.651
R <sup>2</sup>	0.422	0.592	0.405

*Notes:* This table examines the entry of formal of informal Islamic schools as a fraction of all schools built per district–year. The dependent variable measures: formal *madrassa* at all instruction levels built per district–year as a fraction fo all formal schools (including secular public, private, and Islamic schools) in column 1, and the more informal *pesantren* and *madrassa diniyah* built per district–year as a fraction of all schools (column 2) or as a fraction of all Islamic schools (column 3). Differences in the number of observations across columns reflect years with no entry of schools of the given school type. All specification details as in panel (a) of Table 3.2.

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01. Robust standard errors clustered by district.

### C.1.2 Further Results on the Financing of the Islamic Education Sector

**Rice Price Shock.** Appendix Figure C-6 demonstrates the large shock to the world price of rice coincidental with the SD INPRES policy.<sup>1</sup> Maize prices also increased during this period albeit to a lesser extent. Rice is the most important producer commodity across Indonesia; maize is less important in terms of aggregate production and geographic scope.<sup>2</sup>

Appendix Table C.7 shows that the larger supply response to SD INPRES in high-rice-productivity villages is not driven by generally higher agricultural productivity. While we see some differential response in high-maize-productivity villages as well, the effect sizes are much smaller than those for rice. This is consistent with the latter being much more important for more communities and also being subject to a slightly larger price shock during the period of interest.

**Placebo Check on Table 3.3.** Appendix Table C.6 shows that the positive Islamic sector supply response to SD INPRES is unique to the period of mass schooling and does not arise for entry of public primary schools in other periods (1960–68 and 1990–98). This is consistent with the much different and more confrontational period of mass public school construction in the 1970s.

**Informal Taxation.** We estimate the following individual-level regression pooling across four surveys conducted in 4,080 villages:<sup>3</sup>

$$\mathbb{P}(\textit{informal tax}_{ivdt}) = \theta_{dt} + \mathbf{x}'_i \boldsymbol{\beta} + f(\textit{Islamic school entry}_v) + \varepsilon_{ivdt}, \quad (\text{C.1})$$

<sup>1</sup>See Bazzi (2017) for general evidence of passthrough from world rice price shocks to domestic producers.

<sup>2</sup>In the early 1970s, the Ministry of Agriculture reported roughly 3 million tons of maize and 22.4 million tons of rice. In 1983, rice was produced in 73% of villages compared to 56% for maize (according to the 1983 Agricultural Census jointly conducted as part of the triennial *Podes* survey of village officials).

<sup>3</sup>The data were used by Olken and Singhal (2011b) and come from a series of Health and Education Surveys as part of a larger evaluation study reported in Olken et al. (2014).

where the dependent variable equals one if the Muslim respondent contributed any informal tax to the given type of public good,  $\theta_{dt}$  is a set of district×survey-year fixed effects,  $\mathbf{x}$  is a vector of controls for age and age squared and gender, and  $f(\cdot)$  is a vector of binary indicators for the entry of Islamic schools in the village during different time periods (pre-1973, 1973–78, and post-1978).

The estimates suggest that Islamic school entry in the 1973–78 period is associated over the long run with greater informal taxation to support Islamic infrastructure (schools and houses of worship) and less taxation to support roads and bridges. The same holds when introducing controls for Islamic school entry in other periods before and after the SD INPRES era. Together, these estimates (i) point to a persistent role of informal taxation to support the Islamic education sector, and (ii) provide suggestive evidence that such informal contributions might crowd out support for other non-religious infrastructure.

**Waqf Substitution Across Islamic Infrastructure.** In Appendix Table C.10, we report estimates from the following cross-sectional, district-level regression

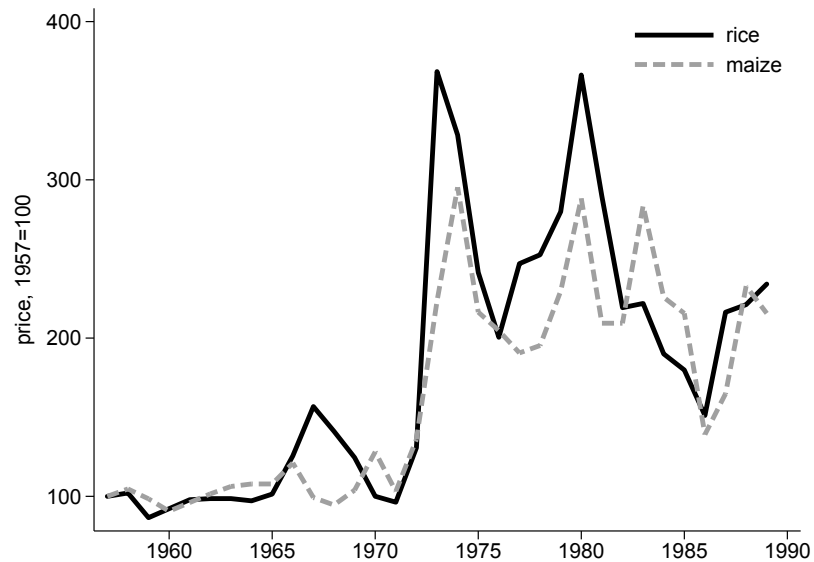
$$\frac{waqf_d^c}{waqf_d} = \alpha + \delta INPRES_d + \mathbf{x}'_d \boldsymbol{\beta} + \varepsilon_d, \quad (\text{C.2})$$

where  $\frac{waqf_d^c}{waqf_d}$  captures the share of total *waqf* land in district  $d$  allocated to Islamic infrastructure category  $c$ , *INPRES* is the number of SD INPRES schools constructed per 1,000 children from 1973 to 1978, and  $\mathbf{x}$  is the usual vector of controls along with, in some specifications, controls for Islamic school construction per 1,000 children from 1973–78. The main categories of *waqf*-endowed institutions include schools, houses of worship, cemeteries, and other, which includes a variety of institutions like local health clinics.

In districts with greater SD INPRES intensity in the 1970s, more *waqf* land is allocated to Islamic schools over the long run (columns 1–2), and this comes at the

expense of allocations to mosques (columns 3–4). Each additional SD INPRES per 1,000 children is associated with 1.7 p.p. more *waqf* land allocated to Islamic schools (relative to a mean of 16%) and 2.4 p.p. less *waqf* land allocated to Muslim houses of worship (relative to a mean of 42%). Reassuringly, we see that districts with greater Islamic school construction in the 1970s also have a significantly higher share of *waqf* land held in religious schools today. This is consistent with the role of *waqf* endowments in support the local Islamic sector response to SD INPRES, as we saw in earlier results.

**Figure C.6:** Agricultural Commodity Price Shocks



*Notes:* This figure plots the evolution of the world price of rice and maize from 1957 (=100) to 1990. Data come from the Bazzi and Blattman (2014) commodity price database.

**Table C.6:** Placebo: Islamic School and Public Primary Entry in Other Periods

	Formal <i>Madrasa</i>			Informal		All
	Elementary (1)	Junior Sec. (2)	Senior Sec. (3)	<i>Pesantren</i> (4)	<i>Diniyah</i> (5)	Islamic (6)
(a) 1960–1968						
SD Entry	0.0007 (0.0005)	0.0001 (0.0001)	-0.0000 (0.0000)	-0.0002 (0.0002)	-0.0007 (0.0009)	-0.0002 (0.0011)
SD × potential rice yield	-0.0013** (0.0006)	-0.0002 (0.0002)	-0.0000 (0.0000)	0.0003 (0.0002)	-0.0001 (0.0007)	-0.0012 (0.0011)
SD × any <i>waqf</i> , predetermined	-0.0016 (0.0029)	0.0018 (0.0014)	-0.0000 (0.0000)	-0.0008 (0.0013)	0.0020 (0.0027)	0.0013 (0.0049)
1959 Islamic Schools × Year FE	✓	✓	✓	✓	✓	✓
Village FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Number of Village–Years	676,782	676,782	676,782	676,782	676,782	676,782
Dep. Var. Mean	0.0027	0.0000	0.0000	0.0009	0.0038	0.0072
R <sup>2</sup>	0.115	0.112	0.111	0.128	0.142	0.138
(b) 1990–1998						
SD Entry	-0.0035 (0.0033)	-0.0015 (0.0016)	0.0012* (0.0007)	-0.0007 (0.0016)	0.0018 (0.0019)	-0.0027 (0.0048)
SD × potential rice yield	-0.0065 (0.0041)	-0.0014 (0.0018)	0.0008 (0.0008)	-0.0025 (0.0021)	-0.0018 (0.0022)	-0.0114* (0.0058)
SD × any <i>waqf</i> , predetermined	0.0041 (0.0049)	0.0019 (0.0042)	-0.0038 (0.0024)	0.0053 (0.0100)	0.0186* (0.0103)	0.0262* (0.0134)
1989 Islamic Schools × Year FE	✓	✓	✓	✓	✓	✓
Village FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Number of Village–Years	676,782	676,782	676,782	676,782	676,782	676,782
Dep. Var. Mean	0.0045	0.0031	0.0011	0.0066	0.0134	0.0287
R <sup>2</sup>	0.122	0.116	0.116	0.223	0.157	0.189

*Notes:* This table re-estimates the exact same specifications in Table 3.3 (see the notes therein) but restricts the analysis to the periods (a) 1960–68 and (b) 1990–98, i.e., before and after SD INPRES. The SD Entry variable turns on the first year of an public elementary school (SD) entering in the given period and then stays on thereafter. In addition to the controls listed in the table, all specifications include interactions of year FE and the stock of public elementary schools in the village in the year prior to the panel beginning.

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01. Robust standard errors clustered by village.

**Table C.7: Other Commodity Exposure**

	Formal <i>Madrassa</i>			Informal		All
	Elementary	Junior Sec.	Senior Sec.	<i>Pesantren</i>	<i>Diniyah</i>	Islamic
	(1)	(2)	(3)	(4)	(5)	(6)
SD INPRES Entry	0.0001 (0.0005)	0.0002 (0.0001)	0.0001 (0.0001)	0.0001 (0.0002)	0.0006 (0.0005)	0.0011 (0.0007)
SD × any <i>waqf</i> , predetermined	0.0069*** (0.0012)	0.0007 (0.0005)	0.0004** (0.0002)	0.0006 (0.0004)	0.0023** (0.0009)	0.0109*** (0.0017)
SD × potential rice yield	0.0025*** (0.0008)	0.0004** (0.0002)	0.0000 (0.0001)	-0.0001 (0.0002)	0.0009 (0.0006)	0.0037*** (0.0010)
SD × potential maize yield	-0.0004 (0.0006)	0.0004** (0.0002)	0.0000 (0.0001)	0.0002 (0.0001)	0.0004 (0.0003)	0.0006 (0.0007)
1967 Islamic Schools × Year FE	✓	✓	✓	✓	✓	✓
Village FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Number of Village–Years	1,203,168	1,203,168	1,203,168	1,203,168	1,203,168	1,203,168
Dep. Var. Mean	0.0013	0.0001	0.0001	0.0006	0.0026	0.0047
R <sup>2</sup>	0.077	0.068	0.066	0.085	0.107	0.105

*Notes:* This table re-estimates the exact same village-level panel specifications in Table 3.3 (see the notes therein), adding an additional interaction of SD INPRES Entry with potential maize yields, also drawn from the FAO-GAEZ database.

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01. Robust standard errors clustered by village.

**Table C.8:** Placebo: Private Non-Islamic Elementary School and SD INPRES Entry

	1973-78		1968-83	
	(1)	(2)	(3)	(4)
SD INPRES Entry	-0.0001	-0.0001	0.0002	0.0001
	(0.0003)	(0.0003)	(0.0002)	(0.0002)
SD $\times$ any <i>waqf</i> , predetermined		-0.0002		0.0002
		(0.0005)		(0.0004)
Initial Islamic Schools $\times$ Year FE	✓	✓	✓	✓
Village FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Number of Village-Years	451,188	451,188	1,203,168	1,203,168
Dep. Var. Mean	0.0006	0.0006	0.0014	0.0014
R <sup>2</sup>	0.177	0.177	0.072	0.072

*Notes:* This table re-estimates the village-level panel specification in Table 3.3 (see the notes therein) looking at how SD INPRES and its interaction with predetermined *waqf* endowments affect entry of non-Islamic private elementary schools from (a) 1973–78 and (b) 1968–83.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Robust standard errors clustered by village.

**Table C.9:** School Entry in the 1970s and the Legacy of Informal Taxation

	Dep. Var.: Any Informal Taxation for ...				
	Roads Bridges (1)	Water Sanit. (2)	Irrigation (3)	Schools (4)	Houses Worship (5)
(a) Regressors for School Entry, 1973-78					
SD INPRES Entry, 1973-78	-0.005 (0.008)	-0.004 (0.004)	-0.002 (0.002)	-0.001 (0.002)	-0.007 (0.007)
Islamic School Entry, 1973-78	-0.040*** (0.014)	-0.004 (0.005)	0.002 (0.003)	0.008** (0.004)	0.022** (0.009)
(b) Regressors for School Entry, All Periods					
SD INPRES entry, pre-1973	0.016* (0.009)	0.001 (0.003)	-0.002 (0.002)	-0.002 (0.002)	0.002 (0.005)
SD INPRES entry, 1973-78	-0.003 (0.008)	-0.004 (0.004)	-0.002 (0.002)	-0.002 (0.002)	-0.007 (0.007)
SD INPRES entry, post-1978	0.003 (0.007)	-0.005 (0.003)	-0.002 (0.002)	-0.001 (0.002)	-0.003 (0.005)
Islamic School Entry, pre-1973	-0.034*** (0.013)	-0.014*** (0.005)	-0.002 (0.002)	0.003 (0.005)	0.031*** (0.010)
Islamic School Entry, 1973-78	-0.039*** (0.014)	-0.004 (0.005)	0.002 (0.003)	0.007* (0.004)	0.021** (0.009)
Islamic School Entry, post-1978	-0.013 (0.008)	0.004 (0.005)	-0.000 (0.002)	0.005** (0.002)	0.007 (0.007)
Number of Individuals	61,486	61,486	61,486	61,486	61,486
Number of Villages	4,080	4,080	4,080	4,080	4,080
Number of Districts	64	64	64	64	64
Dep. Var. Mean	0.604	0.075	0.022	0.018	0.206

*Notes:* This table reports estimates of equation (C.1) relating village-level school entry in different periods to the likelihood of Muslim survey respondents in 2007–14 reporting informal taxation to support different types of public goods listed at the top of each column. The regressions control for district  $\times$  survey-year fixed effects, individual age and age squared, and gender. The school entry variables are indicators equal to one if the given type of school entered in a given period. Islamic schools include all *madrassa* and *pesantren*.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Robust standard errors clustered by district.

**Table C.10:** INPRES and *Waqf* Endowment Substitution across Islamic Infrastructure

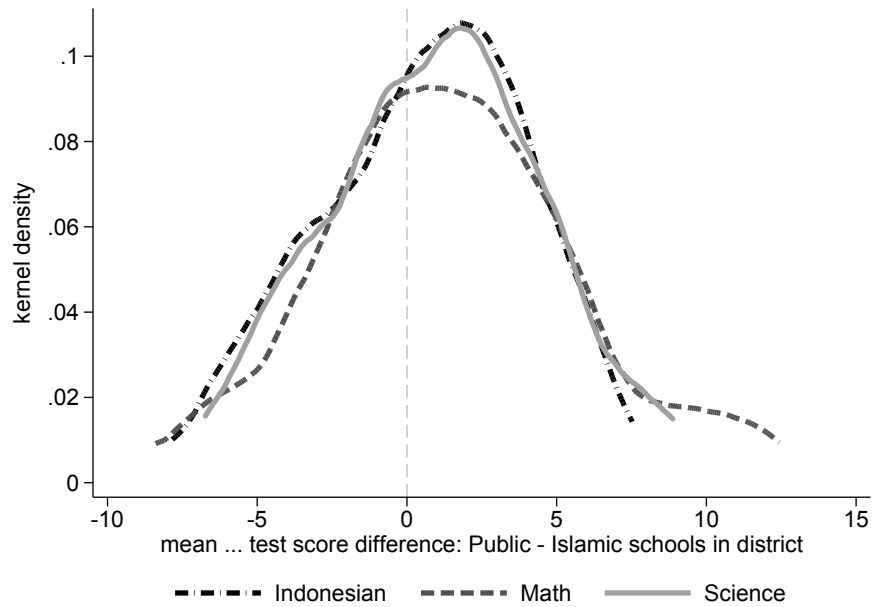
	Share of Total <i>Waqf</i> Endowed Land in ...							
	Schools		Houses of Worship		Cemetery		Other	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SD INPRES, 1973-78	0.0167*	0.0166*	-0.0236**	-0.0238**	0.0094	0.0096	-0.0024	-0.0024
	(0.0097)	(0.0096)	(0.0114)	(0.0116)	(0.0094)	(0.0093)	(0.0083)	(0.0084)
Islamic Schools, 1973-78		0.0781**		0.1390***		-0.2143***		-0.0028
		(0.0373)		(0.0490)		(0.0515)		(0.0353)
Number of Districts	275	275	275	275	275	275	275	275
Dep. Var. Mean	0.159	0.159	0.421	0.421	0.121	0.121	0.114	0.114
R <sup>2</sup>	0.270	0.278	0.551	0.559	0.161	0.211	0.127	0.127

*Notes:* This table reports estimates of equation (C.2) relating district-level school construction intensity in the SD INPRES era to the share of total *waqf* land allocated to different types of Islamic infrastructure listed at the top of each pair of columns. The regressions control for the usual INPRES policy targeting variables. The school entry variables capture the total number of schools constructed from 1973–78 normalized by 1,000 children in 1971. Islamic schools include all *madrasa* and *pesantren*.

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01. Robust standard errors clustered by district.

### C.1.3 Further Background and Results on Religious Curriculum

**Figure C-7:** Test Score Differentials Between Islamic and Non-Islamic Schools



*Notes:* This figure plots the average test score gap between state and Islamic schools across districts. The significantly greater mass to the right of zero implies that students in state schools perform better on average on standardized tests than do students in Islamic schools.

**Table C.11:** Correlations of Curriculum and Test Scores

	Math	Science
	(1)	(2)
Islamic curriculum share	-0.0539**	-0.0398*
	(0.0217)	(0.0221)
<i>Pancasila</i> and Civics curriculum share	0.0550	0.0553
	(0.0758)	(0.0833)
Number of Observations	1,371	1,371
Dep. Var. Mean	0.0	0.0

*Notes:* This table reports correlations of standardized mean school-level test scores in math and science and the share of weekly instruction time devoted to Islamic and *Pancasila*/civics curriculum (the dependent variables in panels a and c of Table 3.4). There are only 1,371 junior secondary schools for which we can link test scores and curriculum registries. The regressions include district and year-of-school-entry fixed effects.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Robust standard errors clustered by district.

**Table C.12:** Curriculum Differentiation in Islamic Schools (Total Hours)

	All Levels (1)	Primary (2)	Jun. Sec. (3)	Sen. Sec. (4)
(a) Islamic Subject Hours				
INPRES $\times$ post-1972	0.256 (0.162)	0.263* (0.147)	0.179 (0.380)	-1.736*** (0.571)
Dep. Var. Mean	6.144	5.412	7.819	8.484
Dep. Var. Std. Dev.	1.729	0.815	0.919	1.491
(b) Arabic Hours				
INPRES $\times$ post-1972	0.051* (0.026)	0.062** (0.031)	0.085 (0.082)	0.434*** (0.060)
Dep. Var. Mean	1.332	1.119	2.020	1.886
Dep. Var. Std. Dev.	0.431	0.187	0.284	0.257
(c) <i>Pancasila</i> /Civic Hours				
INPRES $\times$ post-1972	-0.033 (0.025)	n/a	-0.228* (0.133)	0.215*** (0.054)
Dep. Var. Mean	0.384	0.000	1.813	1.390
Dep. Var. Std. Dev.	0.707	0.000	0.315	0.185
(d) <i>Bahasa</i> Indonesia Hours				
INPRES $\times$ post-1972	-0.109** (0.054)	0.001 (0.061)	-0.431*** (0.156)	0.056 (0.091)
Dep. Var. Mean	0.820	0.035	3.686	2.946
Dep. Var. Std. Dev.	1.437	0.183	0.525	0.137
District FE	✓	✓	✓	✓
Grade-Level FE	✓	✓	✓	✓
Year-of-Entry FE	✓	✓	✓	✓
Number of Observations	4,128	1,404	1,662	1,046
Number of Districts	239	213	213	178

*Notes:* This table reports analogous specifications to those in Table 3.4 with the dependent variable measured in total hours of instruction time per subject rather than subject-specific shares of total instruction time. The specification is otherwise identical to Table 3.4 (see the notes therein).

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Robust standard errors clustered by district.

**Table C.13:** Heterogeneous Curriculum Differentiation in Islamic Schools

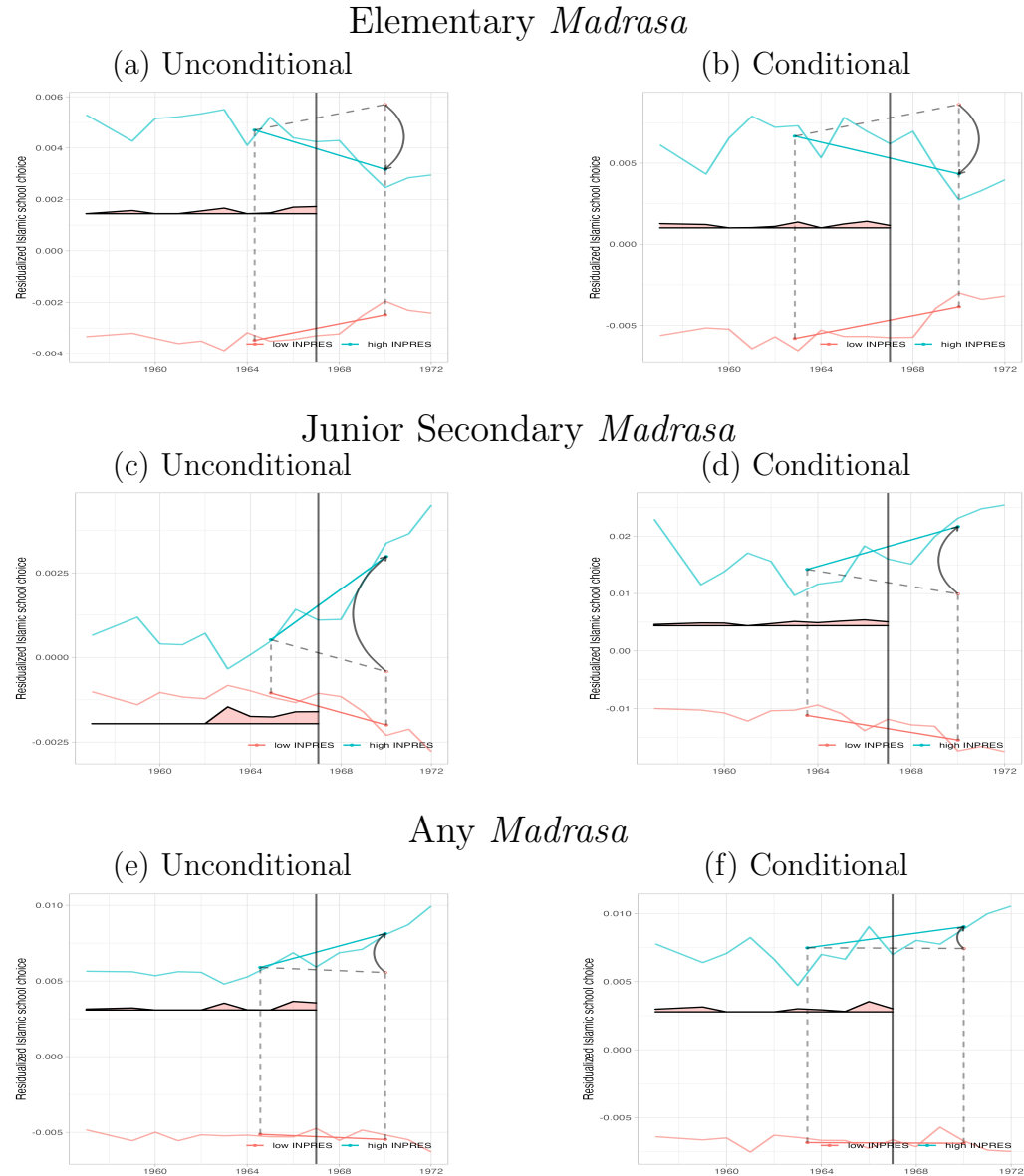
	Dep. Var.: Islamic Subject Share			
	All Levels	Primary	Jun. Sec.	Sen. Sec.
	(1)	(2)	(3)	(4)
INPRES $\times$ post-1972	0.011*	0.014**	0.036***	0.012*
	(0.006)	(0.006)	(0.006)	(0.007)
INPRES $\times$ Islamic vote share (1950s) $\times$ post-1972	-0.006	-0.005	0.034***	0.090***
	(0.006)	(0.005)	(0.009)	(0.007)
District FE	✓	✓	✓	✓
Grade-Level FE	✓	✓	✓	✓
Year-of-Entry FE	✓	✓	✓	✓
Number of Observations	4,243	1,404	1,662	1,046
Number of Districts	258	213	213	178
Dep. Var. Mean	0.246	0.238	0.261	0.242
Dep. Var. Std. Dev.	0.047	0.033	0.028	0.036

*Notes:* This table presents reports estimates of a heterogeneous effects specification of Table 3.4 allowing the effect of INPRES intensity to vary with the vote for Islamic parties in the 1950s legislative elections. The specification is otherwise identical to Table 3.4 (see the notes therein).

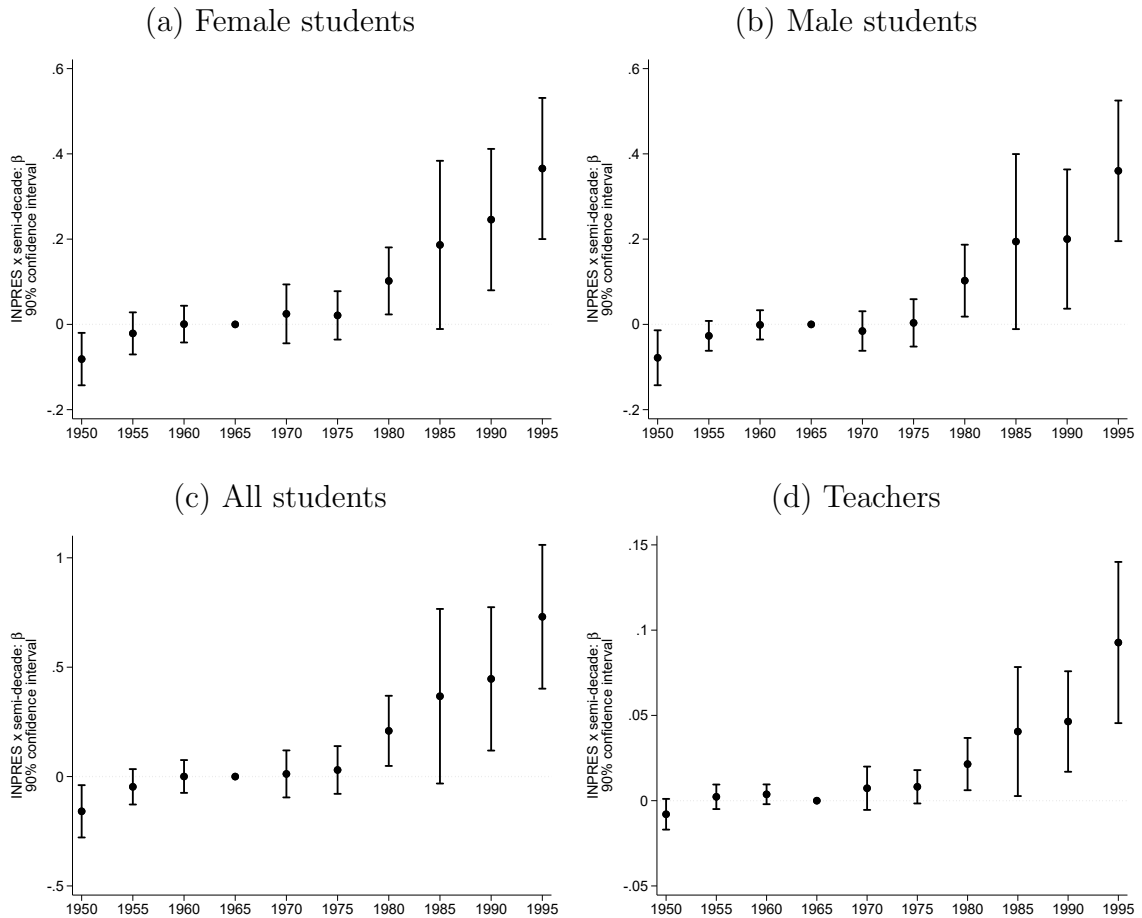
\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Robust standard errors clustered by district.

#### C.1.4 Further Results on Islamic School Choice

**Figure C·8:** Islamic School Choice, Synthetic DID Estimates



*Notes:* This figure reports synthetic difference-in-differences (SDID) estimates of the effect of SD INPRES on Islamic school completion based on annual *Susenas* data from 2012 to 2018. Each figure shows trends in enrollment in elementary *madrasa* (panels a-b), junior secondary *madrasa* (c-d), or *madrasa* at any level (e-f) for districts above the 51st percentile of SD INPRES intensity (“high INPRES” in blue) and the relevant weighted average of comparison districts below the 51st percentile (“low INPRES” in red), with the weights used to average pre-INPRES time periods at the bottom of each panel (in red). The unconditional outcomes in panels a, c, and e correspond to the outcomes in Table 3.5, and the conditional outcomes in panels b, d, and f correspond to the outcomes in Table 3.6. The dashed diagonal line indicates the counterfactual parallel trend, and the arrow indicates the estimated effect. The SDID estimation procedure is otherwise similar to that used in Figure 3-3 (see the notes therein).

**Figure C·9:** Informal (*pesantren*) Islamic School Enrollment

*Notes:* This figure reports semi-decade-specific estimates of  $\beta$  in equation (3.1) on a balanced district-year panel. The dependent variable measures: the number of female students (panel a), male students (b), students of both genders (c), and teachers (d) registered with informal Islamic boarding schools (*pesantren*) established in any given year normalized per 1,000 children in 1971. The data come the MORA registry of *pesantren*, which record 2019 enrollment by gender as well as total teaching staff. All other specification details are as in Figure 3·2. The figure reports 90% confidence intervals with standard errors clustered at the district level.

**Table C.14:** Islamic Education Rates

Source	IFLS, 1993–2014		<i>Susenas</i> , 2012–18		Admin., 2019
Exposure Definition	at given level		at final level		enrolled
Cohort	all	in school	all	in school	in school
	(1)	(2)	(3)	(4)	(5)
Education Level					
All	20%	25%	7%	10%	21%
	N=64,141	N=10,573	N=5,240,958	N=1,652,990	N=59,387,784
Primary	11%	16%	4%	6%	13%
	N=55,912	N=10,572	N=3,187,724	N=1,263,12	N=29,309,849
Junior Secondary	23%	28%	12%	14%	23%
	N=32,221	N=4,282	N=1,394,572	N=629,061	N=13,708,973
Senior Secondary	20%	24%	6%	7%	11%
	N=21,522	N=2,587	N=1,476,917	N=389,880	N=12,412,256

*Notes:* This table summarizes Islamic education rates across multiple levels of schooling using three different sources. The ‘All’ row includes *madrassa* enrollment as well as (where possible) *pesantren* enrollment which cannot be assigned to specific grade levels. Hence Islamic education includes only *madrassa* in the Primary, Junior Secondary and Senior Secondary rows. The sample sizes reflect the total number of observations over which the percent exposed to Islamic education is computed. Columns 1 and 2 used the Indonesian Family Life Survey (IFLS) longitudinal records from 1993, 1997, 2000, 2007 and 2014. This data is representative of 83% of the Indonesian population and does not cover many districts. This survey records the complete educational history of respondents. Column 1 reports the exposure across all individuals spanning the five survey rounds. Column 2 restricts to the 2014 round and looks only at currently enrolled students. The ‘All’ row includes any *pesantren* enrollment. Columns 3 and 4 use the nationally-representative annual *Susenas* data from 2012–2018, which covers all districts and which we deploy in our main empirical analysis. Unlike the IFLS, this data only captures the type of the final year of schooling completed by respondents and only allows respondents to indicate *madrassa* but not *pesantren*. Column 3 reports the exposure across all individuals spanning the six *Susenas* rounds. The Primary, Junior Secondary, and Senior rows are restricted to individuals that completed exactly 6, 9, and 12 years of education, respectively. Column 4 restricts to individuals currently enrolled in school in each round of the survey. These estimates are computed using the sampling weights to obtain national representativeness. Column 5 uses administrative data for the 2019 school year from the Ministry of Education (MEC) and Ministry of Religion (MORA). The former records *madrassa* attendance while the latter records *pesantren* attendance. The ‘All’ row includes *pesantren* enrollment.

**Table C.15: Transitions Between Public and Islamic Schools**

	Graduated Secular Elementary and Transitioned into [...]				Graduated Islamic Elementary and Transitioned into [...]			
	Secular Jun. Sec.	Islamic Jun. Sec.	Secular Jun. Sec.	Islamic Jun. Sec.	Secular Jun. Sec.	Islamic Jun. Sec.	Secular Jun. Sec.	Islamic Jun. Sec.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
INPRES $\times$ young	0.0019*** (0.0006)	0.0015** (0.0006)	0.0003** (0.0001)	0.0004*** (0.0001)	-0.0000 (0.0000)	0.0000 (0.0000)	0.0001 (0.0000)	0.0001*** (0.0000)
District $\times$ Survey Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓	✓	✓	✓	✓
1957 Islamic Schools $\times$ Cohort FE	✓	✓	✓	✓	✓	✓	✓	✓
Cohorts born 1968–72 vs. 1957–62	✓		✓		✓		✓	
Cohorts born 1968–87 vs. 1957–62		✓		✓		✓		✓
Number of Individuals	839,026	2,315,949	839,026	2,315,949	839,026	2,315,949	839,026	2,315,949
Number of Districts	275	275	275	275	275	275	275	275
Dep. Var. Mean	0.022	0.024	0.002	0.002	0.000	0.000	0.000	0.000

*Notes:* This table reports estimates of equation (3.4) based on annual *Susenas* data from 2012 to 2018. INPRES refers to SD INPRES schools constructed from 1973-78 per 1,000 children in 1971. The dependent variables capture transitions across grade levels for those who graduated from one level and transitioned to but did not graduate from the next level. These are the only transitions that we can observe in *Susenas*, which records the type of schooling for the final year of education and, separately, the type of schooling for the final year of completed level of education. Columns 1–2 consider an indicator equal to one if the individual graduated from secular elementary (SD) and transitioned to but did not graduate from secular junior secondary (SMP), columns 3–4 an indicator for graduated from secular elementary (SD) and transitioned to but did not graduate from Islamic junior secondary (MTs), columns 5–6 an indicator for graduated from Islamic elementary (MI) and transitioned to but did not graduate from secular junior secondary (SMP), and columns 7–8 an indicator for graduated from Islamic elementary (MI) and transitioned to but did not graduate from Islamic junior secondary (MTs). The specifications are otherwise identical to those in Table 3.5 (see the notes therein).

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Robust standard errors clustered by district of birth.

**Table C.16:** INPRES Exposure and Islamic Schooling in the IFLS

	Highest Education Level: [...] Islamic				Years of Islamic Education			
	Elementary		Jun. Secondary		Elementary		Jun. Secondary	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
INPRES × young	-0.0118 (0.0108)	-0.0192** (0.0094)	0.0396* (0.0238)	0.0311 (0.0214)	-0.0398 (0.0602)	-0.0786 (0.0521)	0.1261* (0.0720)	0.0896 (0.0649)
District FE	✓	✓	✓	✓	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓	✓	✓	✓	✓
1957 Islamic Schools × Cohort FE	✓	✓	✓	✓	✓	✓	✓	✓
Cohorts born 1968–72 vs. 1957–62	✓		✓		✓		✓	
Cohorts born 1968–87 vs. 1957–62		✓		✓		✓		✓
Number of Individuals	6,124	21,459	3,164	14,090	6,124	21,459	3,164	14,090
Number of Districts	205	242	197	238	205	242	197	238
Dep. Var. Mean	0.110	0.106	0.217	0.259	0.589	0.598	0.623	0.731
R <sup>2</sup>	0.141	0.144	0.152	0.119	0.138	0.143	0.144	0.112

*Notes:* This table reports estimates of equation (3.4) based on Muslim respondents in the IFLS (1993–2015). The binary outcome variables in columns 1–4 are akin to those in panel (a) of Table 3.6, and the outcomes in columns 5–8 are continuous years of Islamic education at the elementary or junior secondary level. All specifications include district of birth dummies and year of birth dummies interacted with the 1971 children population, the 1971 enrollment rate, exposure to the water and sanitation program in the district of birth, and the number of Islamic schools in the district (elementary *madrassa*, secondary *madrassa*, and *pesantren*) as of 1957. In odd-numbered columns, the sample is composed of all individuals aged 2–6 (young) or 12–17 in 1974. In even-numbered columns, we expand the exposure group to all cohorts born between 1968 and 1987, as in Table 3.5.

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01. Robust standard errors clustered by district of birth.

**Table C.17: SD INPRES Exposure and Islamic School Choice (Robustness)**

Additional Controls: Latent Potential Growth in Islamic Education

	Highest Education Level: [...] <i>Madrasa</i>							
	Elementary		Junior Secondary		Senior Secondary		Any Level	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) Unconditional Estimates (Table 3.5)								
INPRES × young	-0.0008 (0.0005)	-0.0006 (0.0006)	0.0015*** (0.0004)	0.0024*** (0.0007)	0.0006** (0.0003)	0.0012*** (0.0004)	0.0013* (0.0007)	0.0028** (0.0011)
Number of Individuals	839,026	2,315,949	839,026	2,315,949	839,026	2,315,949	839,026	2,315,949
Dep. Var. Mean	0.014	0.011	0.011	0.016	0.008	0.012	0.031	0.038
(b) Conditional Estimates (Table 3.6)								
INPRES × young	-0.0014** (0.0007)	-0.0012 (0.0009)	0.0057*** (0.0021)	0.0056** (0.0023)	0.0006 (0.0017)	0.0031* (0.0017)	0.0010 (0.0007)	0.0018** (0.0009)
Number of Individuals	283,359	726,560	100,874	373,064	130,546	471,076	543,748	1,680,217
Dep. Var. Mean	0.024	0.024	0.070	0.086	0.044	0.053	0.036	0.044
1957 Islamic Schools × Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Additional Controls × Year FE	✓	✓	✓	✓	✓	✓	✓	✓
District FE, Year FE	✓	✓	✓	✓	✓	✓	✓	✓

*Notes:* This table augments the baseline specification from panel (a) of Tables 3.5 and 3.6 with the following predetermined controls interacted with year fixed effects: the prevalence of *waqf* endowments in 1960, the Muslim population share in the 1972 census, Islamic political party support in the 1955 elections, historical Arab minority populations from the 1930 Dutch colonial Census, the occurrence of an Islamist armed insurgency in the 1950s, and an indicator for districts involved in an experimental compulsory schooling program after 1957. The dependent variables include an indicator equal to one if the individual's final year of schooling took place an Islamic elementary (columns 1–2), junior secondary (columns 3–4), and senior secondary (columns 5–6). Panel (a) reports standard difference-in-differences estimates. All specifications include district of birth dummies and year of birth dummies interacted with survey year dummies, the 1971 children population, the 1971 enrollment rate, exposure to the water and sanitation program in the district of birth, the number of elementary, junior secondary, senior secondary *madrasa* in 1960, and the number of *pesantren* in 1960. \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. Robust standard errors are clustered by district of birth.

**Table C.18:** Exogeneity of the Compulsory Schooling Pilot Program

	Program Indicator	$\Delta$ Schools ('1000s)	$\Delta$ Teachers ('1000s)
	(1)	(2)	(3)
Elementary <i>madrassa</i>	-0.0019 (0.0119)	-0.0002 (0.0007)	0.0469 (0.0405)
Secondary <i>madrassa</i>	-0.0491 (0.0449)	-0.0048* (0.0027)	-0.0517 (0.0534)
<i>Pesantren</i>	0.0098* (0.0053)	0.0002 (0.0004)	0.0426 (0.0370)
Islamic elementary enrollment	-2.2357 (1.9258)	-0.0118 (0.1542)	-3.2261 (2.9479)
<i>Waqf</i> land	0.1163 (0.4001)	0.0632 (0.0507)	-1.0995 (1.4419)
Arab ethnic share in 1930	-1.8969 (1.8810)	0.0897 (0.1243)	-1.5918 (3.0300)
Historical Islamist insurgency	-0.0339 (0.0869)	-0.0133** (0.0061)	-0.1324 (0.1000)
Islamic party vote shares 1955-57	0.1579 (0.1670)	0.0003 (0.0084)	0.0153 (0.1547)
Muslim share	0.1094 (0.1099)	-0.0020 (0.0053)	-0.0258 (0.0716)
Number of Districts	273	273	273
Dep Var. Mean	0.121	0.005	0.064
R <sup>2</sup>	0.161	0.148	0.255

*Notes:* This table reports district-level cross-sectional correlations between the introduction of the compulsory schooling pilot program (*Wajib belajar*) discussed in Section 3.6.1 and predetermined measures of Islamic schooling and presence in the late 1950s. The program applied to children aged 8 to 14 and was rolled out in 35 pilot districts starting in 1957 (Sarumpaet, 1963). The dependent variable is: in column 1, an indicator equal to 1 if the district was involved in the program; in column 2, the increase in the number of schools induced by the program; in column 3, the increase in the number of teachers induced by the program. The district-level stocks of Islamic schools (*madrassa* and *pesantren*) are measured as of 1957. Islamic enrollment rates are computed among cohorts born before 1957 based on *Susenas*. *Waqf* land is measured as of 1960. Other controls are defined as in Appendix Tables C.1 and C.17.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Robust standard errors in parentheses.

**Table C.19:** SD INPRES Exposure, Islamic Schooling and the 1982 Headscarf Ban

	Highest Education Level:		Highest Level is Islamic	
	Elementary Islamic		Elementary Graduates	
	(1)	(2)	(3)	(4)
INPRES $\times$ young $\times$ woman $\times$ ( $\leq 12$ in 1982)	0.0008* (0.0004)	0.0009** (0.0004)	0.0015 (0.0010)	0.0012 (0.0008)
INPRES $\times$ young	-0.0005 (0.0004)	-0.0004 (0.0004)	-0.0001 (0.0009)	-0.0001 (0.0009)
INPRES $\times$ young $\times$ woman	-0.0006 (0.0004)	-0.0005 (0.0004)	-0.0017* (0.0009)	-0.0017* (0.0009)
INPRES $\times$ young $\times$ ( $\leq 12$ in 1982)	-0.0008** (0.0003)	-0.0007* (0.0004)	-0.0022** (0.0010)	-0.0014 (0.0010)
Observations	839,026	2,315,949	283,359	726,561
Number of Districts	275	275	275	275
Cohorts born 1968-72 vs. 1957-62	✓		✓	
Cohorts born 1968-87 vs. 1957-62		✓		✓
Dependent Variable Mean	0.014	0.011	0.024	0.024
R <sup>2</sup>	0.028	0.023	0.044	0.039

*Notes:* This table reports estimates of equation (3.4) fully interacted with a gender dummy and a dummy for cohorts aged 12 or less in 1982, based on annual *Susenas* data from 2012 to 2018. INPRES refers to SD INPRES schools constructed from 1973–78 per 1,000 children in 1971. The headscarf ban in public schools was adopted in 1982. Women aged 12 or less in 1982 would have been too young to complete their primary education before the ban came into force. The dependent variable is an indicator equal to one if the individual’s final year of schooling was completed in an Islamic elementary. Columns 1 and 2 include all individuals regardless of their years of schooling. Columns 3 and 4 include only elementary graduates across the two systems (Islamic and non-Islamic). The regression includes all two-way and three-way interactions between the *INPRES* and the *young* terms in equation (3.4), a dummy for women, and a dummy for cohorts aged 12 or less in 1982. All specifications also include survey year dummies, district of birth dummies and year of birth dummies interacted with the 1971 children population, the 1971 enrollment rate, exposure to the water and sanitation program in the district of birth, the number of elementary, junior secondary, senior secondary *madrassa*, and the number of *pesantren* in 1959. In odd-numbered columns, the sample is composed of all individuals aged 2–6 (young) or 12–17 in 1974. In even-numbered columns, the exposure group additionally includes cohorts born between 1973 and 1987.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Robust standard errors clustered by district of birth.

### C.1.5 SD INPRES and Support for the New Order Regime

In the short run, a major development initiative like SD INPRES could have bolstered support for Suharto and the New Order. We explore this possibility using legislative election results during this period (in 1971, 1977, 1982, 1987, and 1992) and after Indonesia's democratic transition (in 1999, 2004, and 2009).<sup>4</sup> Only three parties were allowed to compete under the New Order after 1971: Suharto's *Golkar* party, the Muslim umbrella United Development Party (PPP),<sup>5</sup> and the nationalist Indonesian Democratic Party (PDI). *Golkar* obtained 70% of the vote on average across all New Order elections, while the PPP was the main opposition with 21% of the vote. After 1999, both *Golkar* and the PPP garnered much smaller vote shares due to the proliferation of parties on both the secular and religious sides of the political spectrum.

We estimate the time-varying relationship between SD INPRES intensity and the *Golkar* vote share in a district-level panel covering the elections from 1971 through 2009. The 1971 round was the only New Order election before school construction ensued and the first with *Golkar* candidates. As such, we cannot fully account for possible pre-trends in *Golkar* support. However, we can allow for differential trends based on vote shares for key party blocs in 1955 and 1957, the last elections prior to 1971. In understanding the post-1971 dynamics, note that elections held in 1977 and 1982 would have been indirectly affected by the policy (e.g., through the increased presence of public schools in one's community), while exposed cohorts aged less than 6 in 1974 would have first voted in 1987.

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<sup>4</sup>The final election of the Suharto era was in 1997, but we could not obtain district-level records from this round.

<sup>5</sup>In the 1971 election, we capture the Islamic vote share by combining all four Islamic parties that were subsumed in 1973 by regime decree under the PPP: *Nahdatul Ulama* (NU), the Muslim Party of Indonesia (Parmusi), the Islamic Association Party of Indonesia (PSII) and the Islamic Education Movement (Perti). NU was the second-highest ranked party in that election (after *Golkar*) with 18% of the vote.

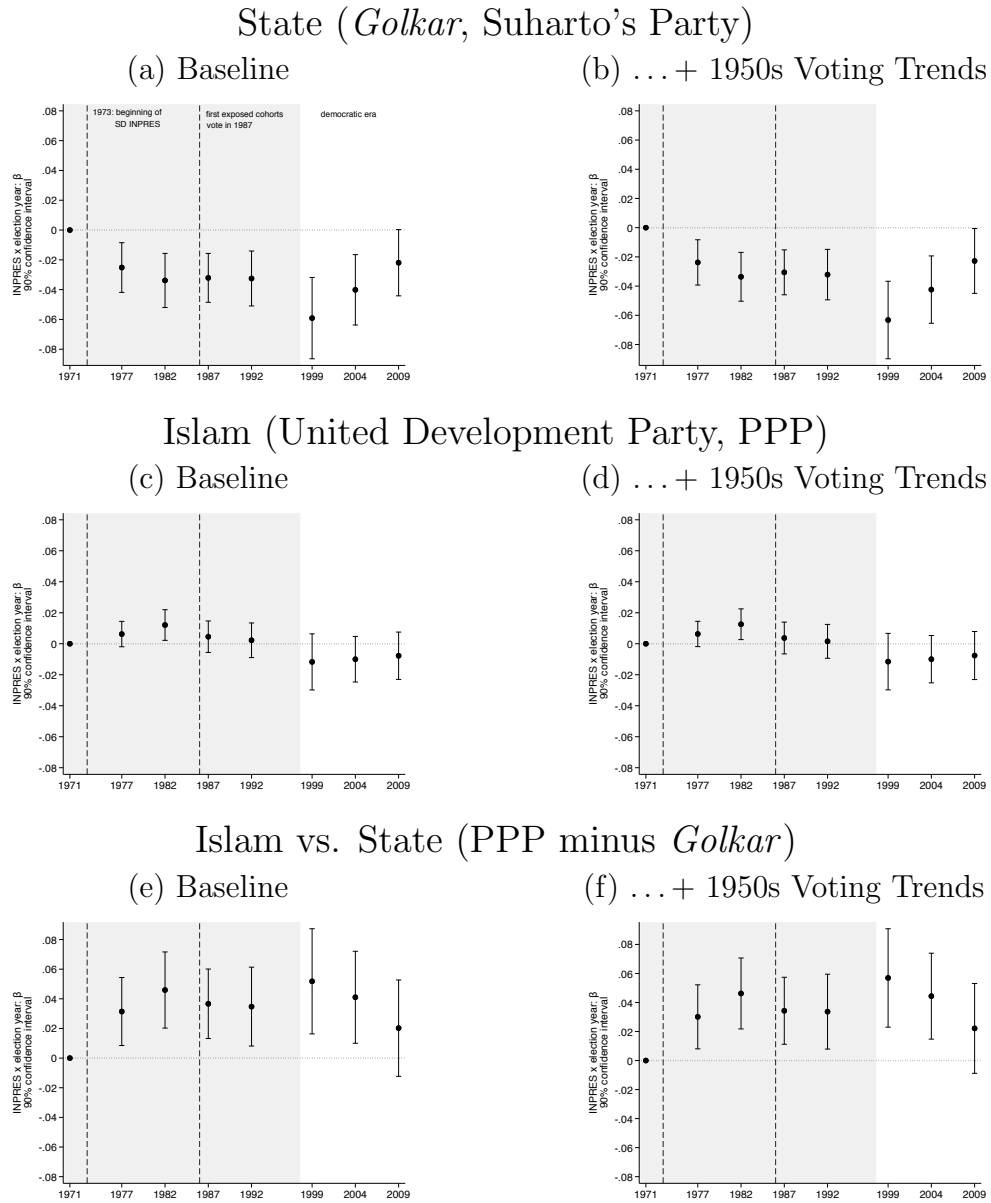
Appendix Figure C-10 shows that SD INPRES did not increase electoral support for the regime in high-INPRES districts. Panel (a) show a marked decline in electoral support for *Golkar* from 1971 to 1977 in high-INPRES districts: each additional INPRES school per 1,000 children is associated with a 2–4 percentage point (p.p.) decline in the *Golkar* vote share (relative to the mean of 65% in 1971). This effect appears as early as 1977 and persists thereafter. These results are effectively unchanged when including interactions of election-year FE with the vote share for Communist and Islamic parties in the 1950s elections (panel b). This provides suggestive evidence against pre-trends inasmuch as support for *Golkar* in 1971 is correlated with voting behavior in the 1950s.

The Islamic opposition captured some of the declining support for *Golkar*. We see this for the PPP vote share in absolute terms (panels c and d) and relative to *Golkar* (panels e and f). One explanation could be that the PPP captured general opposition sentiment. Indeed, the effect of INPRES intensity on support for the PPP becomes noisier after 1999, when the PPP was no longer the main vehicle for opposition aspirations. Another explanation is that the Islamic sector pushed back against secularization, which was most salient in districts with greater INPRES school construction. The decline in *Golkar* support as early as 1977 is consistent with this pushback. If instead these electoral shifts had been slower to materialize, it would have been difficult to rule out an alternative explanation, namely that INPRES created a more educated citizenry that was simply more opposed to the regime's authoritarian ambition. The more plausible explanation for Appendix Figure C-10 is that the Islamic sector mobilized not only by building more religious schools but also by coordinating political opposition through its own expanding school network.

Overall, Figure C-10 shows that SD INPRES did not boost support for the Suharto regime during the New Order era. Even under an autocratic regime with tightly

controlled elections, mass schooling failed to indoctrinate voters and instead benefited the opposition.

**Figure C.10: SD INPRES Intensity and Electoral Support for Islam vs. the State**



*Notes:* This figure reports legislative-election-year-specific estimates and 90% confidence intervals around  $\beta$  in equation (3.1) on a balanced district–election-year panel. INPRES intensity is defined as the number of SD INPRES schools constructed from 1973–78 per 1,000 children in 1971. The dependent variable measures vote shares for *Golkar*, the party of Suharto and the New Order regime (panels a–b), the Islamic opposition party/ies (panels c–d), and the difference in vote shares between the two (panel d–e). All specifications include district fixed effects and election-year fixed effects interacted with the 1971 children population, the 1971 enrollment rate, exposure to the water and sanitation program, the number of elementary, junior secondary, senior secondary *madrasa*, and the number of *pesantren* in 1972. The specifications in panels b, d, and f additionally controls for election-year fixed effects interacted with the respective vote shares for Islamic and Communist parties in the 1950s legislative elections. In 1971, there were four Islamic parties that we group together, but from 1973 onward, the regime only allowed a single umbrella Islamic party, the United Development Party or PPP. The 1971 election is the last just prior to SD INPRES and serves as the reference election given district fixed effects. The gray area captures elections conducted under the New Order regime. The elections in 1987 and 1992 are the first in which INPRES-exposed cohorts would have been eligible to vote. The elections from 1999 onward took place after the fall of Suharto when the country democratized and both secular and Islamic parties proliferated.

### C.1.6 Probing Linguistic Ability and Identity

**Table C.20:** INPRES Exposure and Linguistic Ability

	Able to Speak Indonesian			Latin Alphabet Literacy			Other Literacy		
	All (1)	Muslims (2)	Non-Muslims (3)	All (4)	Islamic-Educ. (5)	Secular-Educ. (6)	All (7)	Islamic-Educ. (8)	Secular-Educ. (9)
INPRES × young	0.0163*** (0.0011)	0.0224*** (0.0052)	0.0056 (0.0068)	0.0323*** (0.0039)	0.0103*** (0.0037)	0.0192*** (0.0040)	0.0039 (0.0023)	-0.0014 (0.0055)	0.0034 (0.0024)
Number of Individuals	31,680,947	31,680,947	27,811,517	839,026	25,935	813,087	839,026	25,935	813,087
Number of Districts	273	273	273	275	268	275	275	268	275
Dep. Var. Mean	0.931	0.933	0.918	0.914	0.985	0.912	0.060	0.045	0.061

*Notes:* This table reports estimates of equation (3.4) using data from the 2010 Population Census (columns 1–3) and *Susenas* 2012–18 (columns 4–9). The specification in columns 1–3 is the same as in columns 1–3 of panel (a) in Table 3.9 with the outcome here being whether the respondent is able to speak Indonesian. The specification in columns 4–9 is the same as in columns 4–6 of panel (a) in Table 3.9 with the other literacy outcomes here.

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01. Robust standard errors clustered by district of birth.

**Table C.21:** Correlations of Islamic Education and Literacy  
Conditional on Years-of-Schooling Fixed Effects

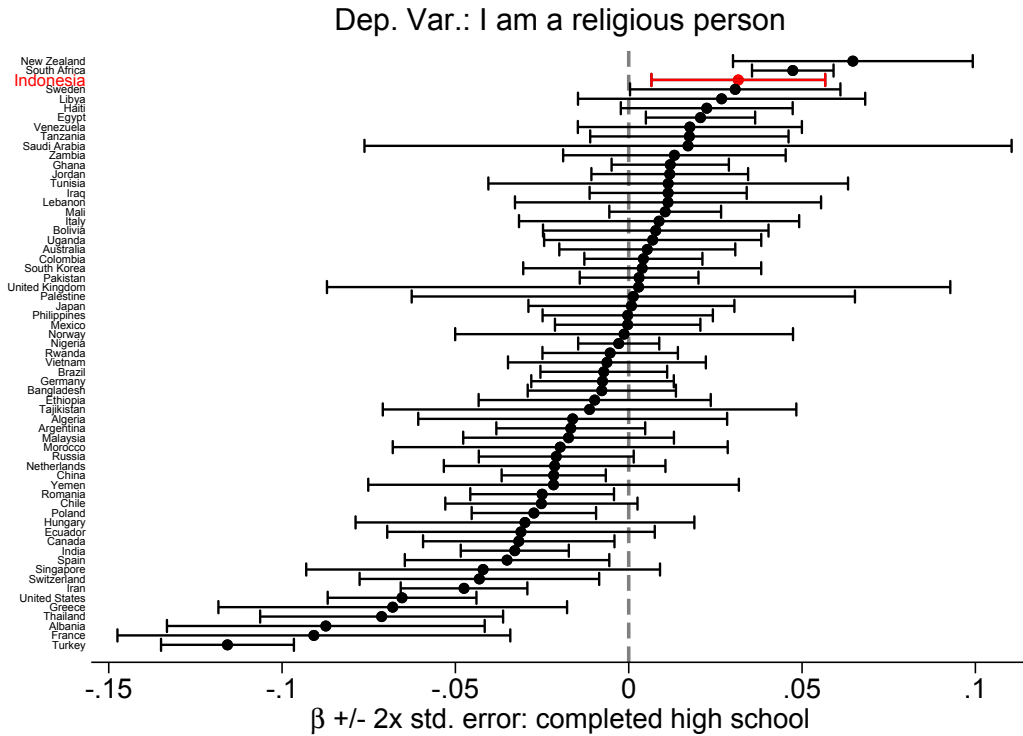
	Literacy in ... Alphabet		
	Arabic	Latin	Other
	(1)	(2)	(3)
Islamic primary	0.1992*** (0.0118)	0.0144*** (0.0020)	-0.0109*** (0.0025)
Islamic junior secondary	0.2627*** (0.0093)	0.0003 (0.0013)	-0.0021 (0.0030)
Islamic senior secondary	0.2842*** (0.0085)	-0.0004 (0.0012)	-0.0012 (0.0053)
Number of Individuals	839,019	839,019	839,019
Number of Districts	275	275	275
Dependent Variable Mean	0.343	0.914	0.060

*Notes:* This table regresses indicators for literacy in different languages/alphabets on indicators for whether the respondent's final level of schooling was Islamic primary, junior secondary or senior secondary. The data come from our baseline *Susen*s data from 2012 to 2018, and the sample is restricted to our baseline cohort specification used throughout the paper. The regressions are conditional on total years-of-schooling fixed effects such that the coefficients identify the differential literacy rates for those completing Islamic versus non-Islamic school with the same total years of schooling. The specification omits the interaction of INPRES and the exposure dummy but is otherwise identical to that used in column 4 of panel (a) in Table 3.9.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Robust standard errors clustered by district of birth.

C.1.7 Additional Figures and Tables

Figure C·11: Education and Religiosity Across Countries



Notes: This figure reports the cross-sectional regression-based correlation between education and religiosity in the World Values Survey data spanning 1981 to 2020 with specific years of enumeration varying across countries. Education is an indicator for high school completion. Religiosity is measured based on the question, “How religious are you as a person?”, with answers being “religious”, “not religious”, and “convinced atheist”. Our outcome is a binary indicator for whether the respondent answers “religious”. Each point estimate and 95% confidence interval is based on a country-specific regression pooling across all survey waves for the given country. The regression controls for age, gender, religious denomination and survey year fixed effects, and standard errors are robust.

**Table C.22: INPRES Exposure and Religious Political Preferences**

	Corporal Punishments (1)	Prohibit Interest (2)	Hijab Mandatory (3)	Support Polygamy (4)	Punish Adultery (5)	Punish Apostasy (6)	<b>Index</b> Objective (7)
INPRES $\times$ young	0.0057 (0.0675)	0.0389 (0.0633)	0.0430 (0.0602)	-0.0343 (0.0866)	0.0343 (0.0589)	0.0240 (0.0381)	0.0143 (0.0288)
Number of Individuals	1,241	1,181	1,250	1,277	1,257	1,238	1,286
Number of Districts	142	140	142	144	144	143	144
Dep. Var. Mean	0.313	0.463	0.822	0.376	0.449	0.175	0.434

*Notes:* This table reports estimates of equation (3.4) using data from Pepinsky et al. (2018). The outcomes in columns 1–6 correspond to the sub-components of the objective index of support for *sharia* law used in Table 3.10 and reproduced here in column 7. The specification is otherwise identical to that in Table 3.10 (see the notes therein).

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Robust standard errors clustered by district of birth.

## C.2 Conceptual Framework: Proofs and Extensions

### C.2.1 Baseline Setup: Proofs

**Stage 4** There are four types of markets that may arise: (1) markets with only  $s$ ; (2) markets with only  $r$ ; (3) markets with both schools; (4) markets without any school. Markets of type (4) do not involve any decision by the students. In markets of type (1) and (2), students need to decide whether to attend the only school they have or not. In markets of type (3), students need to choose between attending  $s$ ,  $r$  or no school at all.

Consider market of type (1). School  $s$  must set  $x_s = 0$ . Hence, a student with religious preference  $\rho_i$  (called type  $\rho_i$  henceforth) will choose to attend the school if and only if

$$v_s - \rho_i^2 \geq 0, \text{ which implies } \rho_i \leq \sqrt{v_s}.$$

Note: if this market's  $J$  is lower than  $\sqrt{v_s}$ , all students will choose to attend the school.

Consider market of type (2). Suppose school  $r$  sets curriculum  $x_r$ . Then a student with type  $\rho_i$  will choose to attend if and only if

$$v_r - (x_r - \rho_i)^2 \geq 0, \text{ which implies } \rho_i \in [x_r - \sqrt{v_r}, x_r + \sqrt{v_r}].$$

Note: if this market's  $J$  is lower than  $\sqrt{v_r}$ , any choice of  $x_r$  will lead to all students attending the school.

Consider market of type (3). We already know that a student of type  $\rho_i$  may choose to attend school  $s$  if  $\rho_i \leq \sqrt{v_s}$  and may choose to attend school  $r$  if  $\rho_i \in [x_r - \sqrt{v_r}, x_r + \sqrt{v_r}]$ . Consider a student whose type satisfies both conditions,

i.e. she has to choose which of the two schools to attend. She will choose school  $s$  if and only if

$$v_s - \rho_i^2 \geq v_r - (x_r - \rho_i)^2, \text{ which implies } \rho_i \leq \frac{1}{2} \left( \frac{v_s - v_r}{x_r} + x_r \right).$$

This condition can also be rewritten as  $(v_s - v_r) \geq x_r(2\rho_i - x_r)$ , which intuitively corresponds to comparing the benefit of higher quality in the public school on the left side and the benefit of more religious education in the religious school. Note: this constraint matters if and only if  $x_r < \sqrt{v_s} + \sqrt{v_r}$ .

This completes the analysis of stage 4.

**Stage 3** Consider the curriculum decision of the religious school in markets of type (2) and (3).

In markets of type (2), the school wants to maximize the mass of attending students, which can be represented as

$$\max_{x_r} (\min\{x_r + \sqrt{v_r}, J\} - \max\{x_r - \sqrt{v_r}, 0\})$$

There may be a continuum of optimal values of  $x_r$ , provided that  $J$  is larger than  $2\sqrt{v_r}$  (or smaller than  $\sqrt{v_r}$ ). However, across all possible values of  $J$ , setting  $x_r = \frac{1}{2}J$  is always an optimal choice. The range of optimal curricula is given by  $x_r \in [\sqrt{v_r}, J - \sqrt{v_r}]$ .

In markets of type (3), the school has to balance maximizing its reach over students and competing with the public school. A student of type  $\rho_i$  will choose to attend the religious school if and only if:

$$\begin{cases} x_r - \sqrt{v_r} \leq \rho_i \leq x_r + \sqrt{v_r} \\ \rho_i \geq \frac{1}{2} \left( \frac{v_s - v_r}{x_r} + x_r \right) \end{cases}$$

Recall from stage 4 analysis that competition does not affect school  $r$  as long as  $x_r > \sqrt{v_s} + \sqrt{v_r}$ .

This effectively splits the school's problem into two possible situations:  $x_r \geq \sqrt{v_s} + \sqrt{v_r}$ , and vice versa. We can solve the problem separately and then compare the solutions to figure out the optimal  $x_r$ .

**Case 1:** Consider the case  $x_r \geq \sqrt{v_s} + \sqrt{v_r}$ . School  $r$ 's problem then becomes

$$\max_{x_r \geq \sqrt{v_s} + \sqrt{v_r}} (\min\{x_r + \sqrt{v_r}, J\} - (x_r - \sqrt{v_r})).$$

If  $J > 2\sqrt{v_r} + \sqrt{v_s}$  holds, then school  $r$  is not constrained by competition. There is a range of  $x_r$  (or a unique  $x_r$  in case of equality) where its objective function is maximized at the value of  $2\sqrt{v_r}$ . This range is given by

$$x_r \in [\sqrt{v_s} + \sqrt{v_r}, J - \sqrt{v_r}].$$

Notably, picking  $x_r = \frac{1}{2}J$  may no longer be optimal. This occurs when  $J < 2\sqrt{v_s} + 4\sqrt{v_r}$ .

If  $J < 2\sqrt{v_r} + \sqrt{v_s}$  holds, then the school's problem becomes

$$\max_{x_r \geq \sqrt{v_s} + \sqrt{v_r}} (J - (x_r - \sqrt{v_r})).$$

This problem has a unique solution  $x_r = \sqrt{v_s} + \sqrt{v_r}$ , i.e. the school wants to pick as low  $x_r$  as possible, while still maintaining the constraint of this case.

**Case 2:** Now consider the case where  $x_r < \sqrt{v_s} + \sqrt{v_r}$ . Based on the above, this case should only matter if  $J < 2\sqrt{v_r} + \sqrt{v_s}$ . In such a case, the lower bound of students who pick school  $r$  is determined by school  $s$ , not by the student's individual rationality constraint. In other words, school  $r$ 's problem becomes

$$\max_{x_r < \sqrt{v_s} + \sqrt{v_r}} \left( \min\{x_r + \sqrt{v_r}, J\} - \frac{1}{2} \left( \frac{v_s - v_r}{x_r} + x_r \right) \right).$$

For low enough values of  $x_r$  the problem takes form

$$\max_{x_{r1} < \sqrt{v_s} + \sqrt{v_r}} \left( x_{r1} + \sqrt{v_r} - \frac{1}{2} \left( \frac{v_s - v_r}{x_{r1}} + x_{r1} \right) \right).$$

and for higher values it takes form

$$\max_{x_{r2} < \sqrt{v_s} + \sqrt{v_r}} \left( J - \frac{1}{2} \left( \frac{v_s - v_r}{x_{r2}} + x_{r2} \right) \right).$$

The first subcase has a strictly increasing function of  $x_r$ , so its solution will be on the upper edge of the subcases, where  $x_{r1} = J - \sqrt{v_r}$ .<sup>6</sup> The second subcase is solved at  $x_{r2} = \sqrt{v_s - v_r}$  or  $x_{r2} = J - \sqrt{v_r}$ , whichever is larger.

Assuming  $v_s < 2v_r$ , we can conclude  $J > 2\sqrt{v_r} > \sqrt{v_s - v_r} + \sqrt{v_r}$ , implying that  $J - \sqrt{v_r} > \sqrt{v_s - v_r}$ . Thus, the optimal choice for the religious school in the case  $J < 2\sqrt{v_r} + \sqrt{v_s}$  becomes  $x_r = J - \sqrt{v_r}$ .

Overall, we can conclude that Case 2 is solved at  $\sqrt{v_s - v_r}$  or  $J - \sqrt{v_r}$ , whichever is larger. If  $v_s < 2v_r$ , then Case 2 is solved at  $x_r = J - \sqrt{v_r}$ .

To summarize, if  $J \geq 2\sqrt{v_r} + \sqrt{v_s}$ , the religious school can enter the market without being affected by the secular school's competition, and get the same payoff as in a market of type (2). If  $J \in (2\sqrt{v_r}, 2\sqrt{v_r} + \sqrt{v_s})$ , then the religious school has to actively compete with the secular school for students, and provided that  $v_s < 2v_r$ , it will choose  $x_r = J - \sqrt{v_r}$ .

Note that in both cases, one of the religious school's best responses is to set  $x_r = J - \sqrt{v_r}$  in every market it enters, i.e. it focuses on the most religious students. It's not the only best response in larger markets and markets without competition from the state school. However, it is the only best response in markets where  $J < 2\sqrt{v_r} + \sqrt{v_s}$ .

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<sup>6</sup>Note that  $J - \sqrt{v_r}$  is smaller than  $\sqrt{v_s} + \sqrt{v_r}$  for this case.

**Stage 2** Consider the entry decision of the religious school. From its perspective, the markets are split into two groups: ones with school  $s$  and ones without.

School  $r$ 's problem may be viewed as a sequential decision about which market to enter next. It will identify "the best" market in each of the two groups, and then compare them. Whichever market is "better", it will choose to enter, and move on to choosing which market to enter after that. This way, the school's problem can be viewed as a sequence of binary comparisons between the best market with school  $s$  and the best market without it.

Since school  $r$  only cares about enrolling as many students as possible, a market's value to it is measured by the mass of students it will be able to cover upon entering. For markets without  $s$ , this is easy to identify: given the assumption that  $J > 2\sqrt{v_r}$ , such a market always has value  $2\sqrt{v_r}$  to the religious school.

Markets with school  $s$  split into two cases. If  $J \geq 2\sqrt{v_r} + \sqrt{v_s}$ , then the market's value is equal to  $2\sqrt{v_r}$ . If  $J \in [2\sqrt{v_r}, 2\sqrt{v_r} + \sqrt{v_s})$ , then the market has value

$$J - \frac{1}{2} \left( \frac{v_s - v_r}{J - \sqrt{v_r}} + J - \sqrt{v_r} \right) = \frac{1}{2} \left( J + \sqrt{v_r} - \frac{v_s - v_r}{J - \sqrt{v_r}} \right).$$

To summarize,

- (a) A market without  $s$  will have value  $2\sqrt{v_r}$ .
- (b) A market with  $s$  has value  $2\sqrt{v_r}$  if  $J > 2\sqrt{v_r} + \sqrt{v_s}$ . Otherwise, it has value  $\frac{1}{2} \left( J + \sqrt{v_r} - \frac{v_s - v_r}{J - \sqrt{v_r}} \right)$ . Note that the latter value is increasing in  $J$  and is less than  $2\sqrt{v_r}$  when  $J < 2\sqrt{v_r} + \sqrt{v_s}$ .

This implies that the school will first prioritize markets that have value  $2\sqrt{v_r}$ . These are all markets without  $s$  and markets with  $s$  where  $J > 2\sqrt{v_r} + \sqrt{v_s}$ . After that, it will rank remaining markets based on their  $J$  and enter them in descending order.

**Stage 1** Here we introduce additional terminology: a market is called *major* if it satisfies  $J \geq 2\sqrt{v_r} + \sqrt{v_s}$ , and otherwise it is *minor*. Major markets can host both schools without them actively competing for students, and hence harming each other's attendance. Let the number of major markets be  $m$ .

If the combined budget of the two schools is smaller than or equal to  $N + m$ , then there are many equilibria where the schools do not compete in any market, major or minor. For example, both schools might enter all major markets, and then split minor markets in a non-overlapping way. Alternatively, one school may mostly occupy minor markets, while the other mostly occupies major ones. Multiplicity of equilibria comes in how the schools split the set of markets in a non-overlapping way (except major markets, which they may share without affecting each other).

If the combined budget of the two schools is larger than  $N + m$ , then the equilibria all involve the following: both schools enter every major market and the largest (by  $J$ ) minor markets; the smaller minor markets are divided between them in an arbitrary but non-overlapping way. Below is an example of how this may work.

**Example:** Suppose there are 5 major markets and 10 minor markets, with both schools having a budget of  $R = S = 12$ . If the schools enter all major markets, they both will still have a budget of 7 remaining. This implies that they will have to share at least 4 minor markets regardless of how they split them. In equilibrium, the state school will enter the 4 largest minor markets, and an arbitrary 3-large subset of the remaining minor markets. The religious school will then enter the 4 largest minor markets too, and the 3 unoccupied smaller minor markets. The multiplicity of equilibria here comes in how the two schools split the smaller 6 markets. The fact that they enter all major markets

and the 4 largest minor markets is true in every equilibrium.

A few lemmas supporting the results above follow.

**Lemma 1.** *Suppose  $s$  and  $r$  share a minor market with  $J = j_1$ , and suppose there is a minor market with  $J = j_2 > j_1$  such that none of the schools entered it. Then this cannot be an equilibrium.*

*Proof.* Either school obviously can improve their payoff by switching to the larger market in the corresponding phase.  $\square$

**Lemma 2.** *Suppose  $s$  and  $r$  share a minor market with  $J = j_1$ , and suppose there is a minor market with  $J = j_2 > j_1$  such that only one of the schools entered it. Then this cannot be an equilibrium.*

*Proof.* Let us start with school  $r$ , as it moves last. Suppose both schools occupy the market with  $J = j_1$ , but only school  $s$  occupies the market with  $J = j_2$ . By entering market with  $J = j_1$ , school  $r$  splits the market with the other school and earns a payoff of

$$\frac{1}{2} \left( j_1 + \sqrt{v_r} - \frac{v_s - v_r}{j_1 - \sqrt{v_r}} \right).$$

If it instead enters the larger market with  $J = j_2$ , it will earn a payoff of

$$\frac{1}{2} \left( j_2 + \sqrt{v_r} - \frac{v_s - v_r}{j_2 - \sqrt{v_r}} \right).$$

Note that this payoff is larger than the previous one, since the expression is strictly increasing in  $J$ . Hence, religious school prefers to deviate from  $J = j_1$  to  $J = j_2$ , and the initial outcome cannot be part of an equilibrium.

Now consider school  $s$  in the same situation: it splits the market  $J = j_1$  with  $r$  and doesn't enter market  $J = j_2$ , with  $r$  entering it afterwards. Under this outcome, it earns a payoff from this market equal to

$$\frac{1}{2} \left( \frac{v_s - v_r}{j_1 - \sqrt{v_r} + j_1 - \sqrt{v_r}} \right).$$

If it instead switches to  $J = j_2$  in stage 1, then two things might happen later:  $r$  might remain in market  $J = j_2$  or switch it to some other market. If it remains,

then payoff of  $s$  improves to

$$\frac{1}{2} \left( \frac{v_s - v_r}{j_2 - \sqrt{v_r} + j_2 - \sqrt{v_r}} \right),$$

since its payoff above is increasing in  $J$ .

If  $r$  switches to another market, there are two subcases: either it switches to a market without impacting  $s$ 's payoff (a major market or a minor market without  $s$ ), or it switches to a minor market with  $s$  in it. The former doesn't impact  $s$ 's payoff improvement, but the latter can. However, the latter occurs if and only if there is an even larger minor market which  $s$  originally occupied but  $r$  did not. In that case, the first half of this proof shows that the initial outcome could not be an equilibrium because  $r$  would prefer to switch. However, if  $r$  did not have such incentive while occupying  $J = j_1$ , then it will not switch to another minor market with  $s$  when that switches to  $J = j_2$ . Hence,  $s$ 's payoff will improve, and the original outcome could not be an equilibrium.  $\square$

These two lemmas show that there is no equilibrium outcome where the largest minor markets are not split between the two schools. If a particular minor market is split between the schools, it must be the case that the larger minor markets are also split; otherwise, this is not an equilibrium. How many of these largest markets will be split in equilibrium?

**Lemma 3.** *Suppose  $s$  and  $r$  share a minor market with  $J = j_1$ , and suppose there is a smaller minor market with  $J = j_2 < j_1$  such that no school entered it. Then this cannot be an equilibrium.*

*Proof.* It is sufficient to show this is not optimal for school  $r$ , though the same is true for the other school. By occupying the same  $J = j_1$  market as school  $s$ ,  $r$  earns a payoff of

$$\frac{1}{2} \left( j_1 + \sqrt{v_r} - \frac{v_s - v_r}{J - \sqrt{v_r}} \right) < 2\sqrt{v_r},$$

where the inequality follows because of  $J < 2\sqrt{v_r} + \sqrt{v_s}$ . By switching to the unoccupied  $J = j_2$  market,  $r$  will earn a payoff of  $2\sqrt{v_r}$  instead, which is clearly better. Hence, the original outcome cannot be an equilibrium.  $\square$

This lemma shows that the equilibrium will have a particular split of the minor markets. All of them will be occupied by at least one of the schools, and the number of the largest minor markets split between both schools must be such that the remaining minor markets are partitioned exhaustively between the two schools in a non-overlapping way. There's a unique number that makes this work, and can be constructed in the following way. Start with schools jointly entering all of the largest markets, and then switch a school from the smallest of these largest markets to one of the smaller unoccupied markets one by one, until all markets are filled.

The exact number of minor markets that will be shared in equilibrium is given by  $R + S - N - m$  or  $N - m$ , whichever is larger. This is true if and only if  $R \geq N$  and  $S \geq N$  are impossible. Otherwise, the exact number of shared minor markets depends on the parameters in a slightly more complicated way.

### C.2.2 Introducing Religious Secondary Education

In this extension, we introduce religious secondary education. We then explore how this affects school  $r$ 's entry decisions at the primary and secondary levels. The market for primary schools works in the same way as above, except that the religious sector can allocate a fraction of its budget towards secondary schools. The new timing of the game is as follows:

1. The state decides which markets to enter.
2. The religious sector sets  $R_p$ , the amount of its budget  $R$  spent on primary schools.
3. The state decides which markets to enter for primary schools.

4. School  $r$  sets curriculum for primary schools in each market where it entered in stage 3.
5. Primary students in each market decide (in a myopic way) which school to attend, if any.
6. Using the remaining funds from stage 2,  $R_h = R - R_p$ , the religious sector decides which markets to enter for secondary schools, under the constraint that secondary schools can only be built wherever there is either a primary state or religious school. Secondary religious school curriculum must be set at some exogenous  $x_r^h$  and school quality is  $v_r^h > v_r$ . The cost of building a primary and a secondary school is equal to 1.
7. Primary student *graduates* in each market decide whether or not to attend the secondary religious school. They attend the religious secondary school if  $v_r^h - (x_r^h - \rho_i)^2 > 0$ .

In this modified setup, school  $r$  now maximizes a combination of primary and secondary enrollment ( $P$  and  $H$ , respectively),  $P + \eta H$ . We focus on the  $\eta \geq 1$  case and, for simplicity, assume that there are no state secondary schools.<sup>7</sup> Additionally, suppose that  $x_r^h = J - \sqrt{v_r^h}$ , since that is a best response under all circumstances.

**Description of the equilibrium.** In the baseline setup, religious schools avoided markets served by a state school. This changes once we introduce religious secondary schools, which may capture the excess demand from primary graduates educated in both sectors. This excess demand makes markets with a school  $s$  relatively more attractive for the religious sector, and leads to a change in the order in which schools  $r$  enter each market. The religious sector first prioritizes (major and minor) markets

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<sup>7</sup>To maintain tractability, we do not consider competition between public and religious schools at the secondary level. Although restrictive, this assumption helps clarify the religious sector's incentives and will be relaxed in the empirical analysis.

with a state school. Only then will it enter (major and minor) markets without a school  $s$ .

This different pattern of entry also incentivizes schools  $r$  to adopt a more religious curriculum at the primary level, for two reasons. First, in major markets with a state school  $s$ , the set of optimal curricula shifts weakly upwards to avoid competition from the state. Second, in all markets without a school  $s$ , the set of optimal curricula also shifts upwards because a low value of  $x_r$  would lead  $r$  to lose some of its least religious primary graduates at the secondary level.<sup>8</sup> Thus, in addition to increasing incentives to challenge the state in the markets where it entered, the introduction of secondary education also increases curriculum differentiation at the primary level. Furthermore, this changes the incentives of the state, which previously would have prioritized major markets and the largest of the minor markets. Now, it has a strict incentive to avoid entering the largest of the minor markets because the religious school prioritizes those markets if it sees  $s$  in them.

**Proof.** Given  $\eta \geq 1$ , any religious primary school that entered a market will want to build a secondary school in the same market. The value of major markets and minor markets without  $s$  will increase, as the school now builds both a primary and a secondary school there (for the price of 2). Since  $v_r^h > v_r$ , both of these markets will have value  $(2 + 2\eta)\sqrt{v_r}$ . As for a minor market with school  $s$ , the primary attendance there is equal to

$$\frac{1}{2} \left( J + \sqrt{v_r} - \frac{v_s - v_r}{J - \sqrt{v_r}} \right).$$

Note that the market is split exhaustively between the state and religious primary schools. Hence, when  $r$  builds a secondary school in it, it can take some of the state school's graduates and enroll them. Assuming  $J > 2\sqrt{v_r^h}$ , this makes secondary

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<sup>8</sup>Here, recall that we assume  $x_r^h = J - \sqrt{x_r^h}$ . Formally,  $x_r$  must satisfy  $x_r \geq x_r^h - \sqrt{v_r^h} = J - 2\sqrt{v_r^h}$  in order to minimize enrollment losses at the secondary level.

attendance in such a market equal to  $2\eta\sqrt{v_r^h}$ . This makes a minor market of size  $J$  with school  $s$  have a combined value for school  $r$  equal to

$$\frac{1}{2} \left( J + \sqrt{v_r} - \frac{v_s - v_r}{J - \sqrt{v_r}} \right) + 2\eta\sqrt{v_r^h}.$$

Note that for some parameters, this may be larger than  $2(1 + \eta)\sqrt{v_r}$ . For instance, if  $J$  is sufficiently close to the cutoff between major and minor markets ( $2\sqrt{v_r} + \sqrt{v_s}$ ), then the value of the market is close to

$$2\sqrt{v_r} + 2\eta\sqrt{v_r^h},$$

which is larger than  $(2 + 2\eta)\sqrt{v_r}$ .

Another case to consider is that of major markets with school  $s$ . If  $J$  of that market is low enough, it is possible for a secondary religious school to get some graduates from the state primary school. For this, we need  $J - 2\sqrt{v_r^h} < \sqrt{v_s}$  to hold, i.e.  $J < 2\sqrt{v_r^h} + \sqrt{v_s}$ . The value of building a primary and a secondary school in such market is

$$(2 + 2\eta)\sqrt{v_r} + \eta \left( 2\sqrt{v_r^h} + \sqrt{v_s} - J \right).$$

This is clearly better than any market without school  $s$ , so school  $r$  will prioritize these markets in addition to minor markets with  $s$ . Note that this value is decreasing in  $J$ , so the school ranks a market higher when it is closer in size to  $J = 2\sqrt{v_r} + \sqrt{v_s}$ , the separating cutoff between major and minor markets.

How does the school comparatively rank major markets with  $s$  and minor markets with  $s$ ? Consider a minor market with  $J = J_m$  and a major market with  $J = J_M$ , both with a primary state school. School  $r$  values the major market higher than the

minor market if and only if

$$\begin{aligned} \frac{1}{2} \left( J_m + \sqrt{v_r} - \frac{v_s - v_r}{J_m - \sqrt{v_r}} \right) + 2\eta\sqrt{v_r^h} &< (2 + 2\eta)\sqrt{v_r} + \eta \left( 2\sqrt{v_r^h} + \sqrt{v_s} - J_M \right) \\ \frac{1}{2} \left( J_m + \sqrt{v_r} - \frac{v_s - v_r}{J_m - \sqrt{v_r}} \right) &< 2\sqrt{v_r} - \eta (J_M - 2\sqrt{v_r} - \sqrt{v_s}) \end{aligned}$$

The comparison on  $J_M$  and  $J_m$  is not clear. However, it is possible for this inequality to go either way. For example, when  $J_m$  is very close to  $2\sqrt{v_r} + \sqrt{v_s}$  while  $J_M$  is not, the minor market is better than the major. When  $J_M$  is close to the cutoff instead, the major market is better than the minor. If school  $r$  has enough budget to fill both of these types of markets with primary and secondary school, it will do that. Otherwise, it will go through both lists and sequentially choose the best option out of the two.

Here is a formal summary of school  $r$ 's optimal order of building.

**Lemma 4.** *School  $r$  will both build a primary and a secondary school in the following order of priority:*

1. *Minor markets with school  $s$  that satisfy*

$$\frac{1}{2} \left( J + \sqrt{v_r} - \frac{v_s - v_r}{J - \sqrt{v_r}} \right) + 2\eta\sqrt{v_r^h} > (2 + 2\eta)\sqrt{v_r},$$

*in the descending order of  $J$ , as well as major markets with school  $s$  that satisfy*

$$J < 2\sqrt{v_r^h} + \sqrt{v_s}$$

*in the ascending order of  $J$ .*

2. *Major markets without  $s$ , minor markets without  $s$ , and major markets with  $s$  that satisfy  $J \geq 2\sqrt{v_r^h} + \sqrt{v_s}$ .*

3. *Minor markets with  $s$  that satisfy*

$$\frac{1}{2} \left( J + \sqrt{v_r} - \frac{v_s - v_r}{J - \sqrt{v_r}} \right) + 2\eta\sqrt{v_r^h} \leq (2 + 2\eta)\sqrt{v_r}.$$

In the first step, if the school has to pick and choose due to low budget, it will arrange the minor markets in descending order of  $J$  and the major markets in as-

cending order of  $J$ , and then compare the top options of both lists. As shown above, this formally corresponds to comparing

$$\frac{1}{2} \left( J_m + \sqrt{v_r} - \frac{v_s - v_r}{J_m - \sqrt{v_r}} \right) \quad \text{and} \quad 2\sqrt{v_r} - \eta (J_M - 2\sqrt{v_r} - \sqrt{v_s}).$$

Lemma 4 impacts the choice of primary curriculum for  $r$ . Recall that we assume  $x_r^h = J - \sqrt{v_r^h}$ . When  $r$  expects to build a secondary school in the same market as a primary school, the primary curriculum cannot be too low (in order to maximize secondary enrollment. Specifically,  $x_r$  should satisfy

$$x_r \geq x_r^h - \sqrt{v_r^h} = J - 2\sqrt{v_r^h}.$$

If this does not hold,  $r$  will be losing some of its least religious primary graduates when it comes to the secondary enrollment. This changes the analysis in Stage 3 of the baseline model as follows:

- In markets of type (2) (without  $s$ ),  $r$  must pick  $x_r \in [\max\{\sqrt{v_r}, J - 2\sqrt{v_r^h}\}, J - \sqrt{v_r}]$ , as opposed to  $[\sqrt{v_r}, J - \sqrt{v_r}]$ . This potentially shifts the set of optimal curricula upwards (in a weak sense), since the lower bound of the set may increase from  $\sqrt{v_r}$  to  $J - 2\sqrt{v_r^h}$ , provided that  $J$  is large enough.
- In major markets of type (3) (with  $s$ ),  $r$  must pick  $x_r \in [\max\{\sqrt{v_s} + \sqrt{v_r}, J - 2\sqrt{v_r^h}\}, J - \sqrt{v_r}]$ . Once again, the set of optimal curricula weakly shifts upwards as its lower bound may increase from  $\sqrt{v_s} + \sqrt{v_r}$  to  $J - 2\sqrt{v_r^h}$ , provided that  $J$  is large enough.
- In minor markets of type (3) (with  $s$ ), there is no change. The optimal primary curriculum is still  $x_r = J - \sqrt{v_r}$ .

Interestingly, Lemma 4 changes the incentives of school  $s$ . Previously, it would prioritize entering major markets and the largest of the minor markets first. Now, it

has a strict incentive to avoid entering the largest of the minor markets because the religious school is going to prioritize entering those if it sees  $s$  in them. Instead, it will prioritize markets in the following order.

**Lemma 5.** *School  $s$  will build its primary schools in the following order of priority:*

1. *Major markets, as well as minor markets that do not satisfy*

$$\frac{1}{2} \left( J + \sqrt{v_r} - \frac{v_s - v_r}{J - \sqrt{v_r}} \right) + 2\eta\sqrt{v_r^h} \leq (2 + 2\eta)\sqrt{v_r},$$

*in any order.*

2. *Minor markets that satisfy this condition, in the descending order of size.*

Thus,  $s$  first prioritizes major markets and the smaller of the minor markets, and only then it goes back to the largest minor markets, if it has leftover budget.

Note that if the schools share any market, it again must be the largest of the minor markets. The exact number of shared markets depends on budget  $S$  first and foremost, and on budget  $R$  next.

Let  $m_{cond}$  be the number of minor markets that satisfy the condition

$$\frac{1}{2} \left( J + \sqrt{v_r} - \frac{v_s - v_r}{J - \sqrt{v_r}} \right) + 2\eta\sqrt{v_r^h} > (2 + 2\eta)\sqrt{v_r}.$$

The next lemma details the number of minor markets that  $r$  and  $s$  will share and compete in. Note that it is possible for the schools to share major markets without competing, i.e. impacting each other's attendance.

**Lemma 6.** *Schools  $s$  and  $r$  do not share any minor markets if  $S \leq N - m_{cond}$ . Otherwise, the schools share the number of the largest minor markets equal to*

$$\min \left\{ m_{cond}; S - N + m_{cond}; \frac{1}{2}R \right\}.$$

To understand this lemma, note that if  $S$  exceeds the number of markets that are not minor markets satisfying the condition above, it means that  $s$  will enter  $S - N + m_{cond}$  or  $m_{cond}$  of those markets, whichever is lower. That is also the exact

number of markets  $s$  and  $r$  will share, unless  $r$  does not have the budget to fill them all with a primary and a secondary school (which would happen if  $\frac{1}{2}R$  is smaller).

### C.3 Oral History Accounts of School Construction in the 1970s

We conducted qualitative field visits to better understand the contexts, institutions, and history of local education markets at the time of SD INPRES, purposively focusing on the Islamic sector’s response to the program. In total, we reconstructed from local interviews the histories of 9 SD INPRES schools, 33 elementary *madrassa* (MI), 14 junior secondary *madrassa* (MTs), 4 senior secondary *madrassa* (MA), 4 boarding schools (*pesantren*), and 6 Qur’anic afternoon (*madrassa diniyah*) established in 1973 or later. This appendix provides further background on these oral history accounts.

#### C.3.1 Setup

**Site Selection.** We selected the location for our qualitative interviews using the following considerations: (i) the historical importance of Islamic schooling in the area, and (ii) *madrassa* and SD INPRES construction activities between 1973–80. Our field locations included the districts of Sijunjung in West Sumatra province and Lamongan and Gresik in East Java province.

We selected West Sumatra based on a review of the secondary literature in Indonesian, Dutch, and English. Historical accounts of Islamic education in Indonesia highlight its deep roots in the region, reflecting its history as one of the first areas to be Islamized due to early contacts with Muslim traders from the Arabic Peninsula and India. Steenbrink (1986) noted that Adabiyah School, the first “modern” *madrassa* in Indonesia, was built in 1907 in Padang Panjang, West Sumatra. In addition, village-level data recorded as many as 51 SD INPRES schools in the district. Interviews were conducted in Fall 2021.

On the other hand, Lamongan in East Java stands out as one of the districts with the most *madrassa* constructions between 1973–80. In this period, Lamongan

experienced the most constructions of Islamic junior secondary (MTs), the third-most of Islamic senior secondary (MA), as well as substantial numbers of Islamic elementary (MI) constructions (18 MTs, 7 MA, 87 MI). As a result, Lamongan had 0.39 more *madrassa* (across all levels) constructed per 1,000 children than the median district (0.32 more MI, 0.06 more MTs and 0.02 more MA). Interviews were conducted in Lamongan and neighboring Gresik district between October-November 2021.

**Respondent Selection.** We targeted respondents using snowball sampling. We instructed our local assistants to identify the following individuals for possible interviews: SD INPRES teachers or principals when the school was first established, *madrassa* teachers or principals at time of establishment, or community leaders (including village heads and subdistrict heads) who were in office during the construction period. Reaching the original *madrassa* founders typically required several interactions with intermediaries. Respondents were 69 years old on average.

### C.3.2 Key Lessons

**1. SD INPRES and *Madrassa* Compete on Location and Content.** The first finding from our oral histories was that SD INPRES and elementary *madrassa* built between 1973–80 tend to operate in close geographical proximity to each other. Several villages had both types of schools constructed less than one kilometer apart from each other; occasionally the two schools were a few dozen meters apart. Constructions of new elementary *madrassa* tended to closely track the timing of SD INPRES construction.

One of the SD INPRES schools we located was described as having been strongly opposed by local religious leaders, who would frequently mention it during Friday prayers and subsequently mobilized the community to build a MTs. In this case, the SD INPRES itself competed back by providing free uniforms to students. One

striking anecdote mentioned to us was that religious leaders would often refer to SDN (*Sekolah Dasar Negeri*, i.e., public primary school) as “schools in hell”, using a wordplay on the Indonesian acronym. Finally, we recorded instances of (i) failed attempts to merge the SD INPRES with the local MI, after pushback from local chapters of large Islamic organizations (*Nahdlatul Ulama* (NU) and *Muhammadiyah*), and (ii) cheating in national exams orchestrated by SD INPRES and MI instructors as part of the ongoing competition between both types of schools.

Neighboring SD INPRES and elementary *madrassa* also competed on the content and organization of schooling. A local religious leader (known colloquially as *kiai*) who established an MI openly declared competition with the new SD. The *kiai* “*already had many students, the children in the neighborhood all went there. But when the SD was built he reacted like that. He felt the competition, because his school is located close with the SD.*” In that same village, the SD INPRES initially had high enrollment, but this enrollment dwindled—by the mid 1990s, the school only had six pupils left. “*The reason was that over time the community felt that the portion of religious teaching in the SD was inadequate for the children.*” In this and other cases, combining formal education in the state (SD) school with Islamic teachings in the early morning or the late afternoon was a solution adopted by many families: “*the elders and youths of the village discussed this and agreed to hold extra religious classes prior to the normal school day. The school day was made to start at 5:30am so they could have extra religious classes before normal school started at 7 am.*” The *kiai* “*then built a kindergarten in the village, with the hope that the kindergarten graduates go to MI, not the SD INPRES.*”

Competition to attract students transitioning across instruction levels was also salient in our interviews. In one instance, an SD INPRES instructor affiliated with NU encouraged all SD INPRES graduates to transition into the local MTs. Most

MI graduates chose to continue their education in the nearest MTs, especially when the schools were run by NU or *Muhammadiyah*. While others chose to transition to the nearby *pesantren*, few students were said to have chosen the nearby SMP (junior secondary public school) because “*they deemed the religious education there was lacking.*” Other *Nahdliyin* (NU-affiliated) community members reported preferring educational institutions that offer a 70% religion / 30% general curriculum mix. A respondent affiliated with an MTs stated: “*To me, the curriculum from the government rather made the religious lessons fewer, because they add the numerous general subjects. We offer Fiqh, Alquran Hadits, Aqidah Akhlak, and others. The madrasa’s curriculum is roughly balanced between religious subjects and general subjects.*”

## C.4 Data Sources and Construction

We describe here the main variables and data sources used in the paper.

### Education: Survey and Administrative Data

*Surveys.* We measure years and type of schooling using the annual National Socioeconomic Survey (*Susenas*) from 2012, 2013, 2014, 2016, 2017, and 2018. These enumerate schooling measures for all household members and also record the birth district for each, which we merge with the district-level INPRES intensity measure collected by Duflo (2001). We additionally use Islamic school attendance data from the Indonesia Family Life Survey (IFLS) in 1993, 1997, 2000, 2007, and 2014. The IFLS is too limited geographically for our econometric analysis, but we use it for descriptive purposes in Table C.14 and elsewhere in the text.

*Susenas* reports the type of education (Islamic or secular) for the final level of schooling certification (primary, junior secondary, and senior secondary) as well as the final year of schooling attended if falling between certification levels. Our measure of Islamic schooling is based on the union of these two, but results are nearly

identical when restricting to final level certified or final level attended. For example, some individuals report completing secular primary school and attending two years of Islamic junior secondary but not completing the full three years at that level. Our approach identifies this individual as having secular primary school and, separately, Islamic junior secondary school.

*Registries.* We use data from numerous administrative sources provided by the Government of Indonesia. Table C.14 used data on total non-*pesantren* enrollment in 2019 from the Ministry of Education (MEC) and Ministry of Religious Affairs (MORA) as reported at the following website: <http://apkapm.data.kemdikbud.go.id> (accessed March 22, 2020). *Pesantren* enrollment in 2019 is computed from school-level records that we scraped from the MORA portal: <https://ditpdpontren.kemenag.go.id/pbsb/> (accessed November 15, 2018). These records also indicate the district and year of establishment for each *pesantren* (see Bazzi et al., 2020, for additional details).

Data on *madrassa* come from MORA registries provided to us by MORA officials in August 2019 and January/February 2020.<sup>9</sup> These include village, district, and year of establishment for all formal *madrassa* (primary, junior secondary, and senior secondary) as well as informal *madrassa diniyah*. The latter are entirely privately-run. The former are majority private with a small fraction (around 8%) that are publicly-run by MORA. Overall, 6% of *madrassa* and 22% of *pesantren*, respectively, have missing establishment years. This missing-ness is uncorrelated with SD INPRES intensity.

Data on non-Islamic schools come from a MEC registry known by its Indonesian acronym *Dapodik*.<sup>10</sup> These data include village, district, and year of establishment

<sup>9</sup>We are grateful to the following individuals for graciously sharing these data: Dodi Irawan, Aziz Saleh, Dr. Abdullah Faqih, and Doni Wibowo.

<sup>10</sup>We are grateful to Wisnu Harto Adiwijoyo for graciously sharing these data.

for all formal schools not administered by MORA. These include 166,257 publicly-run schools and 52,888 privately-run schools. Among the latter, 10,919 schools have Islamic names, indicating that they are likely religious schools operating under the MEC instead of MORA. These schools are subject to different regulations on curriculum and also have access to other sources of state funding than the Islamic schools under MORA oversight. We distinguish secular from Islamic-named private schools in the MEC data by identifying the latter as having any of the following terms appearing in the school name: Islam, Darussalam, Darul, Muhammada, Salam, Sunna, Kuran, Jihad, Umma, Madrasa Halal, or Imam. We use this distinction to examine private secular schools in Appendix Figure C-2.

In addition to the main district-level data constructed from the above registries, we also built a village-level panel. We use the 2018 *Podes* dataset listing all villages in Indonesia as the master. We match this database by successively using a fuzzy merge with the *Dapodik*, MORA *madrasa*, MORA *diniyah*, and *pesantren* data. The *Dapodik* and MORA *madrasa* data record the village name where the school is located, while the *diniyah* and *pesantren* datasets have address fields to identify the location of each establishment. The fuzzy merge uses province code, district name, subdistrict name, and village name with a high matching score threshold (0.95) and required match on province code and district name. We were able to match 80% of villages in *Dapodik* and 84% of villages in MORA *madrasa* data. For *diniyah* and *pesantren*, we use village names extracted from its full address after pre-processing the address string with extensive regular expressions. We are able to match 62% of villages in the *diniyah* dataset and 66% of villages in the *pesantren* dataset.

We measure curriculum content at the school–grade level using data from the Sistem Informasi Aplikasi Pendidikan (SIAP) registry of schools. We scraped data from this registry’s online portal over several months in Fall 2019: <http://siap-sekolah>.

com/. As of April 2020, SIAP only included detailed curriculum timetables for *madrasa*. We link these *madrasa* to the MORA registry using school IDs reported in both sources. The SIAP report detailed course timetables for every hour of every schoolday in a typical week for the 2018–2019 academic year. There are over 3,000 distinct course titles with many being (spelling) variations on the same topic. We coded up each course as being Islamic or non-Islamic and also identified courses associated with civic education and *Pancasila*, which are known by their Indonesian acronym of PPKN. These course codings are available upon request. SIAP includes data for around one-fifth of all *madrasa*, but as noted in footnote 21, this selective reporting likely works against our core findings with respect to INPRES intensity.

We measure test scores using data collected by the MEC on the national exam scores in 2014 for science and math. We scraped these data in March 2015 from the MEC portal: <http://referensi.data.kemdikbud.go.id>. We link these data to the *Dapodik* and MORA registries using school IDs available across datasets.

### **Electoral Outcomes: Vote Shares and Legislative Candidates**

*Vote Shares.* First, we draw upon district-level vote shares by party from the national legislative elections in 1971, 1977, 1982, 1987, 1992, 1999, 2004, and 2009. These data were graciously shared with us by individuals that worked with Dwight King. In 1971, one observes the following Islamic parties: NU, PSII, Perti, and the Muslim Party of Indonesia (*Partai Muslimin Indonesia* or Parmusi). From 1977 to 1992, the only Islamic party was the United Development Party (*Partai Persatuan Pembangunan* or PPP), which was forged out of a forced merger of the four Islamic parties contesting the 1971 election. We study the vote shares for the PPP and the Suharto regime party, *Golkar*.

*Legislative Candidates.* We use data on the universe of legislative candidates in the

2019 election. Thanks to Nicholas Kuipers for scraping and sharing these data from the Indonesian Electoral Commission: <http://www.kpu.go.id/>. These include candidates for national, provincial, and district legislatures. We use information on candidate age, district, and party ticket. We also categorize their campaign motivation and platform statements as appealing to Islamic themes as reflected in the following words: *umma*, *dawah*, Muslim, Islam, *sharia*, and jihad. We separately classify appeals to nation building as reflected in the following words: *Pancasila*, Indonesia, NKRI, *bangsa* (nation), *bhinneka* (diversity), and *satuan* (unitary). The latter three terms are staples in the nation-building corpus of Indonesian leaders and literature. NKRI is an acronym for the Indonesian homeland in a popular nationalistic slogan.

### **Linguistic Proxies for Identity**

We proxy for national identity using an indicator of whether an individual speaks the national language, *Bahasa Indonesia*, as his/her main language at home (instead of his/her native ethnic language). This is distinct from Indonesian speaking ability, which we also observe. These data—along with religion, age, and district of birth—are recorded in the complete-count 2010 Population Census, which we obtained from the Harvard Library.

We view Arabic language proficiency as one indicator of Islamic identity. The *Susenans* data described above record literacy in Latin, Arabic, and other alphabets.

### **Religiosity and Religious Political Preferences**

We use rich individual-level survey data from Pepinsky, Liddle, and Mujani (2018), which is based on a 2008 survey conducted by the authors in which 10 individuals were sampled from each contemporary district. These data include individual age, religion, years and type of education, a host of questions on Islamic piety, practice, and political preferences. Seven Islamic practices are explored in Table 3.9. The survey

also record dimensions of support for Islamic law (*sharia*) and religious politics more generally. We also use a measure of stated support for *Pancasila*.

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# CURRICULUM VITAE

