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Norms, Culture and Local Infrastructure: Evidence from Indonesia

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**Abstract:** The present paper explores the role of religious and social norms on a community's access to public infrastructure. Distinguishing between social and physical infrastructure, we argue that investment in social infrastructural goods (e.g., health, education) could contribute to exchange both within and outside the community, while that in physical infrastructure (e.g., road, transport, communications) could only improve exchange outside the community. Accordingly, traditional communities may prefer to invest in social infrastructure goods at the cost of physical infrastructure goods in an attempt to preserve their indigenous identity. Using three rounds of Indonesian family life survey data, we find some support to this central hypothesis, even after controlling for all other possible covariates.

Keywords: Pluralistic society; Religious and social norms; Traditional Islamic communities; Threat of modernisation; Social and Physical infrastructure; Community development; Indonesia.

JEL code: D02, H41, O43, P51

# Norms, Culture and Local Infrastructure: Evidence from Indonesia

## 1. INTRODUCTION

In recent years there has been a renewed interest to analyse whether the varied economic paths of different societies over time can be traced to differences in culture, customs, social norms and religion (e.g., see Guiso, Sapienza and Zingales, 2006). The present paper integrates this literature with the standard literature on public goods to explore the role of religious and social norms, if any, on the provision of local public infrastructure in Indonesia.

While there has been a growing political economy literature on the provision of local public goods in many developing and transition countries, the role of culture in this respect remains virtually unexplored. The recent development experience from around the world has however highlighted the role of diverse social customs/beliefs/norms on economic development (e.g., see Platteau 2000). We argue that the inclusion of culture is particularly relevant for the provision of local public goods and infrastructure, where community preferences and community actions feature prominently.

Standard models of collective action argue that the provision of public goods depends on group size and group effort subject to free-riding on others' efforts. Ethnic diversity may also affect provision of public goods; the relationship could be attributed to taste differences of different sections of the population (Alesina, Baqir and Easterly, 1999), unequal distribution of the benefits from public goods (Khwaja, 2000) and/or

inability to impose social sanctions in ethnically diverse communities (e.g., Miguel and Gugerty, 2005), thus leading to failures in collective actions.

Others have highlighted the importance of various political economy considerations on the provision of local public goods in many decentralised economies. While decentralisation may increase the accountability of elected representatives and strengthen the voice of the poor and the marginalised, it may also enhance the influence of local elite (Bardhan and Mukherjee, 2000). Second, some studies have emphasized the role of legislator identity including reservation of seats for female (Duflo and Chattopadhyay, 2002) or low castes (Pande 2003) in India.

Our analysis highlights the role of social and religious norms in the provision of public infrastructure in Indonesia. Some social norms could provide an effective solution to the problem of social organisation while others could be harmful. For example, Grief (1994) highlights the merits of individualist cultural beliefs for the formation of efficient agency relations in the context of medieval merchants. Putnam (1993) attributes the greater success of modern political institutions in northern Italy to the pre-existence of a strong civic culture. Bowles and Gintis (2004) argue how the ethnically linked parochial groups could achieve high levels of cooperation in informal contracts while engaging in exclusionary practices. Aspects of religion too can complement/motivate development while it can also obstruct/undermine it in most complex ways. Religious people and institutions may be agents of advocacy, funding innovation, empowerment, social movement and service delivery. Equally, religious people and institutions can incite violence, model hierarchy, oppose empowerment, deflect advocacy, absorb funding and cast aspersions on service delivery. People may find it easier to trust those who have faith

in the same norms (religious/social). Religious and social norms could thus affect trust, which in turn may affect the optimal investment in social capital and also a community's choice of local public goods.

Indonesia is an important case in point. Indonesians are grappling with the problems of living in a world of differing ideas of norms and justice. On the one hand, there are longstanding efforts to shape lives in an Islamic way; on the other hand, there are even longer standing and diverse efforts to share them according to complex local norms and tradition called *adat*. All these efforts are further complicated by the nation's attempt to impose modern state laws and decrees in the post-independent period with a view to remove local injustice.

There are about 500 communities speaking more than 600 languages in Indonesia. Its pluralistic identity gives rise to a coexistence of traditional Adat laws, Islamic Sharia laws and positive laws of the modern state. Literally 'adat community' translates to 'autonomous' groups of indigenous people who are able to manage their lives without knowing western laws and established their own regulations and social control. There has also been a historical division between 'traditional' and 'modern' Islamic values/practices in Indonesia; this distinguishes 'Muslim modernists', who seek to reform Indonesia, from the traditional ones. While the traditional Islamic practices lean on Sharia laws, Muslim modernists have focused more on the positive laws of the state. Suharto's New Order Period (from late 1970s onwards) witnessed efforts to undermine the ethnic identities of traditional adat communities with a view to promote the integration of the nation and modernise the state. This has been implemented through policies and programmes, e.g., significant changes in property rights in land and other natural resources. Even though the

state did not formally own all of the free land, the notion of state controlled land was highlighted during this period. State resumed exclusive authority over any territories classified as the forest area including all aspects of human activities within it. These changes came as a threat to the traditional adat communities, who lived on land and natural resources for generations and maintained their autonomous culture, including aspects of language, belief, production patterns, law and social institutions.

Trust and social capital within a close-knit ethnic group, e.g., adat communities, may give rise to feelings of loyalty and norms of solidarity to protect their traditional identity/livelihood, especially in response to a common perception of threat (e.g., that arising from Suharto's attempt for national integration). Inclusion of social and religious norms could thus help reconciling conflicting preferences for public goods within a traditional community. We particularly distinguish between social (health and education) and physical (utility, transport, communications) public infrastructural goods. While investment in social infrastructural goods like health and education can directly improve skills and productivity of community people, thus facilitating production/exchange in the community, investment in physical infrastructure like transport and communications improve trade with outside communities only, thus threatening the basis of adat livelihoods, traditionally linked to land and natural resources. Accordingly, one could argue that traditional adat communities could rationally encourage investment in social infrastructure at the cost of that in public physical infrastructural goods (in an attempt to preserve their traditional identity). This is our central hypothesis.

It is now well-established that access to public infrastructure is central to economic growth. Neglect in the provision of public capital and infrastructure could

adversely affect the productivity of private capital (e.g., see Reinikka and Svensson, 2004). In addition, good governments that invest in essential public goods and services realise high rates of return (e.g., see Easterly, 2001). Analysis in this paper highlights one possible mechanism through which culture can adversely affect economic development via investment in basic infrastructural goods. Using three rounds of Indonesian Family Life Survey (IFLS) data, we classify traditional communities as those strongly adhering to adat and Islam, which in turn allows us to examine the role of culture on the provision of local public infrastructure (even after controlling for all possible factors) among communities drawn from thirteen major provinces in Indonesia.

Considering the public goods literature for Indonesia, Beard (2007) examines the effects of various household characteristics on household contribution to community development, while Bandeira and Levy (2007) focus on the role of democratic decision making on the provision of a number of public goods in Indonesia. Both these studies however use single cross-section IFLS data-set: Beard (2007) used third round of IFLS data while Banderia and Levy's (2007) analysis is based on second round IFLS 1997.[1] We use three rounds of IFLS data to construct a three-period (1993, 1997 and 2000) community-level panel data-set. Our analysis focuses on a community's access to public transport, cemented road, piped water, public telephone office, post office, banks and markets (see further discussion in section 2) that could directly reduce community disadvantages related to location and distance.[2] We also consider community's access to

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[1] There are other attempts to understand the politically economy of public goods provision in Indonesia (e.g., see Olken, 2007), which is based on author's own survey data.
[2] Our analysis however excludes access to basic health and education services as the provision of these services were not significantly different between developed and under-developed communities in our sample.

public schools (elementary, junior high and senior high) and health care (puskesmas and Posyandu) facilities. In addition to indices of religious and social norms, we also control for other conventional factors including public action and group efforts, nature of local governance as well as the characteristics of the community leader.

An analysis of our sample data highlights a significant heterogeneity in the provision of public infrastructure among sample communities. Even after controlling for all other possible factors, we find that culture plays a significant role: traditional communities strongly adhering to adat and Islamic values/practices (as opposed to modern communities with weaker adherence to traditional adat and Islamic values/practices) tend to have comparable/better access to social infrastructure (schools and health facilities), but lower access to some physical infrastructural goods like motorized transport, cemented roads, telephone office and post office, thus lending some support to our central hypothesis.

The analysis is developed as follows. Section 2 describes the data and research setting while section 3 analyses the results. The final section concludes.

## 2. DATA DESCRIPTION

The analysis has been based on the community-level data obtained from 1993, 1997 and 2000 Indonesian Family Life Survey (IFLS) from 314 rural and urban communities drawn from 13 provinces including Jakarta, Bali, Java (central, east and south), Sumatra (north, west and south), Lampung, Wntenara and south Kalimantan. This is a particularly rich data-set that provides community-level information on a whole range of

demographic characteristics, public utilities, infrastructure and transport, health and education facilities, citizen's participation in planning and implementation of local development projects. In addition, 1997 IFLS data set provides information on a community's adherence to adat and common law as well as nature of community governance (consensus building, voting, or oligarchy). Following Guiso, Sapienza and Zingales (2006), we argue that social and religious norms tend to be persistent and change only slowly, even when they are no longer efficient. Accordingly, we link 1997 adat and community governance information to 1993, 1997 and 2000 IFLS community-level data on availability of public infrastructure and community development. Also reverse causality (from infrastructure to cultural norms) is ruled out here as cultural norms are generally inherited at birth and practised over generations. Finally, exit from a community, especially traditional community, is extremely rare. Communities adhere to various punitive mechanisms to prevent some members exit to take advantage of external economic opportunities.

Starting in the 1970s and until early 1990s, the government of Indonesia had emphasized the importance of investment in infrastructural development. Several major projects were undertaken during this period, which have radically improved the availability of community-level infrastructure and public services in the country. Then the economic crisis of the 1990s had a major blow to the infrastructural investment; transport and communication output contracted by 36.44% and 15.13% respectively; road conditions deteriorated significantly due to the lack of maintenance fund. Decentralisation introduced in the new Millennium had a further adverse impact on infrastructural development though that is beyond the scope of the present study. Prior to

2000, village governments were responsible for maintaining/providing utilities (water supply, electricity), local roads and transport (road/waterways), health posts and schools in the community. They also administered various income and food transfer programmes. These programmes were primarily financed by funds from the central government.

We focus on a number of basic infrastructural goods that could directly impact on sustainable livelihoods and provide opportunities for all, especially for the poor. First, the list of physical infrastructural goods includes cemented local roads (rather than national highways), motorized public transport (public bus/boat), public telephone office (PTO), post office (PO). Since economic backwardness and poverty in the country have often been caused by remoteness and isolation, local roads and different modes of motorized transport have a crucial role for economic development and poverty alleviation. Similarly, communication goods like PO and PTO could reduce the disadvantages related to location and distance. We include two more essential infrastructural services, namely, banks and markets that could facilitate formal exchange, thus assisting the process of economic development. This would also allow us to test if the traditional communities have any aversion to formal modes of exchange (Kranton 1996). Finally, we compare the cases of physical infrastructural goods with two important social infrastructural goods, namely, community's access to public health and schooling facilities.

Table 1 summarises the sample communities' access to various local public infrastructure during the study period 1993-2000. In general there has been an improvement in the provision of a number of public goods over this period. The progress slowed down somewhat after the crisis, most notably for banks. The latter could be linked to the fact that the 1997 crisis started in the financial and banking sector though it quickly

spilled over to the real sector. Despite the crisis, there has been impressive development in transport and communications in general.

Significant inter-community dispersion in our sample is pronounced. Inpres Deas Tertingadl (IDT) was the primary antipoverty programme in the country and was targeted to the poorest communities. Without any loss of generality, we use this information to classify sample communities as 'underdeveloped' if the community was selected for the implementation of IDT programmes; the rest of the communities are labelled 'developed'. Table 2 summarises mean differences in the provision of a range of basic infrastructural goods between under-developed and developed communities in our pooled sample. Despite significant infrastructural improvement in the 1970s and 1980s, access to motorized transport, cemented road, telephone office, post office, is significantly lower in the under-developed communities in the 1990s.[3] However the difference is not statistically significant in case of access to government schools (elementary, junior and senior schools) and health facilities (government health centres, puskesmas and community health posts, posyandu), thus revealing traditional community's preference for the latter .

## 2.1. Social and religious norms

Literally 'adat community' translates to 'autonomous' groups of indigenous people who are able to manage their lives without knowing western laws and established their own regulations and social control. Adat laws are formally mapped by Dutch legal scholars to provide the basis for the legal system to rule over the indigenous Indonesians, with few

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[3] Note that the electricity coverage is very high (above 90%) in both developed and under-developed communities in our sample; consequently, we exclude access to electricity from our analysis.

exceptions to protect Dutch commercial interests involving transactions between Indonesians and Europeans. Accordingly the Dutch Colonial rule recognised village government as lawful entities and encouraged to self-rule. In modern Indonesia, however, the autonomy of the adat communities has not always been officially recognised, especially during Suharto's New Order Period (1978 onwards).

The 1998 reform that led to the fall of Suharto's regime was however an important moment when the autonomy of adat communities was officially recognised. The latter found an expression in the formation of AMAN which is an alliance for the Indonesian indigenous people. AMAN defined adat community to be a community living together based on their origins intergenerationally in adat land, who have sovereignty over the land and the natural resources, their socio-cultural life being regulated by adat law and adat institutions, which manage sustainability of community lives.

Religious norms too could play an important role in community development. In the Indonesian case there remains a historical division between 'traditional' and 'modern' Islamic values/practices. Nahdlatur Ulama (NU) has been the world's largest Muslim organisation founded by Javanese Muslim scholars in 1926. It had soon distinguished itself as a force for the promotion of 'traditional' Sunni Islamic values/though/practices across the regions, distinguishing them from 'Muslim modernists', who sought to reform Indonesia. NU has, however, significant contribution to promote various social infrastructure including religious education, women's empowerment, family planning and reproductive health across the country.

### 2.1.1. Community classification

Our analysis classifies communities according to a community's adherence to (a) social

norms and (b) religious norms. Depending on the degree of adherence to adat laws, IFLS data classifies a community into 4 categories: (i) traditional laws are almost never broken; (ii) sometimes traditional laws are broken; (iii) traditional laws are frequently broken and (iv) only a few people understand traditional laws. We use this information to classify a community as 'adat' community (a binary variable labelled ADAT) if adat laws are almost never broken; the variable takes a value zero otherwise. Second, IFLS data also provides information on the main religion practised in a community; thus a community is classified to be an Islamic community (a second binary variable labelled ISLAM) if Islam is the main religion. Given that Indonesia is an Islamic country, it is also important for us to identify the 'traditional Islamic communities' from the rest. In the absence of any direct information in this respect, we use the religion information ISLAM in conjunction with the ADAT information. This is done by creating a composite index of ISLAM and ADAT using principal component method and labelled as PCNORM. About 28% of all communities strongly adhere to adat while as high as 86% of these adat communities had Islam as the main religion. We thus define Islamic adat communities as 'traditional Islamic' communities to distinguish them from others labelled as 'modern Islamic' communities. In the absence of any existing empirical evidence in this respect, the effect of social and religious norms on public infrastructure remains a matter of empirical scrutiny that we explore in the paper.

## 2.1.2. Sample characteristics

Demographic dimensions of adat communities in our sample are worth noting (Table 2).

In general, adat communities tend to be strongly ethnically linked and predominantly rural. Often these communities are dominated by a single large ethnic population group while the average population size is significantly smaller than the non-adat communities. Also the proportion of university educated population tends to be much less in adat communities though the difference is significant only at about 10% level. Role of education could be important in influencing culture, as education can reduce the role of inherited cultural aspects in the formation of priors. Guiso, Sapienza and Zingales (2004) have shown the dependence of trust (and thus prior belief) on cultural variables weakens for more educated people. It clearly follows from Table 2 that compared to non-traditional communities, traditional communities have significantly lower access to selected physical infrastructural goods; similar differences are mirrored in the comparison of developed and under-developed communities in our sample. The case of social infrastructure is however different for both cases: number of government schools is significantly higher in traditional communities while number of health facilities is not statistically different between traditional and modern communities. Similar result holds when we consider share of government schools (as proportion of total schools) and health facilities (as proportion of total health facilities). Our analysis in the rest of the paper investigates if this preliminary result holds, even after controlling for all other possible covariates.

There is also significant variation in average community characteristics across the provinces. Table 3 shows the summary statistics for the selected community characteristics across the sample provinces. In general, provinces with higher average population per community, higher proportion of university educated population and lower

proportion of strongly adat communities tend to have better provision of all types of public infrastructural goods under consideration; these better off provinces also tend to have relatively lower proportion of under-developed communities. For example, the average community size is much bigger in Jakarta while influence of adat laws is rather negligible in the province; Jakarta is also the province with the lowest proportion of underdeveloped communities in the country, as against those in Bali or Wntenara, for example.

## 2.2. Other Possible Covariates

In addition to social and religious norms, we identify three sets of possible factors influencing a community's access to public infrastructure. Choice of these factors has been guided by the existing literature. These are (a) collective action and its sustainability, (b) nature of local governance and (c) characteristics of the community leader.

### 2.2.1. Collective action

We consider population size of the community as an index of group effort (or collective action). It is also important to consider the factors that could enhance the long-term sustainability of public action in a community. To this end, we include the proportion of university educated population since a higher proportion of university educated population could arguably contribute to the sustainability of group efforts for essential community causes. In order to check the robustness of our results we also control for the average proportion of household members with at least junior high schooling and average

community level mean monthly expenditure (both food and non-food taken together) in alternative specifications (see further discussion in section 3.2).

### 2.2.2. Nature of local governance

Prior to decentralisation of the new Millennium, local governments were responsible for maintaining/providing utilities, local transport, health posts and schools in the community, primarily with funds from the central government. Decision making regarding the allocation of funds could be classified into two broad categories: (a) majority decision making through consensus building or voting and (b) elite dominance/oligarchy whereby local religious/legal elite or officers in local government institutions influenced the decision-making process.[4] The governance mechanism varied across the regions though as high as 73% of the communities followed some kind of majority rule. If however we classify the majority rule into voting and consensus building (e.g., through meeting with community citizens), we find that consensus building (as against voting) is a more common mode of decision making, especially in traditional communities in the sample.

### 2.2.3. Profile of the community leader

The extent of collective action in a community would also depend on the actions of the community leader. IFLS data allows us to identify the characteristics of the community leader. Community leaders are typically elected by popular votes and upon election they become members of the Indonesian Civil Service.

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[4] This is derived from a response from the community head: decision making by voting, all residents (which we label as consensus building), local elites, local institutions and others. Thus decision making by local elites, local institutions and others are labelled as decision making by oligarchy.

Given that the gender of the leader is endogenous to the choice of programme, our analysis focuses on other relevant characteristics of the leader. In particular, we consider education (i.e., if the leader has college education or more COLLEGE) and also the years in position of the community leader (if the tenure is 10 years or more).[5] As high as 97% community leaders is male in our sample. While only about 28% leaders have college or higher education; about 38% of community leaders have been in tenure for 10 years or more. We shall examine the possible role of these characteristics on the provision of public infrastructure in sample communities.

## 3. EMPIRICAL ANALYSIS

Provision of public infrastructure in a community is a reflection of community organisation and preferences, which in turn depend on a number of community characteristics. The model specification is discussed in section 3.1 while results are analysed in sections 3.2 and 3.3; estimates of access to individual infrastructural goods are discussed in section 3.2 while section 3.3 considers estimates for indices of composite community development.

### 3.1. Model specification

We use three rounds of IFLS panel data to determine a community's access to a range of public infrastructural goods and utility services. The list of dependent variables includes (a) binary variables indicating a community's access to pucca (cemented) road (PROAD),

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[5] We also considered age of the head, but did not include it as it is closely correlated to the tenure in office.

motorized public transport (TRANS), public telephone office (PTO) and post office (PO), market (MARKET) and bank (BANK). (b) In addition, we consider some indices of social infrastructure, namely, number (GOVSCH_N, GOVHLTH_N) as well as share of public schools (PGOVSCH) and public health facilities (PHLTHF) in the community. (c) We also construct a composite index of access to various public infrastructure listed in (a) above, namely, PCDEV, using principal component method. (d) Finally, we generate an index of under-development (a binary variable) as follows. If a community has been selected for the ongoing IDT programme during the sample period, we define it to be an underdeveloped community (UNDEV) and examine the probability of the community to be under-developed. Note however that there is a crucial difference between (a), (d) on the one hand and (b), (c) on the other: while indicators of public goods and underdevelopment listed in (a) and (d) are all binary in nature those in (b) and (c) are continuous variables. Accordingly, we use binary probit models for (a) and (d), while we use continuous regression models for estimating (b) and (c). In each case, we apply panel data models as explained below.

In general, we estimate an equation of the following type to determine any dependent variable $Y_{it}$ of our choice (as laid out in infrastructural indicators (a)-(d) above) in the i-th community at t-th time:

$$Y_{it} = \beta'X_{it} + \alpha_i + u_{it} \qquad (1)$$

where i refers to the i-th community, i = 1,2,.....,314 and t to the time dimension of the data, t = 1993, 1997 and 2000. $\alpha_i$ is the unobserved community-level fixed-effects (that does not change over time) whereas $u_{it}$ is the idiosyncratic error (assumed to be distributed with zero mean and unit variance) that varies across community (i) and also

over time (t). In other words, $\alpha_i$ accounts for the unobserved time-invariant community-level factors, e.g., government funding, external influences or administrator's preferences, affecting the provision of the particular public infrastructure in question.

$X_{it}$ is the set of explanatory variables reflecting four sets of factors: (i) group size and its sustainability; (ii) characteristics of the community leader; (iii) measures of community governance; (iv) indices of social and religious norms. As indicator of group effort, we include the community size measured by the log of community population (LVPOP). Sustainability of group effort over time is accounted for by the proportion of university educated population (PUED). We also include a binary variable POP11 indicating whether the population of the largest ethnic group is greater than or equal to 90%; this is used as an index of ethnic diversity, as ethnic diversity is an important determinant of public goods provision.[6] Second, we include some characteristics of the community leader, namely, education (if has college education or more, COLLEGE) and also if the head is in position for ten years or more (TENURE10). We do not include age of the community leader as it seems to be closely correlated with tenure in office. Third, we include two indices of local governance: if the community adheres to decision making by consensus building (DMMEET) and that by voting (DMVOTE); the reference category here is oligarchic decision making. Finally, we have two binary variables indicating a community's strong adherence to traditional adat laws (ADAT), and if Islam is the main religion (ISLAM). We generate a composite index of ADAT and ISLAM (called PCNORM) using principal component analysis. Since one is born into a given culture and cannot choose his/her parents' religion and cultural beliefs, the question of

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[6] We also experimented with a measure of ethnic heterogeneity $1-\sum p_i^2$ where $p_i$ is the population proportion of different ethnic groups in the population. However this index was never significant in any specification.

reverse causality (from public goods to cultural norms) does not apply here. Finally we include a dummy for the post-crisis year 2000 (which also marks the end of Suharto regime and a change towards more decentralised community governance); a second dummy is included to indicate whether it is a rural community as rural communities are more likely to be underdeveloped as well as more traditional (see Table 2). A third dummy indicates a community's nearness to sea. Table 4 shows the means and standard deviations of all the regression variables used in our analysis.

For each dependent variable of our choice, we try three specifications: (1) we start with conventional covariates (i) and (ii); (2) we augment specification (1) by covariates (iii); (3) is the complete specification, where we augment (2) by the cultural covariates (iv), directly linked to our central hypothesis.

Probit model does not lend itself well to the fixed effects treatment. Hence, for cases in (a) and (d), we first determine logit fixed effects models.[7] The latter allows for the possibility that some $x_i$s could be correlated with fixed effects $\alpha_i$s. In an attempt to check the robustness of fixed effects estimates, we also compare the fixed effects estimates with more general random effects estimates (which also allow us to include the time invariant factors). The underlying assumptions for the random effects are that $X_{it}$'s are purely exogenous and $\alpha_i$'s are uncorrelated with $X_{it}$s so the total estimation error is $v_{it}$ = $(\alpha_i + u_{it})$. Thus the variance of $v_{it} = 1+\sigma^2_\alpha$ where $\sigma^2_\alpha$ is the variance of $\alpha_i$; also, covariance of $(v_{it,} v_{is}) = \rho$ so that $\sigma^2_\alpha = \rho/(1-\rho)$. We obtain the consistent estimates of all the parameters including $\rho$.

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[7] Note however that the social norms and governance variables are time-invariant in our data. So when we consider the fixed effects estimates, these variables are naturally dropped.

For each of the selected public infrastructure, it is therefore important for us to choose between fixed and random effects models. We use Hausman test for estimating continuous dependent variables as in (b) and (c), while a variant of the Lagrange Multiplier (LM) test when the dependent variable is binary in nature (i.e., cases (a) and (d)). The null hypothesis for the Hausman test is that $\alpha_i$ is uncorrelated; in other words, acceptance of the null implies acceptance of random effects. The LM test boils down to a test of significance of $\rho$. Rejection of the null hypothesis that $\rho=0$ leads to an acceptance of the alternative hypothesis in favour of the random effects estimates (see Tables 5-8). In each case, we also estimate the corresponding pooled OLS estimates as the baseline model (see Appendix Tables A1-A3).

## 3.2. Estimates of individual infrastructural goods

Given that the parameter $\rho$ is statistically significant, we consider the random effects estimates to be appropriate for our sample. A further advantage of these random effects estimates is that we can now directly control for the time-invariant factors (e.g., local decision making – voting and consensus building and also Adat and Islam). Estimates of access to physical infrastructure for the complete specification (3) are summarised in Table 5; Table 6 shows the corresponding estimates for access to social infrastructural goods. Estimates for the intermediate specifications (1) and (2) are shown Appendix Tables A4 and A5. Estimates are quite robust and do not change with the change of the specifications. Our discussion in the rest of the paper is couched in terms of the complete specification (3).

The size of the community population turns out to be a strong predictor for access to any public good/services considered here. There is confirmation that larger communities tend to have more access to different public infrastructure, thus highlighting the importance of group size and public action for public goods provision. Quality and sustainability of public action is important too, especially in the provision of public infrastructural goods requiring huge investment. In particular, communities with higher proportion of university educated population are more likely to get pucca road, telephone office. Some leadership characteristics could also influence a traditional community's aversion to certain public goods. In particular, ceteris paribus, a community's probability of having a public telephone office is higher if the community leader has college or higher education, while the community leader being in position for ten years or more has a significant positive effect on the likelihood of having access to pucca road. Other things being equal, there is direct evidence of the significant role of culture on the provision of local infrastructure in our sample, thus supporting our central hypothesis. Traditional Islamic adat communities (as reflected in the significance of PCNORM) are significantly less likely to have access to motorized public transport, pucca road, post office, telephone office and markets. Similar results hold even when we include individual adat and Islam variables.

In contrast, estimates shown in Table 6 highlight the contrasting role of traditionalism on access to social infrastructure. Here we present two sets of estimates: share of public school and health facilities and also actual number of public school and health facilities in the community. While traditional communities are more likely to have greater share of public schools and public health facilities in our sample, there is no

evidence that traditional communities are significantly different from others when we consider number of public schools and health facilities as such. These results hold even after accounting for all other possible covariates.

We also do some robustness checks. First we replace proportion of university educated by the proportion of family members with at least junior high schooling; results remain unchanged. We have also tried to incorporate average per capita monthly household expenditure in the community as an indicator of prosperity and the results remain unchanged. Taken together, one can argue that, holding other factors unchanged, traditional Islamic adat communities in Indonesia tend to prefer investment in social rather than physical infrastructure, as investment in social (as opposed to physical) infrastructure directly benefits its people and community.

## 3.3. Estimates of Community Development

In this section, we consider the factors determining the probability of a community being underdeveloped, using the same set of explanatory variables as in section 3.2. We first consider a composite index of access to various physical infrastructural goods obtained by using the principal component analysis of a community's access to bus, road, post office, public telephone office, bank and market. Given that it is a continuous variable, we obtain both fixed and random effects estimates. Since the Hausman statistic indicates that the random effects estimates should be preferred, our discussion focuses on the random effects estimates of composite public goods (see Table 7). These estimates suggest that traditional (Islamic and Adat) communities suffer from a lack of access to public physical infrastructure provision of composite public goods in our sample.

Finally, we determine an index of under-development, which is a binary variable indicating whether a community has been selected for the on-going IDT programme in the relevant year. If a community has been selected for IDT, it is regarded as an underdeveloped community – we use this information to construct a binary variable of under-development. Table 8 shows both the logit fixed effects and probit random effects estimates of UNDEV for all sample communities. Given that $\rho$ is significant, as before we choose the random effects estimates. Clearly these random effects estimates highlight that communities with strong adherence to adat and Islam are more likely to be underdeveloped. Other things being equal, we argue that this result has a cultural interpretation. In particular, traditional Islamic communities prefer to invest more in social infrastructure (e.g., health and education), but less on physical infrastructure that connects them with the outside world; the latter helps them maintain their indigenous way of life away from modern Muslim modernists and also by relying more on informal parochial networks within their community.

There is thus consistent evidence from our analysis that even after accounting for other factors, cultural considerations do exert a significant impact on a community's access to local social and physical infrastructure in our sample. One possible interpretation would be that religion and ethnicity could affect trust, which in turn may affect optimal investment in social capital, especially as a response to the perception of a common threat, e.g., from Muslim modernists who seek to reform Indonesia. The latter in turn may give rise to feelings of duty, respect and loyalty or as norms of solidarity and service among traditional adat communities to protect their indigenous way of life; the result could be significant investment in social infrastructure, but lower provision of

physical infrastructure including transport and communications. Analysis using three rounds of IFLS community-level data provides support to this central hypothesis.

## 4. CONCLUSION

The present paper goes beyond the existing literature to argue that local culture, i.e., religious and social norms could explain a part of the variation in the provision of public goods and infrastructure across communities within a country. Using three rounds of Indonesian family life survey data and controlling for all possible covariates, we find that traditional Islamic communities tend to have lower provision of physical infrastructural goods like pucca road, motorized transport, post office, public telephone office, while they are not significantly different from others with respect to social infrastructural goods like health and education. While social infrastructural goods could contribute to exchange within/outside the community, investment in physical infrastructural goods could only improve exchange outside the community. One could thus argue that a lower provision of physical infrastructural goods in traditional communities could highlight their attempt to preserve their indigenous way of life, especially in response to the perception of a common threat from Muslim modernists in Indonesia's pluralistic society. The latter clearly stands in the way of reducing economic backwardness and poverty which have often been caused by the remoteness and isolation in the country.

Our results also highlight the role of education and nature of community governance on the provision of physical infrastructural goods in the region. In particular, proportion of university educated population and community decision making through

consensus building, e.g., by community meetings (rather than voting) tend to have a significantly favourable effect on the probability of a community being developed. In other words, higher levels of education and mass community participation in decision making could gradually pave the way for modern development. It is thus interesting to see how the spread of education in a traditional community could gradually influence culture (e.g., Gusio, Sapienza and Zingales) and could thereby pave the way for modern economic development.

# References

Alesina, A. and E. La Farrara. 2005. Ethnic Diversity and Economic Performance', *Journal of Economic Literature* 63 pp. 762-800.

Bandeira, O. and G. Levy. 2007. 'The Diminishing Effect of Democracy in Diverse Societies', mimeo, London School of Economics, September.

Bardhan, P. and D. Mukherjee. 2002. 'Decentralisation of Governance and Development', *Journal of Economic Perspectives*, 185-205.

Beard, V. 2007. 'Household Contribution to Community Development in Indonesia', *World Development* 35(4), 607-25.

Bowles and Gintis. 2004. 'Persistent Parochialism: Trust and Exclusion in Ethnic Networks', *Journal of Economic Behaviour and Organisation* 55 pp. 1-23.

Candland, C. 2000. 'Faith as Social Capital- Religion and Community Development in South Asia', *Policy Science* (33) pp. 355-74.

Chattopadhyay, R., and E. Duflo. 2004. 'Women as Policy Makers: Evidence from a India-Wide Randomized Policy Experiment', *Econometrica*, Vol. 72, pp. 1409-1443.

Cole, H, G. Mailath and A. Postlewaite. 1992. 'Social Norms, Savings Behaviour and Growth', *Journal of Political Economy*, 100, pp. 1092-

Easterly, W. 2001. *'The Elusive Quest for Growth : Economists' Adventure and Misadventure in teh Tropics'*, MIT Press, Cambridge.

Grief, A. 1994. Cultural Beliefs and the Organization of Society: A Historical and Theoretical Reflection on Collectivist and Individualist Societies', *Journal of Political Economy* 102(5), pp. 912-50.

Guiso, Sapienza and Zingales. 2006. 'Does Culture Affect Economic Outcomes?' *Journal of Economic Perspectives*.

Kranton. 1996. 'Reciprocal Exchange: A Self-Sustaining System', *American Economic Review* 86(4) pp. 830-51.

Kuran, T. 1997. 'Islam and Underdevelopment: An Old Puzzle Revisited', *Journal of Institutional and Theoretical Economics*.

Kuran, Timur, 2001. "The Provision of Public Goods Under Islamic Law: Origins, Contributions, and Limitations of the Waqf System" (July 21, 2001). USC CLEO Research Paper No. C01-13. Available at SSRN: http://ssrn.com/abstract=276378 or DOI:10.2139/ssrn.276378.

La Porta et al. 2007. 'The economic Consequences of Legal Origin', *Journal of Economic Literature*.

Mansuri, G. and Rao. 2004. 'Community Based and Driven Development: A Critical Review', *World Bank Research Observer* 19(1) 1-39.

Narayanan and Pritchett. 1999. 'Cents and Sociability – Household Income and Social Capital in Rural Tanzania', *Economic Development and Cultural Change* 47(4) 871-98.

Olken, B. 2006. 'Corruption and the Costs of Redistribution: Micro Evidence from Indonesia', *Journal of Public Economics* 90 pp 853-70.

Olken, B. 2007. Political Institutions and Local Public Goods, mimeo, Harvard University, February.

Pande, R. 2003. 'Can Mandated Political Representation Increase Policy Influence for Disadvantaged Minorities? Theory and Evidence from India', *American Economic Review*, Vol. 93, pp. 1132-1151.

Platteau, J-P. 2000. *Institutions, Social Norms and Economic Development*, Harwood Academic Publishers.

Platteau, J-P. 2004. 'Monitoring Elite Capture in Community Driven Development', *Development and Change* 35(2) 223-46.

Platteau, J-P. 2008. 'Religion, Politics and Development – Lessons from the Lands of Islam', *Journal of Economic Behaviour and Organisation*.

Pritchett, L. S. Sumarto and A. Suryahadi. 2002. 'Targeted Programs in an Economic Crisis: Empirical Findings from the Experience of Indonesia', SMERU Working paper.

Putnam, R. 1993. *Making Democracy Work*, Princeton University Press, Princeton, NJ.

Wahhaj, Z. 2008. 'Social Norms and Individual Savings in the Context of Informal Insurance', CEDI discussion paper 08-20, Brunel University, UK.

Weber, M. 1905. *The protestant Ethic and the Spirit of Capitalism*, Routledge Classic, London, 2001.

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# Tables

**Table 1. Community's access to local public goods 1993-2000**

| Community's access to | % of total sample communities (314) | 1993 | 1997 | 2000 | Mean (sd) 1993-2000 |
|---|---|---|---|---|---|
| Public transport (BUS) | | 33.1 | 27.3 | 43.9 | 0.35 (0.48) |
| Public telephone office (PTO) | | 42.4 | 50.8 | 64.6 | 0.55 (0.66) |
| Post office (PO) | | 25.2 | 26.7 | 30 | 0.31 (0.72) |
| Pucca Road (PROAD) | | 71.3 | 79.7 | 83.3 | 0.79 (0.41) |
| Electricity (ELEX) | | 91 | 96.2 | 98.1 | 0.97 (0.22) |
| Piped water (PAM) | | 57.3 | 60.6 | 63.7 | 0.61 (0.49) |
| Market (MKT) | | 36.9 | 39.7 | 45.3 | 0.43 (0.63) |
| Bank (BANK) | | 41.9 | 40.3 | 15.4 | 0.36 (0.74) |

**Table 2. Selected community characteristics: A comparison of means**

| Variables | Community classification | | | Community classification | | |
|---|---|---|---|---|---|---|
| | Under-developed | Developed | T-stat | Traditional | Non-traditional | T-stat |
| Access to bus | 0.21 | 0.39 | -5.234** | 0.24 | 0.38 | -4.211** |
| Access to any motorized public transport | 0.68 | 0.81 | -2.955** | 0.72 | 0.82 | -2.767** |
| Access to market | 0.26 | 0.47 | -3.781** | 0.32 | 0.46 | -3.415** |
| Access to PTO | 0.30 | 0.63 | -5.233** | 0.42 | 0.59 | -3.399** |
| Access to PO | 0.19 | 0.35 | -2.296* | 0.17 | 0.36 | -4.820** |
| Access to bank | 0.23 | 0.40 | -2.484* | 0.22 | 0.41 | -4.478** |
| Access to pucca Road | 0.60 | 0.83 | -6.098** | 0.66 | 0.82 | -4.736** |
| Access to electricity | 0.92 | 0.98 | -2.474* | 0.93 | 0.98 | -2.496** |
| Access to piped water | 0.33 | 0.68 | -9.389** | 0.46 | 0.65 | -5.169** |
| number of government schools | 5.45 | 5.21 | 1.190 | 5.53 | 5.15 | 2.185* |
| number of government health facilities | 5.3 | 5.4 | -0.742 | 5.35 | 5.39 | -0.489 |
| Under-developed UNDEV | na | na | Na | 0.18 | 0.14 | 1.780* |
| Strong adherence to adat | 0.40 | 0.24 | 2.376* | 1 | 0.05 | na |
| If Islam is the main religion | 0.85 | 0.75 | 3.637** | 1 | 0.70 | na |
| Largest population group >90% of total population | 0.97 | 0.82 | 4.576** | 0.91 | 0.78 | 10.411** |
| Proportion of university educated population | 0.05 | 0.25 | -1.650 | 0.08 | 0.26 | -1.470 |
| Population (number) | 5952 | 11018 | -7.385** | 7040 | 11000 | -5.357** |
| Rural | 0.68 | 0.38 | 7.672** | 0.61 | 0.39 | 6.136** |

Note: Number in each indicates the proportion of total sample communities except population. Share of government schools refer to average share of government schools (in total schools) at elementary, junior and secondary levels. Share of government health facilities correspond to average number of government health and family welfare clinics as share of total (government and private) clinics in the community.

**Table 3. Inter-province variation in selected community characteristics**

| | Community characteristics | | | | |
|---|---|---|---|---|---|
| | Mean (standard deviation) | | | | |
| | Population | University educated population | Strong adherence to adat laws | Islam is the main religion | Under-developed |
| Jakarta | 30023.25 (14228.6) | 0.19 (0.26) | 0.03 (0.17) | 0.31 (0.46) | 0.11 (0.32) |
| West Java | 10056.3 (9693.6) | 0.08 (0.12 | 0.20 (0.40) | 0.98 (0.14) | 0.14 (0.35) |
| East Java | 7424.09 (5740.1) | 0.69 (0.88) | 0.38 (0.49) | 0.96 (0.21) | 0.24 (0.43) |
| Central Java | 6513.25 (6275.7) | 0.12 (0.32) | 0.20 (0.40) | 0.97 (0.17) | 0.22 (0.42) |
| North Sumatra | 5562.9 (5639.8) | 0.14 (0.49) | 0.15 (0.36) | 0.46 (0.50) | 0.19 (0.40) |
| South Sumatra | 3869.6 (2499.6) | 0.25 (1.10) | 0.13 (0.34) | 0.87 (0.34) | 0.20 (0.40) |
| West Sumatra | 2453.4 (1099.2) | 0.11 (0.15 | 0.29 (0.46) | 0.93 (0.26) | 0.21 (0.42) |
| Bali | 8624.3 (1599.6) | 0.19 (0.22) | 0.50 (0.51) | 0 (0) | 0.27 (0.45) |
| Wntenara | 8206.4 (4621.3) | 0.05 (0.71) | 0.50 (0.63) | 0.87 (0.33) | 0.63 (0.49) |
| Ykarta | 13411.00 (10081.7) | 0.19 (0.25) | 0.26 (0.44) | 1.00 (0.00) | 0.16 (0.37) |
| Lampung | 5016.09 (2771.4) | 0.03 (0.03) | 0.45 (0.51) | 0.81 (0.39) | 0.27 (0.45) |
| Sulawesi | 4897.0 (5218.15) | 0.08 (0.13) | 0.63 (0.49) | 0.63 (0.49) | 0.31 (0.47) |
| South Kalimantan | 3850 (4040.6) | 0.08 (0.12) | 0.46 (0.51) | 0.85 (0.37) | 0.15 (0.37) |

Note: Number in each indicates the proportion of total sample communities (except for population total).

**Table 4. Descriptive statistics, 1993–2000**

| Variable | Mean | Std.Dev. |
|---|---|---|
| Log of population (LVPOP) | 8.74 | 0.97 |
| Population group 1>=90% (POP11) | 0.56 | 0.50 |
| Share of university educated (PUED) | 0.21 | 2.67 |
| Decision making by consensus (DMMEET) | 0.57 | 0.49 |
| Decision making by voting (DMVOTE) | 0.04 | 0.19 |
| Strong adherence to Adat laws (ADAT1) | 0.27 | 0.45 |
| Islam is the main religion (ISLAM) | 0.77 | 0.42 |
| ADAT1 & ISLAM (PCNORM) | 0.24 | 0.43 |
| Village head is male | 0.97 | 0.17 |
| Village head has college education or higher (COLLEGE) | 0.28 | 0.45 |
| If the village head is in position for >=10 years (TENURE10) | 0.38 | 0.49 |
| Rural community (RURAL) | 0.45 | 0.50 |
| POST-CRISIS | 0.33 | 0.47 |
| BALI | 0.05 | 0.21 |
| SUMATRA | 0.17 | 0.38 |
| Central JAVA | 0.12 | 0.32 |
| Eastern JAVA | 0.14 | 0.35 |
| WNTENARA | 0.05 | 0.22 |
| LAMPUNG | 0.04 | 0.18 |
| YKARTA | 0.06 | 0.24 |
| SULAWESI | 0.05 | 0.22 |
| South Kalimantan | 0.04 | 0.20 |
| No of observations | 942 | |

**Table 5: Random effects estimates of public infrastructure using composite measure of religious and social norms, specification (3)**

| Variable | Public transport | | Pucca road | | PO | | PTO | | Bank | | Market | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Est | T-stat | Est | T-stat | Est | T-stat | Est | T-stat | Est | T-stat | Est | T-stat |
| Constant | -4.18** | -3.94 | -5.02** | -4.03 | -9.11** | -5.436 | -4.75** | -3.57 | -4.92** | -3.97 | -8.61** | -7.17 |
| LVPOP | 0.42** | 3.79 | 0.72** | 5.15 | 0.93** | 5.487 | 0.66** | 4.55 | 0.55** | 4.37 | 0.88** | 7.05 |
| POP11 | 0.14 | 0.87 | 0.28 | 1.33 | -0.11 | -0.459 | 0.10 | 0.48 | -0.06 | -0.28 | -0.05 | -0.29 |
| PUED | 0.69** | 2.72 | 0.36** | 3.78 | -0.02 | -0.082 | 0.19** | 3.3 | 0.61* | 1.88 | 0.06 | 0.14 |
| COLLEGE | 0.095 | 0.69 | 0.066 | 0.31 | 0.077 | 0.412 | 0.31 | 1.53 | -0.28 | -1.5 | 0.057 | 0.36 |
| TENURE25 | 0.36* | 1.71 | -0.055 | -0.22 | -0.11 | -0.296 | 0.56* | 1.79 | 0.06 | 0.22 | 0.49 | 1.59 |
| SEA | -0.006 | -0.15 | 0.031 | 0.62 | 0.06 | 0.573 | 0.03 | 0.55 | 0.04 | 0.54 | -0.07 | -1.23 |
| RURAL | -0.27* | -1.74 | -0.83** | -4.43 | -0.59* | -2.41 | -0.15** | -7.43 | -0.54* | -2.72 | -0.25 | -1.32 |
| POSTCR | 0.50** | 4.05 | 0.53** | 2.78 | 0.23 | 1.347 | 0.97** | 5.23 | -1.18** | -7.04 | 0.25 | 1.48 |
| Provinces | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | |
| Consensus | 0.035 | 0.26 | 0.29 | 1.57 | 0.44* | 2.111 | -0.06 | -0.38 | 0.018 | 0.12 | 0.46** | 2.82 |
| Voting | -0.49 | -1.08 | -0.83* | -1.94 | -0.45 | -0.619 | -0.66 | -1.12 | -0.16 | -0.34 | -0.64 | -1.15 |
| PCNORM | -0.174* | -2.09 | -0.28** | -2.61 | -0.23* | -1.914 | -0.23** | -2.06 | -0.11 | -1.19 | -0.25** | -2.39 |
| Rho | 0.29** | 3.65 | 0.32** | 3.26 | 0.58** | 7.704 | 0.39*8 | 3.61 | 0.43** | 5.5 | 0.59** | 9.12 |
| Log | -430.99 | | -292.88 | | -312.84 | | -306.35 | | -368.86 | | -395.21 | |
| Chi | 175.72** | | 277.76** | | 192.78** | | 396.25** | | 265.36** | | 349.93** | |

Note: See Table 4 for definitions of variables. Statistical significance: * - 10% ; ** - 1%. Corresponding fixed effects estimates are shown in Appendix Tables A1-A3. Random effects estimates for specifications (1) and (2) are shown in Tables A4 and A5 respectively.

**Table 6. Random effects estimates of access to social infrastructure**

| Variable | Share of govt. schools | | Share of govt health clinics | | No. of govt schools | | No. of govt health facilities | |
|---|---|---|---|---|---|---|---|---|
| | Estimate | T-stat | Estimate | T-stat | Estimate | T-stat | Estimate | T-stat |
| Population Share of | 0.0542** | 22.782 | 0.0634** | 29.788 | 0.0618 | 0.47 | 0.2349** | 3.07 |
| University edu | -0.005 | -0.377 | 0.0012 | 0.007 | -0.0286 | -1.22 | -0.00026 | -0.02 |
| POP1>=90% | 0.0461* | 1.792 | -0.0095 | -0.518 | 0.5185* | 2.35 | 0.00054 | 0 |
| Leader: COLLEGE | -0.1072** | -4.391 | -0.0654** | -3.744 | -0.3089* | -1.98 | -0.155* | -1.64 |
| Leader's TENURE>=10 | -0.0131 | -0.366 | -0.0237 | -0.965 | -0.0634 | -0.48 | 0.0468** | 0.59 |
| SEA | -0.047** | -7.662 | -0.0353** | -7.525 | -0.0147 | -0.3 | -0.1557** | -5.3 |
| RURAL | 0.088** | 3.737 | 0.0443** | 2.667 | 0.0025 | 0.01 | -0.133 | -1.1 |
| POST 1997 | 0.117** | 4.7 | -0.1698** | -4.801 | -0.2355* | -1.87 | -0.6289** | -8.22 |
| Consensus | 0.016 | 0.756 | -0.0320 | -0.193 | -0.0109 | -0.06 | 0.14 | 1.27 |
| Voting | 0.122 | 1.565 | 0.0550 | 1.543 | 0.4838 | 1.01 | 0.0715 | 0.26 |
| PCNORM | 0.0456* | 1.669 | 0.0247* | 1.762 | 0.1677 | 1.61 | 0.0853 | 1.41 |
| Intercept | 0.228** | 6.486 | 0.1703** | 4.914 | 4.2618** | 3.27 | 3.476** | 4.61 |
| Provinces | Yes | | Yes | | Yes | | Yes | |
| R-square | 0.2048 | | 0.4652 | | 0.1296 | | 0.1529 | |
| F-stat | 177.03** | | 533.03** | | 76.85** | | 150.02** | |
| Breusch-Pagan test[1] | 13.98** | | 87.18** | | 52.90** | | 67.03** | |

Note: See Table 4 for definitions of variables. Statistical significance: * - 10% ; ** - 1%
[1] This is Breusch-Pagan Lagrange Multiplier test for random effects model that variance of $\alpha_i$ is zero. Rejection of the null hypothesis suggests acceptance of random effects model.

**Table 7. Panel estimates of composite index of physical infrastructure**

| Variable | FE estimates | | Random effects estimates - PCDEV | | | | | |
| | | | 1 | | 2 | | 3 | |
| | Estimate | T-stat | Estimate | T-stat | Estimate | T-stat | Estimate | T-stat |
|---|---|---|---|---|---|---|---|---|
| Constant | | | -2.934 | -6.136 | -2.89** | -5.998 | -2.82** | -5.927 |
| LVPOP | 0.52** | 5.774 | 0.3565** | 7.271 | 0.352*8 | 7.165 | 0.334** | 6.863 |
| POP11 | | | -0.16* | -2.087 | -0.147* | -1.869 | -0.104 | -1.326 |
| PUED | 0.016 | 1.078 | 0.011 | 0.974 | 0.01 | 0.95 | 0.0094 | 0.831 |
| COLLEGE | 0.18* | 2.092 | 0.132* | 1.728 | 0.129* | 1.699 | 0.13* | 1.725 |
| TENURE10 | 0.33* | 2.334 | 0.22* | 1.86 | 0.22* | 1.87 | 0.24* | 2.018 |
| SEA | | | -0.0068 | -0.279 | -8.12E-03 | -0.335 | -0.011 | -0.455 |
| RURAL | | | -0.41** | -5.326 | -0.429*** | -5.529 | -0.40** | -5.216 |
| POSTCR | | | 0.127* | 1.887 | 0.129* | 1.925 | 0.130* | 1.956 |
| Consensus | | | | | 0.127* | 1.821 | 0.173** | 2.478 |
| Voting | | | | | -0.31* | -1.713 | -0.217 | -1.2 |
| PCNORM | | | | | | | -0.138** | -3.568 |
| Provinces | | | Yes | | Yes | | Yes | |
| R-square | 0.61 | | | | | | | |
| F-stat | 3.51** | | | | | | | |
| Breusch-Pagan LM[1] | | | 60.18** | | 56.69** | | 53.77** | |
| Hausman | 11.34(0.58) | | | | | | | |

Note: See Table 4 for definitions of variables. PCDEV is the composite index of selected public infrastructural goods while UNDEV is a binary indicator of community under-development. Statistical significance: * - 10% ; ** - 1%
[1] This is Breusch-Pagan Lagrange Multiplier test for random effects model that variance of α_i is zero. Rejection of the null hypothesis suggests acceptance of random effects model.

**Table 8. Panel estimates of index of community under-development (UNDEV)**

| | Fixed effects estimates | | Random effects estimates: specifications | | | | | |
| | | | 1 | | 2 | | 3 | |
| Variable | Est | T-stat | Est | T-stat | Est | T-stat | Est | T-stat |
|---|---|---|---|---|---|---|---|---|
| Constant | | | 0.19** | 4.393 | 0.23** | 4.572 | 0.30** | 4.896 |
| LVPOP | -0.29** | 3.299 | -0.25** | -4.931 | -0.29** | -5.074 | -0.37** | -5.364 |
| POP11 | | | -0.623* | -1.708 | -0.11* | -2.452 | -0.17** | -3.572 |
| PUED | 0.048 | 0.016 | -0.22 | -1.172 | -0.22 | -1.134 | -0.27 | -1.184 |
| COLLEGE | 0.83* | 1.643 | 0.36 | 0.889 | 0.25 | 0.577 | 0.45 | 0.837 |
| TENURE10 | -0.95 | 1.065 | -0.11 | -1.45 | -0.92 | -1.068 | -0.99 | -1.296 |
| SEA | | | 0.29 | 1.626 | 0.30* | 1.659 | 0.33* | 1.728 |
| RURAL | | | -0.34 | -0.938 | -0.39 | -1.003 | -0.50 | -1.232 |
| POSTCR | | | 0.73* | 1.901 | 0.80* | 2.061 | 0.84* | 2.007 |
| Provinces | | | Yes | | Yes | | Yes | |
| Consensus | | | | | -0.66** | -2.136 | -0.87** | -2.533 |
| Voting | | | | | -0.023 | -0.016 | -0.31 | -0.205 |
| PCNORM | | | | | | | 0.78** | 2.67 |
| Rho | | | 0.93** | 42.168 | 0.95** | 52.989 | 0.95** | 67.44 |
| Log | | | -270.001 | | -268.336 | | -264.216 | |
| LR-Chi | | | 289.5853 | | 291.4463 | | 291.7422 | |

Note. See Table 4 for definitions of variables. PCDEV is the composite index of selected public infrastructural goods while UNDEV is a binary indicator of community under-development. Statistical significance: * - 10% ; ** - 1%

**Appendix**

**Table A1. Pooled OLS estimates of access to physical infrastructure**

| | pubtrans | | PO | | PTO | | Proad | | Bank | | Market | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t |
| pcnorm | -0.10185 | -1.69 | -0.13328 | -1.99 | -0.14954 | -2.12 | -0.22758 | -3.1 | -0.11958 | -1.86 | -0.05011 | -0.83 |
| lvpop | 0.38060 | 4.43 | 0.56346 | 6.68 | 0.62444 | 6.5 | 0.58340 | 6.04 | 0.39877 | 4.89 | 0.47569 | 6.07 |
| pop11 | 0.10100 | 0.75 | -0.03322 | -0.24 | 0.00638 | 0.04 | 0.12045 | 0.8 | -0.1112 | -0.82 | -0.07691 | -0.61 |
| pued | 0.93082 | 1.8 | -0.01151 | -0.37 | 2.02906 | 4 | 3.59265 | 3.98 | 0.45893 | 2.07 | 0.11669 | 0.53 |
| college | 0.04434 | 0.32 | -0.0147 | -0.11 | 0.18655 | 1.34 | 0.09137 | 0.57 | -0.19599 | -1.53 | 0.05630 | 0.47 |
| tenure | 0.03919 | 0.36 | -0.0756 | -0.67 | -0.01271 | -0.11 | 0.14320 | 1.18 | 0.00488 | 0.05 | 0.10782 | 1.06 |
| sea | 0.00429 | 0.1 | 0.02847 | 0.64 | 0.00920 | 0.22 | 0.02375 | 0.53 | 0.02039 | 0.51 | -0.06103 | -1.45 |
| rural | -0.22747 | -1.74 | -0.38435 | -2.86 | -1.04032 | -8.02 | -0.60245 | -4.31 | -0.36761 | -2.85 | 0.03487 | 0.29 |
| Years | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | |
| Province | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | |
| Intercep | -2.4369 | -2.96 | -5.33257 | -6.4 | -5.12847 | -5.64 | -4.17132 | -4.66 | -3.68486 | -4.58 | -4.07423 | -5.37 |
| Log-L | 373.288 | | 353.676 | | -330.711 | | -308.995 | | 393.718 | | -44.946 | |
| LR | 114.49 | | 211.83 | | 453.16 | | 252.82 | | 212.45 | | 195.41 | |

Note: See Table 4 for definitions of variables.
Statistical significance: * – 10% ; ** – 1%

**Table A2. Pooled OLS estimates of access to social infrastructure**

| | govts_n | | pgovsch | | govhlt_n | | pgovhlth | |
|---|---|---|---|---|---|---|---|---|
| | Coef. | t | Coef. | t | Coef. | t | Coef. | t |
| pcnorm | 0.089482 | 1.1 | 0.020655 | 1.79 | 0.113741 | 2.35 | 0.001034 | 0.19 |
| lvpop | 0.103624 | 0.99 | 0.003586 | 0.24 | 0.215217 | 3.49 | 0.01609 | 2.36 |
| pop11 | 0.59371 | 3.43 | 0.0435 | 1.76 | 0.038388 | 0.37 | -0.00123 | -0.11 |
| pued | -0.04397 | -1.79 | -0.00482 | -1.38 | 0.002432 | 0.16 | 0.000719 | 0.44 |
| college | -0.24371 | -1.49 | -0.10769 | -4.63 | -0.06453 | -0.65 | -0.05368 | -4.92 |
| tenure10 | -0.08631 | -0.63 | 0.034876 | 1.78 | 0.055551 | 0.67 | 0.016242 | 1.76 |
| sea | -0.0008 | -0.02 | -0.04726 | -6.34 | -0.11683 | -3.72 | -0.03785 | -10.92 |
| rural | -0.0369 | -0.23 | 0.033739 | 1.44 | -0.12898 | -1.31 | 0.008068 | 0.74 |
| Years | Yes | | Yes | | Yes | | Yes | |
| Province | Yes | | Yes | | Yes | | Yes | |
| Intercept | 3.411793 | 3.32 | 0.50842 | 3.47 | 3.708987 | 6.1 | 0.515332 | 7.66 |
| R-square | 0.1139 | | 0.1768 | | 0.1474 | | 0.4102 | |
| F-stat | 6.30** | | 10.52** | | 8.43** | | 33.38** | |

Note: See Table 4 for definitions of variables.
Statistical significance: * - 10% ; ** - 1%

**Table A3. Pooled OLS estimates of indices of community development**

| | Composite physical infrastructure | | | Under- developed | |
|---|---|---|---|---|---|
| | Coef. | t | | Coef. | t |
| pcnorm | -0.11799 | -3.15 | pcnorm | 0.096721 | 1.68 |
| lvpop | 0.338629 | 7.08 | lvpop | -0.55826 | -6.32 |
| pop11 | -0.11507 | -1.44 | pop11 | -0.01417 | -0.1 |
| pued | 0.011153 | 0.98 | pued | -1.21677 | -2.41 |
| college | 0.143447 | 1.86 | college | 0.262318 | 1.93 |
| tenure10 | 0.028991 | 0.45 | tenure10 | 0.051174 | 0.46 |
| sea | 0.001535 | 0.06 | sea | 0.06 | 1.46 |
| rural | -0.39274 | -5.18 | rural | 0.086434 | 0.65 |
| Years | Yes | | yr1997 | Yes | |
| Province | Yes | | Province | Yes | |
| Intercept | -2.71854 | -5.76 | Intercept | 4.280661 | 5.07 |
| R-square | 0.2978 | | Log-L | -365.593 | |
| F-stat | 19.6** | | LR | 142.02 | |

Note: See Table 4 for definitions of variables.
Statistical significance: * - 10% ; ** - 1%

**Table A4. Probit random effects estimates of specification (1)**

| Variable | TRANS Estimate | TRANS T-stat | Proad Estimate | Proad T-stat | PO Estimate | PO T-stat | PTO Estimate | PTO T-stat | Bank Estimate | Bank T-stat | Market Estimate | Market T-stat |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Constant | -4.48 | -4.31 | -5.625 | -4.6 | -9.29 | -5.8 | -5.1 | -3.83 | -5.13 | -4.11 | -8.77 | -7.34 |
| LVPOP | 0.46 | 4.215 | 0.78 | 5.58 | 0.97 | 5.894 | 0.69 | 4.803 | 0.58 | 4.53 | 0.92 | 7.382 |
| POP11 | 0.02 | 0.139 | 0.14 | 0.687 | -0.19 | -0.87 | -0.045 | -0.23 | -0.12 | -0.59 | -0.15 | -0.89 |
| PUED | 0.68 | 2.721 | 3.9 | 3.994 | -0.014 | -0.07 | 1.88 | 3.364 | 0.62 | 1.876 | 0.05 | 0.123 |
| COLLEGE | 0.10 | 0.747 | 0.073 | 0.337 | 0.055 | 0.292 | 0.32 | 1.573 | -0.28 | -1.52 | 0.05 | 0.33 |
| TENURE10 | 0.34 | 1.638 | -0.11 | -0.418 | -0.10 | -0.27 | 0.53 | 1.729 | 0.056 | 0.214 | 0.45 | 1.545 |
| SEA | -0.006 | -0.15 | 0.041 | 0.797 | 6.48E-02 | 0.621 | 0.03 | 0.6 | 0.04 | 0.542 | -0.07 | -1.15 |
| RURAL | -0.28 | -1.86 | -0.79 | -4.34 | -0.5484 | -2.48 | -1.48 | -7.43 | -0.55 | -2.92 | -0.24 | -1.36 |
| POSTCR | 0.48 | 3.958 | 0.51 | 2.688 | 0.22 | 1.295 | 0.95 | 5.198 | -1.18 | -7.08 | 0.23 | 1.367 |
| Provinces | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | |
| Rho | 0.28 | 3.62 | 0.37 | 3.988 | 0.57 | 7.658 | 0.38 | 3.592 | 0.43 | 5.613 | 0.58 | 8.998 |
| Log | -434.83 | | -301.7 | | -317.58 | | -310.37 | | -369.7 | | -402.3 | |
| Chi | 171.7 | | 293.26 | | 192.64 | | 420.68 | | 264.97 | | 345.95 | |

Note: See Table 4 for definitions of variables. Statistical significance: * - 10% ; ** - 1%

**Table A5. Probit random effects estimates of public infrastructure – specification (2)**

| Variable | Trans Estimate | T-stat | Proad Estimate | T-stat | PO Estimate | T-stat | PTO Estimate | T-stat | Bank Estimate | T-stat | Market Estimate | T-stat |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Constant | -4.27 | -4.076 | -5.3 | -4.32 | -9.3 | -5.49 | -4.84 | -3.595 | -5.04 | -4.024 | -8.71 | -7.34 |
| LVPOP | 0.44 | 4.047 | 0.76 | 5.542 | 0.96 | 5.632 | 0.68 | 4.684 | 0.57 | 4.482 | 0.91 | 7.313 |
| POP11 | 0.07 | 0.47 | 0.23 | 1.137 | -0.19 | -0.81 | 0.023 | 0.113 | -0.09 | -0.49 | -0.13 | -0.75 |
| PUED | 0.68 | 2.65 | 3.67 | 3.843 | -0.015 | -0.07 | 1.83 | 3.226 | 0.61 | 1.841 | 0.06 | 0.135 |
| COLLEGE | 0.09 | 0.689 | 0.06 | 0.292 | 0.065 | 0.35 | 0.31 | 1.525 | -0.28 | -1.547 | 0.05 | 0.339 |
| TENURE10 | 0.34 | 1.613 | -0.13 | -0.50 | -0.096 | -0.25 | 0.52 | 1.679 | 0.055 | 0.21 | 0.46 | 1.54 |
| SEA | -0.03 | 0.3998 | 0.04 | 0.756 | 0.06 | 0.564 | 0.034 | 0.64 | 0.041 | 0.549 | -0.07 | -1.22 |
| RURAL | -0.30 | -1.989 | -0.87 | -4.68 | -0.63 | -2.60 | -1.53 | -7.502 | -0.56 | -2.945 | -0.28 | -1.55 |
| POSTCR | 0.49 | 4.016 | 0.52 | 2.761 | 0.23 | 1.348 | 0.96 | 5.183 | -1.18 | -7.039 | 0.24 | 1.419 |
| Provinces | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | |
| DMMEET | -0.01 | -0.105 | 0.23 | 1.305 | 0.37 | 1.816 | -0.09 | -0.589 | -0.01 | -0.072 | 0.401 | 2.512 |
| DMVOTE | -0.59 | -1.352 | -0.99 | -2.29 | -0.62 | -0.83 | -0.79 | -1.314 | -0.22 | -0.488 | -0.78 | -1.43 |
| Rho | 0.29 | 3.61 | 0.34 | 3.551 | 0.58 | 7.795 | 0.39 | 3.674 | 0.43 | 5.567 | 0.58 | 9.06 |
| Log | -433.366 | | -296.74 | | -314.67 | | -308.78 | | -369.55 | | -397.77 | |
| Chi | 170.9987 | | 290.16 | | 192.72 | | 417.52 | | 263.97 | | 344.90 | |

Note: See Table 4 for definitions of variables. Statistical significance: * - 10%; ** - 1%