State Capacity and Firms' Distribution in the territory: the shadow of the colonial period

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Abstract

In this paper we complete and expand previous studies on how state capacity affects the economy by explicitly modeling the interaction between firms and state capacity. We model state capacity on a network framework where the provision of public goods and services boost productive decisions of entrepreneurs located in each municipality. This static model is the first that explicitly model the interaction between productive agents and state in a network framework of municipalities. By estimation of the reduced form model, we obtain a large and positive effect of state capacity on several indicators of productive development on the firm level like the number of formal firms, percentage of non-microfirms, median lifecycle of the firm and the median size of the firms.

Introduction

The relationship between economic agents and the government is perhaps the topic that has motivated the most passionate discussion in the discipline. It is understood that governments are very heterogeneous across countries and this heterogeneity is influenced by the historical formation of its actual state (Acemoglu and Robinson, 2012). This difference is translated to different kinds of interactions with the economy. For example, a large government is usually criticized in developed parts of the world as taxes, expropriations and inefficiencies are latent

barriers for economic agents. Also, Parente y Prescott (1999) book explain how policies can prevent technology adoption, when they are directed in order to secure local interests, and so explain the economic gaps observed between countries. Nevertheless, small governments are also a problem in a set of African and Latinamerican countries where the absence of a centralized authority precludes the provision of basic and necessary public goods and services that are actually denied for large parts of the population. As this features demonstrate, too large or too small governments can be detrimental for economic activity (Acemoglu, 2005).

As the African experienced shows, the existence or the formation of a centralized authority is not obvious. Recent literature incorporates incentives to understand how states can build more capacity in taxing, and providing public goods and services to the population. The contributions of Acemoglu (2005), Besley and Persson (2009), and Acemoglu, Moscona and Robinson (2016); are valuable in this direction. Modeling the interdependence of state's actions and economic agents reactions is on the heart of the debate about the role of the State. In this same topic, Acemoglu, Garcia-Jimeno and Robinson (2015, AGR) have made a great contribution approaching the effect of state capacity in a sub national level study where municipalities operates within a network. This study is estimated from a reduced form of a structural model regarding how municipalities interact between them. As this model accomplish to evaluate this game on the state side, the economic agents side is not modeled.

Our paper contributes to the study of how state capacity interacts with economic agents in several dimensions. First we build an large database concerning an extensive mapping of the characteristics of each municipality, the "stock" of state capacity built and productive characteristics of firms operating in each municipality. Second, we build a complete model where state authorities and economic agents interact in a sub national level network game. Our model uses previous contributions made by Acemoglu, Garcia-Jimeno and Robinson (2015), Acemoglu (2005), Beasley and Persson (2009), and Asturias, Hur, Kehoe and Ruhl (2015); to offer a first attempt to explicit the interaction between local authorities and local

producers in a sub national level. Third, we test the economic predictions of our structural model by estimating the reduced form relationship between productive outcomes and state capacity. Estimations advanced use the instrumental variables approach adapting the general specification to our network framework. In order to deal with endogeneity problems we use colonial state capacity as historical instruments to isolate the exogenous variations of present state capacity. As in AGR, we use measures of the number of colonial state officials, colonial state agencies and the distance to colonial roads. In this sense, i) we expand the evidence of AGR in Colombia about how local authorities interact between each other and ii) we shed light about how state capacity affect local producers in a sub national level.

Onwards this paper is structured in seven section. The first section present previous studies advanced in the related topics of this research. The second section presents the main characteristics of our case study: the Peruvian case. The third section present our theoretical model on how state capacity affects local economic producers. The next section, present our case study, the database used to estimate the economic predictions and some descriptive statistics of our baseline model. The fifth section, presents our empirical strategy regarding the exclusion restrictions, the baseline estimation, a counterfactual over the results of baseline estimation, the important falsification test of rivalry explanations, specification test and, finally, the robustness of our results when controlling for relevant features of our case study. The sixth section describes the future improvements that will be done in this paper and the incorporation of additional evidence regarding the Brazilian case. Finally, the last section presents the preliminary conclusions of our research.

Related Literature

The relationship between markets and government is a deal that rest on the core of economic science. Since the pioneering work of D. North, economist have long discuss the benefits and detriments of a more present state in the economy. In general, governments can participate on

the economy in many ways. Public enterprises, regulation of markets, taxes, expropriations, and public goods and services; are the most relevant forms of interventions. One central insight of D. North draws a picture where the decision over the property rights structure are not necessarily taken to maximize the economic growth for the whole society; instead, political decision are biased to improve the returns and wealth of the decision makers and elites. In this sense, a smaller government without capacity to tax and expropriate will drive to economic growth. The work of Barro (1991) support this view with a cross-nation exploration of how government affects economic growth. Nevertheless, the discussion is far from consensus as theoretical and empirical work support the views of the state as an actor that boost economic growth as the experience of East Asia show (Wade, 1990). Other recent contributions of Acemoglu, Moscona and Robinson (2016) highlights the central role of US state in boosting the wave of innovations that took place in the 19th century via a wide and connected network of post offices that channel ideas and inventions all around the country. This also contributes to an efficient system of patents and the spread of knowledge and ideas. Finally, Acemoglu and Dell (2010) shed light to the important income differences that exist within a country (across - municipalities) and, thus, open a new course for social research focus on sub national studies regarding local institutions.

Our model is based on how state capacity affects productive outcomes of society. Nevertheless, assuming that the state can decide tax rates or other interventions on the economy is unreal. Literature on the origins of the state and/or how government centralize in order to be able to decide over its capacity can be found in Acemoglu, Robinson and Torvik (2016) and, recently for the Democratic Republic of Congo, Sanchez (2016). Also, the determinants of investments in state capacity can be found in Beasley and Persson (2009, 2010). At the same time, the building of capacity and the bureaucratic structure are critical on the economic performance. The effectiveness of state is closely connected to bureaucratic formation (sometimes called the human capital of the state) as adressed in Cukierman, Edwars and Tabellini (1992), Evans and Rauch (1999, 2000), and Acemoglu, Ticchi and Vindigni

(2011). For weak states, patronage and corruption are embedded practices of bureaucracy, this having long run effects in fiscal capacity of state as shown in Xu (2016). In our study, bureaucracy is proxied by the number of state officials or agencies, and effectiveness of the bureaucracy by historical and present covariates.

Contributions relating productive outcomes of firms and state capacity can be found in Acemoglu (2005) which represents a general framework to understand when the government can affect positively or negatively economic performance. On this way, the ability to raise taxes (and effectively collect them) and the constraints to executive power are categories that differentiate between weak and strong states. The state is modeled as an agent that can consume or invest in public goods (relevant in the production function of private sector) resources taxed from the economy. In this framework, both weak and strong states generates miss-allocation of resources and so, both weak and strong states are detrimental to economic growth. For good economic outcomes, the model advice a "balanced state" that can set taxes in an intermediate level in order to provide public goods and influence positively investment decisions by private sector. In this way, in order to sustain this intermediate situation, there has to be a balance between the political power of the state. A politically weak state has rulers that can be easily replaced. In this sense, a balance in the political power of the state is necessary. As an special case of a subgame perfect equilibria, supported by trigger strategies, a "consensually strong state" (i.e. a pollitically weak state that is allowed to raise taxes if it invest a great percentage to provide public goods to the private sector) is the archetype of the ideal state observed in the OECD countries.

Later, Beasley and Persson (2009) build a theoretical model explaining state capacity as a consequence of past investments in state capacity building. In this way, regulation of markets and the ability of raise taxes are endogenous policy choices which are constrained by historical investments in legal and fiscal capacity (what is called the current institutions). In the later, some determinants of investments in state capacity measured as fiscal capacity and legal capacity are: (i) countries with higher wealth or better markets benefits, (ii) greater

demands for public goods (i.e. wars, internal conflict or discovery of natural resources that needs infrastructure to produce), (iii) greater political stability (i.e. the political parties in power being mostly accepted by the population), (iv) more consensus on political system, and finally, (v) preferences over investments on legal or fiscal capacity depends on the party in power and its political affiliation (in the model, rich group will prefer to develop the property right system of defense and the poor group will prefer to develop the fiscal system for redistribution). Recently, Acemoglu, Robinson and Torvik (2016) explore the origins of state capacity looking at the centralization process of the state which is saw as a prerequisite for capacity building.

An structural model of sub national state capacity formation was developed and estimated by Acemoglu, Garcia-Jimeno and Robinson (2015). Knowing the large income differences across municipalities in Latin America (Acemoglu and Dell, 2010), the authors build an structural model where state capacity decisions are taken trading off the benefits of better social outcomes and the cost of building such capacity. Simplifying the underlining elements that affect state capacity building and using a network game structure to allow externalities and interdependent decisions, the model is estimated and the results show that state capacity significantly and positively affect several welfare indicators of society via own capacity and network spillovers. Our framework is build over the theoretical model developed in this work.

The relationship between firms strategies and policies implemented by governments are studied in Aghion et al. (2012) which analyse the effect of sectoral policies targeted to one specific sector can enhance economic innovation (vertical), growth and efficiency; when diversification strategies of firms are limited. This conclusion are supported by evidence on a panel data of Chinese firms obtaining that subsidies allocated to competitive sectors can have a positive and significant net effect of taxes and subsidies on productivity and economic growth. Ferraz, Finan and Szerman (2015) shows that government auctions (interpreted as demand shocks) affect positively the growth of the firm and that this increment is persistent

in time (so, government expenditure can be seen as a big push for winning contract firms).

Literature analysing relevant economic characteristics of firms and its pattern of growth can be found in the papers of Dunne and Hughes (1994), Hsieh and Klenow (2014) and Kueng, Yang and Hong (2014). These are unique contributions about the behavior of firms over the life cycle, its evolution and vulnerability for different size of firms in UK, United States, India, Mexico and Canada. Some conclusions held in this researches are that "organizational capital and management practices are the most important determinants to explain intensive margin firm growth over the life-cycle" and "financial frictions are an important determinant of firm exit, conditional on firm age". Some of this dimensions are studied here.

Other contributions highlight the problems of state building in development economies where a diversity of social groups live within the same country. Literature relating the quality of government with ethnically and linguistic segregation, which is one element present on the diverse racial composition of Peru, is addressed by Easterly and Levine (1997), La Ferrara and Mele (2006), Banerjee and Pande (2007), Alesina and Zhuravskaya (2009) and Alesina, Glaeser and Sacerdote (2001). In this works, states with greater social fragmentation, segregation and or animosity leads to a set of policies that worsen economic conditions.

Theoretical Model

We model the interaction between entrepreneurs decisions to participate in the economy and how public goods and services provision affect that decision on the basis of recent research like Acemoglu, García-Jimeno and Robinson (2015), Besley and Persson (2009), Acemoglu (2005), Lucas (1978) and Kihlstrom and Laffont (1979). Our framework describes two level of government, a national government and a set of local municipalities, and a continuum of established entrepreneurs with potential productive projects to take up in each municipality.

In this sense, the public goods provided by the state affect the potential production function of the established entrepreneurs in the municipality. All agents maximizes an objective function based on preferences specified below.

Description

Our approach works on a very simple model based on some assumptions of the dynamics of the game. We model the economy as an interaction between state and entrepreneurs in a decentralized manner. The physical space of the country is divided by a set of municipalities indexed by i. All municipalities has mayors that decide over the state capacity in its jurisdiction. Also, there is a centralized government who provides state capacity across municipalities driven by an specific objective function. Within each municipality there exist an established continuum of heterogeneous entrepreneurs (i.e. established in the sense that entrepreneurs cannot move between municipalities) that have to decide whether to start or not a firm (equivalently, whether to stay in operation or exit, as the decisions of the entrepreneurs are made each period) in its own municipality. There is a single good produced by all entrepreneurs in the economy which is trivially exchanged and consume by them and, therefore, the price is taken as numerate. They are indexed by the productivity parameter $\mu \in [0, 1]$ where μ_k is the productivity type of entrepreneur k. In order to evaluate the decision of taking up a firm, agents evaluate the utility of this decision. Utility of entrepreneur k in municipality i is represented as:

$$u_{ki} = \mu_k S_i - \Gamma_i \tag{1}$$

Where S_i is the public goods and services provision of state in municipality i. This will be a function of state capacity investments driven by government authorities in both level of government. Entrepreneurs incur in a fixed cost Γ_i specific to the municipality in order to start production. This cost represents all other barriers apart from those related to public

goods and services provision that affects the costs of beginning a productive project. Some examples are the costs of municipality-specific factors necessary to produce, geographical and climate difficulties, quality of soils and others. The outside option of entrepreneurs is equal to zero. Each type of government maximizes an specific objective function deciding over some dimensions of state capacity[1]. This problem is solved within a physical space where network spillovers between neighbor municipalities exists and so, are taken into account by the municipalities and central government at the maximization. We model local level state authorities as agents who maximizes social welfare that will be equivalent to promoting the entry of more entrepreneurs to the economy in its municipality[2]. This outcome is affected by the level of state capacity which is build with a convex cost.

Following the definition of AGR, local state capacity is a result of investments made by national government $b_i \in [0, \infty)$ and local government $l_i \in [0, \infty)$. Both investments compose the state capacity of municipality as:

$$y_i = \left[\alpha l_i^{\frac{\sigma-1}{\sigma}} + (1-\alpha) b_i^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}} \quad \sigma > 0 \tag{2}$$

Preferences are represented in a very simple way balancing benefits and costs of investments in state capacity. All political concerns about self interested politicians are ignored. Each municipality will choose l_i, taken others choices as given, in order to maximize:

$$U_i = p_i - \frac{\theta}{2} l_i^2 \tag{3}$$

Where p_i^j is a function of the share of entrepreneurs participating in the economy which, by the structure of the model, is equivalent to the social surplus generated. And the national state chooses b_i to maximize:

[1]For future research we will expand the measurement of state capacity held by AGR to connect a type of state capacity more related to productive decisions.

[2]This motivation can represent electoral incentives held by rulers but this framework is not concerned with that kind of political motivations.

$$W = \sum_i \left(U_i \omega_i - \frac{\eta}{2} b_i^2 \right) \tag{4}$$

For the national government $\omega_i s$ are weights representing various possible distributions of preferences over municipalities motivated by political factors like the political competition faced by the national party (Fergusson, Larreguy, and Riaño, 2015), segregation of ethnic groups that leads to an absent state (Easterly and Levine, 1997; Alesina and Zhuravskaya, 2009) or distinct motivations of government to develop industrial regions.

The timing of events in this simple model is:

- Local mayors and central government decide over its own state capacity and the distribution of state capacity across municipalities, respectively; taking into account the network structure of the game.
- Entrepreneurs in each municipality decide whether to start or not a productive project in its municipality.

This two stage game is solved by backward induction. First we obtain the best response functions of entrepreneurs in each municipality. Second, given entrepreneur's best response functions, state authorities decide how much state capacity to build simultaneously under complete information of all the relevant parameters in the model.

Sequential Nash Equilibrium

Solving by backward induction, each entrepreneur decides whether to take up a productive project (E) or not (NE). Given the specification of preferences, the best response function of entrepreneurs in each municipality is as follows:

$$br_{ki} = \begin{cases} E & if \quad u_{ki} \geq 0 \quad \equiv \quad \mu_k S_i - \Gamma_i \geq 0 \\ NE & if \quad u_{ki} < 0 \quad \equiv \quad \mu_k S_i - \Gamma_i < 0 \end{cases} \tag{5}$$

Anticipating this behavior, state authorities will try to maximize the welfare of society by trying to promote start up of businesses. In order to specify correctly the objective function of government, we compute the utility of the indifferent entrepreneur in the economy:

$$u_{ki} = \mu_k S_i - \Gamma_i = 0 \quad or \quad S_i = \frac{\Gamma_i}{\mu_k} \tag{6}$$

Using a log transformation,

$$log(S_i) = log(\Gamma_i) - log(\mu_k) \quad or \quad log(S_i) - log(\Gamma_i) = -log(\mu_k) \tag{7}$$

We use this expression to construct the objective function of the local authorities (and so, for the national authority) as $p_i^j = -log(\mu_k)$. The intuition goes as follows, the entrepreneur μ_k in the municipality is indifferent between entering and not entering so all entrepreneurs with productivity type below μ_k will choose not to start up a business. In this sense, μ_k will be interpreted as the fraction of firms out of the economy. As state authorities maximize social welfare, they will try to minimize the number of entrepreneurs out of the economy by incrementing the provision of public goods and services as a function of its state capacity and the neighbors state capacity. We specify the following functional form of public goods and services:

$$S_i = (Y_i)^{\kappa_i} (Y_i \mathbf{H_i}(\delta)\mathbf{Y})^{\phi} (\mathbf{H_i}(\delta)\mathbf{Y})^{\rho} \tag{8}$$

and the specific fixed cost in each municipality:

$$\Gamma_i = e^{X_i \beta_u + \Lambda_i^D + \epsilon_i} \tag{9}$$

This specification is choose in order to make the model very tractable and to use the previous results of AGR. Finally, we can express the objective function of the local authorities as a log representation:

$$p_i = \kappa_i y_i + \phi y_i \mathbf{H_i}(\delta)\mathbf{y} + \rho \mathbf{H_i}(\delta)\mathbf{y} + u_i \tag{10}$$

where p_i represents the social welfare of municipality i, $y_i \in [0, \infty)$ is the level of state capacity build by the mayor of municipality i. Also the log of fixed cost is represented by u_i. It is important to note that u_i do not include the vector $\mathbf{c_i}$ because the instruments are exogenous in the outcomes equation (i.e. the exclusion restriction that will be demonstrated later). The network framework is incorporated via $\mathbf{H_i}(\delta)$ that is *ith* row of matrix $\mathbf{H}(\delta)$ and $\mathbf{y}$ is the full column vector of state capacity levels. This matrix is calculated using the following weighting index:

$$h_{ij} = \frac{1}{1 + \delta_1 d_{ij}(1 + \delta_2 e_{ij})} \tag{11}$$

where d_{ij} represents the geodesic distance between two municipalities, e_{ij} is the difference in elevation between the two municipalities, both parameters δ_1 and δ_2 represent the relative importance of this two dimensions in the weighting index, and h_{ij} are the final entries in the final matrix $\mathbf{H}(\delta)$ that will show the present and strength of a connection between two municipalities. We use the adjacent municipalities to conform the set of municipalities generating spillovers on the analysed municipality, and farther experiment with other definitions of $H(\delta)$ like neighbors of neighbors or including own and adjacent department's capitals.

Besides, and following AGR, κ_i represents the quality or effectiveness of municipality i's state capacity in providing public goods which is modeled as:

$$\kappa_i = g(\mathbf{c_i}\varphi + \mathbf{x_i}\beta) + \lambda_i^D + \xi_i \tag{12}$$

Here, $\mathbf{c_i}$ and $\mathbf{x_i}$ are vectors of historical and contemporary municipality characteristics, λ_i^D denotes the department fixed effects, and ξ_i is unobserved heterogeneity. This parameter is observed for all municipalities as is a game of complete information. Parameter ϕ represents the interaction effect of own and neighbors state capacity and ρ is the spillover direct effect

of neighbors state capacity on entrepreneurs participation. We can illustrate this important network connection by thinking about the logistics of producing and transporting the production to other municipality markets. Also, improvements in neighbors state capacity as building innovation centers or industrial parks affects neighbors firms that can benefit from new knowledge at a smaller cost. In our econometric approximation κ_i and ϕ are identified from the best response equation of municipalities, and ρ is obtained from a estimation on each productive outcome as will be described below. In our empirical strategy it will be important to allow spatial correlation between ϵ_i and ξ_i given the network framework and political, social or geographical factors that cross borders besides state capacity.

Given that all municipalities has positives levels of state capacity (this means interior solutions), optimization of local state implies the following first order conditions:

$$\alpha\Big[\frac{y_i}{l_i}\Big]^{\frac{1}{\sigma}}\Big[\kappa_i + \phi y_i \mathbf{H_i}(\delta)\mathbf{y}\Big] - \theta l_i = 0 \tag{13}$$

One important result is the nature of the relationship between municipalities contained in ϕ. This parameter shows is investments are complementary ($\phi > 0$) or substitutes ($\phi < 0$). For national government, given that it has presence is all municipalities, the first order conditions yield:

$$(1-\alpha)\Big[\frac{y_i}{b_i}\Big]^{\frac{1}{\sigma}}\left\{\omega_i\big[\kappa_i + \phi y_i \mathbf{H_i}(\delta)\mathbf{y}\big] + \phi y_i \mathbf{H_i}(\delta)(\mathbf{y} * \omega) + \frac{1}{J}\sum_j \gamma^j \mathbf{H_i}(\delta)\omega\right\} - \eta b_i = 0 \tag{14}$$

The * operator means element by element multiplication. In order to obtain the Nash equilibrium of this network game we follow the proposition of Allouch (2015):

Proposition 1 (Allouch 2015) *If for every player*

$$1 + \frac{1}{\lambda_{min}(\mathbf{H}(\delta))} < \left[\frac{\partial l_i}{\partial \mathbf{H_i}(\delta)\mathbf{y}}\right]^{-1} < 1$$

then the game has a unique Nash equilibrium.

The theoretical spirit of this game explains the distribution of state capacity across municipalities - and how much it is build by the national state and the local municipality - given the real values of the parameters. Nevertheless, we do not know the parameters of the model so the strategy is to estimate them using the real distribution of state capacity assuming that the model is correct. Onwards, we present the model following the same structure held in AGR. This means, we are going to verify the existence of this Sequential Nash equilibrium by the estimation of the model's parameters from the actual distribution of state capacity across municipalities. There are two cases we are going to study, (i) equilibrium with no national government where the state capacity of the municipality is entirely chosen by local levels ($\alpha = 1$) and (ii) the general equilibrium with the national government (this second case will be studied in the subsequent versions of this research). In the next section we present the database used in the empirical strategy.

Data Collection - The Peruvian Case

Peru is a very suitable case study as it has recently manage to decentralized at the municipal level. There have been several attempts to move from a highly centralized government to a decentralized administration. Although the begining of the process was in 1988-1989 in the administration of president Alan Garcia, municipalities had some degree of political and administrative autonomy when democracy returned by 1980s. This were very difficult years for the peruvian economy and, so, the process did not advance. By 1990 and 1992 a process of re-centralization emerged with the so called CTARs that were institutions of the central government that administrates the provinces leaving municipalities with parallel nominal authority only. This duality of functions remained until the recent descentralization process come in scene. The actual process of decentralization, originated in 2002 and 2003, was enforced by a series of constitutional reforms (Ley No 27680 de Reforma Constitucional,

Ley No 27783 de Bases de la Descentralización, Ley No 27867 Ley Orgánica de Gobiernos Regionales and Ley No 27972 Ley Orgánica de Municipalidades) that defines the physical territories, functions and competences of each level of government and its mechanism of co-operation in overlapped competences. Nevertheless, the fiscal decentralization, the power to raise taxes, continues to be centralized in the national government authority through its tax collector institution, "Superintendencia Nacional de Administración Tributaria (SUNAT)".

The Peruvian case has some special features related to its cultural diversity, geographical obstacles and mining activities that are important for the performance of firms. The Andean mountains is a large chain that cuts in a half from south to north the whole peruvian territory. This gives birth to a wide diversity of ecosystems with two possible classifications: by its souls (cost - dessert, highlands and jungle) and by its elevation (Cost, Yunga - warm valleys, Quechua - temperate lands, Suni - rainy lands, Puna - highlands with extreme climates, Cordillera - Pick of the mountains, High Jungle - Jungles in the low mountainside, and Low Jungle - The jungle zone crossed by the Amazon River). For productive projects, this wide diversity means great efforts in the logistic of firms related to the transportation of inputs or outputs to the market. Also, this explains some natural specialization in the production patters of Peru (this explains the fixed costs and our assumption of established entrepreneurs in the theoretical model). Second, and highly related to the geography, the mining activity is important economic sector that affect the overall growth of the economy and, even more, explains almost all the variation in total national exports (Hausmann and Klinger, 2008). In general, the exploitation is carry out by large foreign firms usually established in highlands. The impact of mineral activities has been extensively studied by many authors like Loayza and Rigolini (2015), Aragon and Rud (2013), and Escobal and Ticci (2015). Finally, there are racial and cultural differences that are strongly correlated to poverty, extreme poverty, malnutrition, and low rates of employment in the formal sector. In general, indigenous or native population tend to focus in agricultural and commerce activities because of the inability to perform satisfactorily in the formal labor markets. There are claims that this

share of Peruvian population is continuously forgotten in the provision of public goods by central authorities and so conditioned in its productive future (Figueroa, 2003).

Relating this characteristics of our case study and in order to estimate the theoretical model, we compile a large database that accomplish to map the sub national level of Peru. As in AGR, we need to provide an spatial content to the data that clearly identify the structure of the network. This includes the measure of productive indicators at the local level, indicators of state capacity at the local and national level, controls that capture municipality characteristics, the set of colonial instruments and the pre-colonial system of roads inherit from the Incas[3]. In addition, we add the geographical variables that structure the network nature of the model. The matrix **Dist** contains the geodesic distance between municipalities[4], matrix **Elev** contains the difference in elevation between municipalities[5] and, finally, matrix **Adj** represents the structure of the network, this is, states the neighbors of each municipality. The whole set of variables or the data generating process for the specify model is presented as:

$$\{(\mathbf{Y}_i, l_i, b_i, \mathbf{x}_i, \mathbf{c}_i)_{i=1}^n, \mathbf{Dist}, \mathbf{Elev}, \mathbf{Adj}\} \tag{15}$$

In order to define the number of employees at the local and national level, we use this legal resource to classify and construct our state capacity variable. The national government is encharged to look for the principal taxes (income tax, sales tax, tariffs and others), the system of justice, the number of police officers, health centers and a big part of the education system. For the local level, we follow AGR to construct two indicators of state capacity related to the state agencies and local employees operating in the territory. It deserves to specify

[3]The Incas was a large empire that comprises part of the actual countries of Argentina, Chile, Bolivia, Peru, Ecuador and Colombia. This ancient culture manage to communicate its territories with a simple system of roads that would be used in the colonial period. It was conquered by the Spanish Empire by the 1533 when The Inca emperor was killed and its principal city Cuzco taken.

[4]Also refered "as the birds fly" distance.

[5]This dimension is of great importance for the Peruvian case. As its territory is crossed by the Andean montains, the difficulties of communication between two municipalities is greatly explained by the variation in elevations.

the sources of income of municipalities that are structured as resources directly collected (related to sales or rents from property), credits, donations and transfers, and determinate resources (this is the more important source of income and is composed of transfer related to mining activities and some minor taxes transferred or collected by the municipalities). All income is allocated to the municipality's budget with some specific rules and supervision of expenditure.

Related to the state capacity measure and following the structure of the theoretical model, we need data for the general and local government level. We have several sources to collect the database. First, we collect information about the local level of government from the National Registry of Municipalities (RENAMU) to obtain information about the number of local level employees and state agencies in 2012[6]. But this source is incomplete because the data related to the construction and modernization of schools by the local government is not collected. To complete the data we use the Infrastructure of Education Census (CIE) that is a census of the whole infrastructure of education and specifies the institution that construct or works on modernizations for each school. This information completes the local state agencies dimension. In order to construct the national level we compile databases hold by the largest public institution that provides public services to the municipalities: Ministry of Education (MINEDU), Ministry of Health (MINSA) and Ministry of Internal Order (MININTER). From MINEDU we use the number of state employees used in schools and related activities[7], we use the number of employees working in hospitals administrated by MINSA[8], and the number of policy officers in each municipality is obtained by the MININTER[9].

In order to obtain the outcome variables, we use and process several dataset to obtain a multidimensional analysis of the effects of the state capacity. The vector $\mathbf{Y}_i$ contains measures of productive outcomes at the local level. This last information was quite difficult

[6]This is an extensive mapping of the municipal administration that will allow us to expand the usual definitions of state capacity and to move forward to new measures closer to firms interactions.

[7]This is obtained by the Scholar National Census of 2012.

[8]Obtained by the internal database managed by the Statistics and Informatic Office of the MINSA.

[9]This is obtained by the National Census of commissaries of 2012.

Table 1: Descriptive Statistics

Variables	**Mean**	**Median**	**Std**
Loc. Lev. State Agencies	26.1	17.0	31.0
Loc. Lev. Munic. Empl.	93.0	27.0	259.0
Nac. Lev. Munic. Empl.	396.2	128.0	1078.8
Num. of Formal Firms	1612.3	64.0	7357.2
% of Non-Microfirms	0.034	0.017	0.044
Med. Lifecycle of Firms	5.5	5.6	1.7
Med. Size of Firms	2.6	2.5	1.3
Med. An. Sales/Worker ($)	3206	3054	1548
Num. Colonial Officials	5.3	0.0	97.6
Colonial State Presence Index	0.1	0.0	0.4
Distance to Colonial Roads	48479	25983	74070
Population in 1876 (1000s)	3.6	3.6	3.1
Number of Neighbors	5.9	6.0	2.0
Distance to Neighbors	23.5	18.4	20.1
Elevation diff. with Neighbors	16.2	15.7	8.5
Dist. to Prim. Highways	48.5	26.0	74.1
Dist. to Sec. Highways	18.2	7.6	48.9
Longitude	8796181	8708835	397229
Latitude	442888	391128	310122
Surface	70063	20724	207196
Elevation	2235	2772	1382
An. Average Rainfall	1.336	1.084	0.899
Population (1000s)	15.7	4.6	47.1

to obtain so our approximation to productivity in this kind of disaggregated data is a valuable contribution. We use information of firms data provided by the National Tax Collector Institution (SUNAT) to obtain high quality productive variables as the number of formal firms, the percentage of non-microfirms, the median lifecycle of the formal firms considered, the median size of the firms, and the median sales by worker that is an approximation of the productivity of labor within the firms. The size of the enterprise is calculated using the number of employees and the size of real valued sales reported to the tax institution[10]. Finally, to complement this information, we have data related to the tariff paid by exporting firms to SUNAT, so we extract information related to the FOB per person by municipality. This is a quite nice approximation of productivity and, directly, competitiveness of each municipality in global markets[11]. Preliminary dotplots of state capacity and productive outcomes are shown in figure 1.

To overcome the fundamental endogenity problem of the theoretical model, we follow the strategy of AGR and use historical data as instruments for the present state capacity. By 1793, the anatomy professor of the Real University of San Marcos, Joseph Hipólito Unanue, was commanded to elaborate a general guide of the political state of the Vice royalty of Peru. This guide was structured in three big parts concerning each of the powers in charged of the colony: politics, religion and military. We benefit greatly of this document that specifies the specific location and the number of officials and state administrators present. This "census" provides us the municipality level state agencies and officials - state administrators. The second input obtained to instrument state capacity is obtained from Laviana (1986) who record the specific location of precolonial roads. There is a higher density of colonial roads

[10]There is a high level of formal microfirms in the Peruvian economy, in order to not sub estimate the size of the firms we use two indicators one of which does not include the micro enterprises - firms that has less than 6 workers (OIT, 2006) or in the case of sales the ones that reports sales for lees than 150 UITs. UITs are the annual units of taxes and its approximately 1,100 dollars.

[11]The information is presented as the mean exportation for 2001, 2007 and 2012. For the mining enterprises there is a problem related to the fiscal location of the firm, as they extract mineral in the highlands but they report its operations in Lima. Nevertheless, this indicator has a lot of "zeros" as just a few municipalities have exporting firms. However, for future researh we will scale the municipality level to a provincial level in order to reduce this "zero problem" and estimate our state capacity measures to this important productive outcome measure.

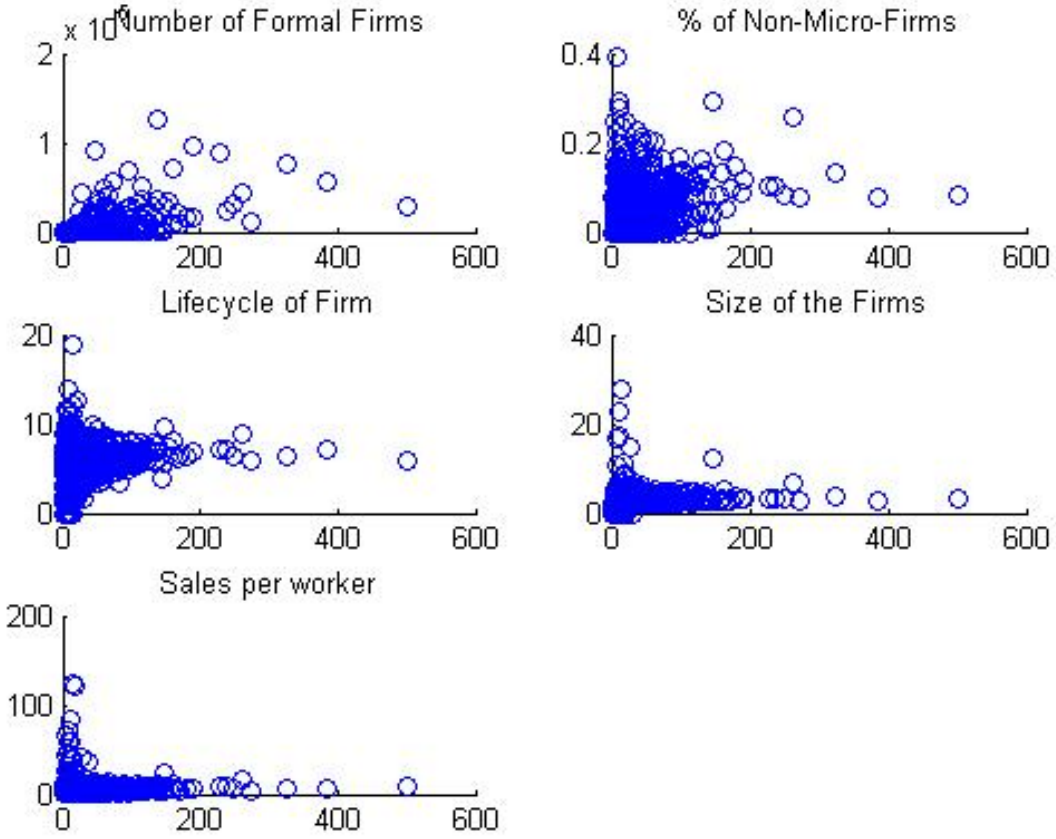

Figure 1: Productive Outcomes and State Capacity

as Peru was the center of the Inca Empire and, then, of the colony. This map is geo-referenced using ArcGis and so, we are capable to calculate the distance of each municipality centroid to the historical royal road. Finally, we collect the population by 1792 as instrument of current population when is necessary given the model.

Table 2: Correlation of Productive Outcomes

Productive Outcomes					
Correlations	N. of Formal Firms	% of Non-Microfirms	Lifecycle of Firms	Size of Firms	Sales per Worker
N. of Formal Firms	1	0.5436	0.4058	0.3359	0.1660
% of Non-Microfirms	0.5436	1	0.3263	0.3415	0.2235
Lifecycle of Firms	0.4058	0.3263	1	0.2313	0.0651
Size of Firms	0.3359	0.3415	0.2313	1	0.0928
Sales per Worker	0.1660	0.2235	0.0651	0.0928	1

In order to structure the network nature of the model, we construct the adjacency matrix

Table 3: Correlation of State Capacity Indicators

	State Capacity				
Correlations	**N. of Loc. State Agen.**	**N. of Loc. State Off.**	**Nat. Gov. Employees**	**% of Executed Budget**	**% of Paved Roads**
N. of Loc. State Agen.	1	0.7718	0.8271	-0.1183	0.0621
N. of Loc. State Off.	0.7718	1	0.8385	-0.0951	0.1709
Nat. Gov. Employees	0.8271	0.8385	1	-0.0957	0.1297
% of Executed Budget	-0.1183	-0.0951	-0.0957	1	-0.0311
% of Paved Roads	0.0621	0.1709	0.1297	-0.0311	1

of municipalities **Adj** based on the geopolitical map reported at the municipal level by the Ministry of Enviroment (MINAM). With this map and using the ArcGis software we georeference our data in order to obtain the coordinates of the centroids and all extension of the borders of each municipality. We clasify neighbors on the basis of adjacency of borders[12]. The second matrix **Dist** is related to the geodesic distance between municipalities and is calculated "as the birds fly" distance between municipality's centroids. This gives as a measure of the strength of connection between two neighbor municipalities. The third matrix is **Elev** and complements the information about the strength of connection between municipalities. Both matrixs will give a better measure of the difficulties in transportation and communication between municipalities that is central in this network framework.

Finally, we include a set of covariates to control for specific characteristics of each municipality. First, we control for the distance to the nearest highway using the database provided by the Ministry of Transportation and Communication (MTC). Second, we add geographical variables like the longitude, latitude, surface area and the elevation[13] of the centroid of the municipality; all information is collected from the municipality level map from MINAM. Finally, we use the data of population from the Development Program of the United Nations. This set of covariates represent our baseline model for estimation. In later sections we will add other covariates to test the robustness of our estimates to the inclusion of fundamental controls of the Peruvian case.

Table 2 and 3 present preliminary correlations between the two important categories of our work. For productive outcomes, measures seem to be correlated but not strongly corre-

[12]Even if two municipalities are adjacent in just one point they are denominated as neighbors.
[13]The data is collected from SRTM 90m Digital Elevation Database v4.1

lated. This means that each dimension carries out independent information about firms that can be studied and interrelated to state capacity. For state capacity correlations, the dimensions seems to be strongly correlated for the number of local state agencies, municipality employees and national determined state employees. This high correlation with nationally determined national state employees prevent us to estimate it as a control and, then, we will study this national state capacity in the general model only.

Empirical Strategy

The structural model presented yields specifications based on the dynamics on how state capacity investments are done. Onwards, both cases are empirically tested using instrumental variables method within an network framework and correcting for spatial correlation in the standard errors. First, we explore the specific case where state capacity investments are taken entirely by local authorities. The general model estimation is left for future improvements of this work.

State Capacity as Local Investment ($\alpha = 1$)

The first case analyzed is related to federal decentralized economies where municipality decision are highly important in the economic outcomes of the territory. Incorporating the assumption of $\alpha = 1$, the first order conditions reduce to:

$$y_i = \frac{\kappa_i}{\theta} + \frac{\phi}{\theta}\mathbf{H_i}(\delta)\mathbf{y} \tag{16}$$

and using the definition of κ_i:

$$y_i = \frac{\phi}{\theta}\mathbf{H_i}(\delta)\mathbf{y} + \frac{g(\mathbf{c_i}\varphi + \mathbf{x_i}\beta)}{\theta} + \lambda_i^D + \frac{\xi_i}{\theta} \tag{17}$$

Which shows a linear relationship between state capacity and neighbors state capacity.

The second term of the right hand side is interpreted as the endogenous reaction of own state capacity when neighbors state capacity changes. Rearranging and replacing this expression on equation 10 gives the reduced form expression for welfare outcome on state capacity:

$$p_i^j = \theta y_i^2 + \rho^j \mathbf{H_i}(\delta)\mathbf{y} + u_i^j \tag{18}$$

and using the definition of u_i^j:

$$p_i^j = \theta y_i^2 + \rho^j \mathbf{H_i}(\delta)\mathbf{y} + \mathbf{x_i}\beta_{\mathbf{u}}^{\mathbf{j}} + \Lambda_i^{Dj} + \epsilon_i^j \tag{19}$$

This reduced form equation obtained from the model shows that a linear regression of productive outcomes on state capacity is poorly specified and may conducts to inconsistent estimation of the real parameters. In order to identify all model parameters we need the estimation of both equations. From equation 19 we obtain θ and then, from equation 17 we recuperate κ_i and ϕ which are the relevant parameters of our framework. In order to estimate the model we follow an IV approximation estimating both equations separately. For future work we will estimate all equations (productive outcomes and best response equations) in a system GMM for gains in efficiency. As the covariates of both equations are endogenous, provided by the nature of the model, we use historical instruments to consistently estimate this relationship (Acemoglu, Garcia-Jimeno and Robinson, 2015). Next, we discuss the exclusion restrictions that support the estimation.

Exclusion Restrictions

Given the endogenous nature of state capacity determination, we need to board this issue in order to obtain consistent identification. From equation 19 we have clearly the problem that $corr(y_i, \epsilon_i^j) \neq 0$ and $corr(\mathbf{H_i}(\delta)\mathbf{y}, \epsilon_i^j) \neq 0$ following the theoretical model. As error terms collect all omitted information, sources not considered affecting prosperity will affect the determination of state capacity (first issue) and, as the framework is based on a net-

work and this factors are highly spatially correlated (i.e.the errors of two municipality are correlated), state capacity of neighbors is also endogenous (second issue). Furthermore, in order to identify completely the model parameters, we need to estimate equation 17 where $corr(\mathbf{H_i}(\delta)\mathbf{y}, \xi_i) \neq 0$ is also a problem. Following the strategy held by AGR, we rely on historical state capacity to recuperate exogenous variations of present state capacity. Historical state capacity investments are likely to represent different costs of building state presence across municipalities but, also, different motivations of colonial authorities (Lohman, 1957; Assadourian, 1982). Also, we need to justify that this historical state presence is not related to present productive outcomes which is an assumption highly plausible once we control for geographical characteristics.

Table 4: Within Deparment Correlation of Historical State Presence

Distance to colonial roads			Colonial officials			Colonial state agencies		
Own	Neig.	Neig. of Neig.	Own	Neig.	Neig. of Neig.	Own	Neig.	Neig. of Neig.
1.00	-0.12	-0.14	-0.42	-0.21	-0.11	-0.34	-0.15	-0.03
-0.12	1.00	0.63	0.01	0.18	0.21	0.03	0.13	0.17
-0.14	0.63	1.00	0.02	0.24	0.19	0.04	0.19	0.13
-0.42	0.01	0.02	1.00	-0.01	-0.04	0.68	-0.01	-0.04
-0.21	0.18	0.24	-0.01	1.00	0.03	-0.01	0.67	0.00
-0.11	0.21	0.19	-0.04	0.03	1.00	-0.03	0.00	0.70
-0.34	0.03	0.04	0.68	-0.01	-0.03	1.00	0.02	-0.03
-0.15	0.13	0.19	-0.01	0.67	0.00	0.02	1.00	-0.01
-0.03	0.17	0.13	-0.04	0.00	0.70	-0.03	-0.01	1.00

The location of colonial state in the Peruvian vice royalty is clearly related to extractive institutions (Acemoglu and Robinson, 2012; Dell, 2010; Engerman and Sokoloff, 1997). The characteristics of the state they build up in each municipality was associated to the stock of minerals, the location of indigenous labor force, idiosyncratic factors about the distribution of "encomiendas" and the location of the bigger settlements. This factors are clearly relating to productive outcomes but only through the capacity of state build up in each place (this is highly plausible since market institutions in Peruvian territory where non-existent, and so,

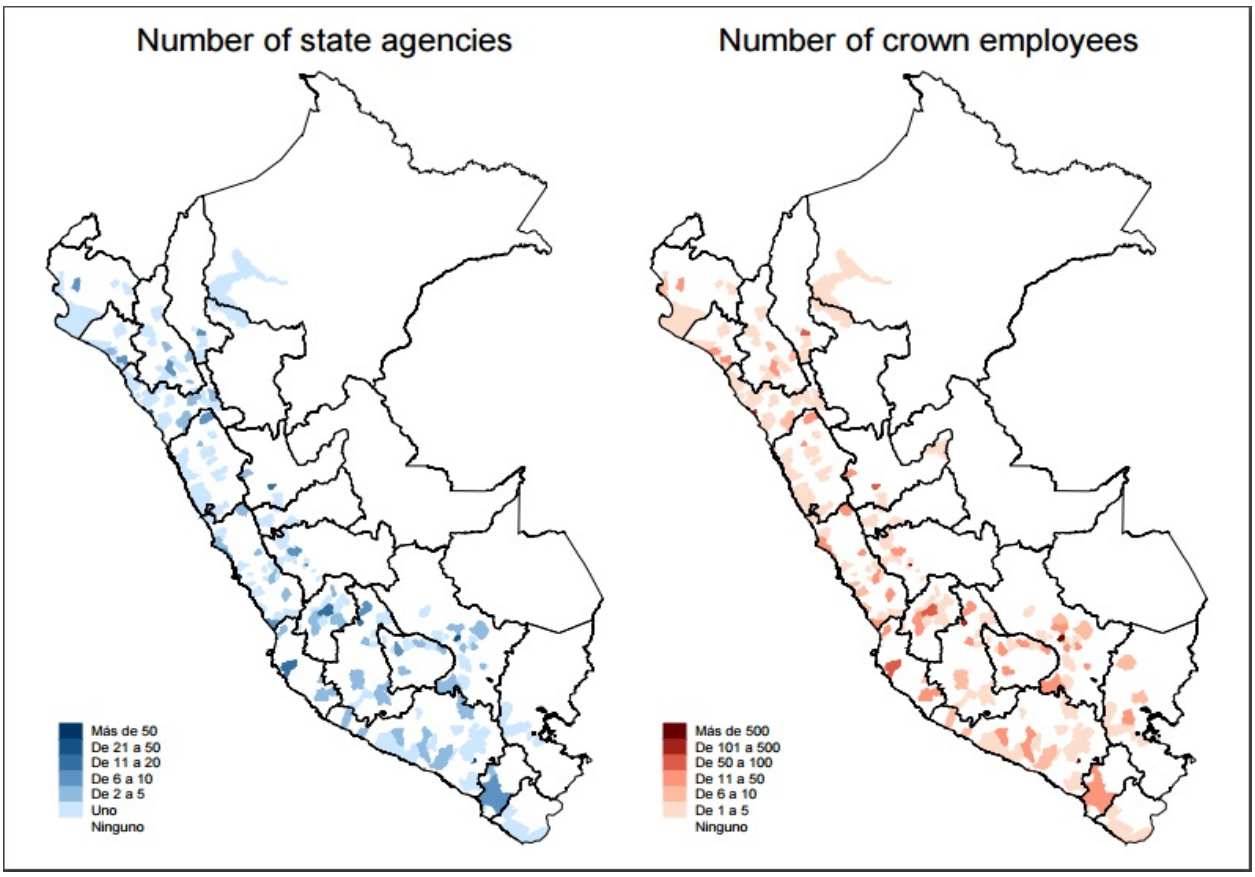

Figure 2: Colonial State Presence

the state was an important actor in each municipality). In figure 2 the maps of historical state presence are presented. In both cases, colonial officials and state agencies are concentrated around areas of the kind mentioned above. This shows that the colonial goals where guided by different motivations and so expressed in the distribution of state presence in the territory. Also, the distribution of state presence is qualitatively different for each kind of municipality. Mining municipalities needed a different state that Spanish settlements. The former was more intensive in tax officials and military troops to assure the assistance of labor into mines (Dell, 2010). The last was more intensive in administrative issues of a Spanish settlement. We think that none of this factors are relevant for present productive outcomes except through state presence. Summing up, we argue that $corr(c_i, \epsilon_i^j) = 0$ and $corr(\mathbf{H_i}(\delta)\mathbf{c}, \epsilon_i^j) = 0$. For neighbors, as is shown in figure 2 and table 4; the colonial state capacity is highly concentrated in some specific municipalities, this means that the effect of state capacity

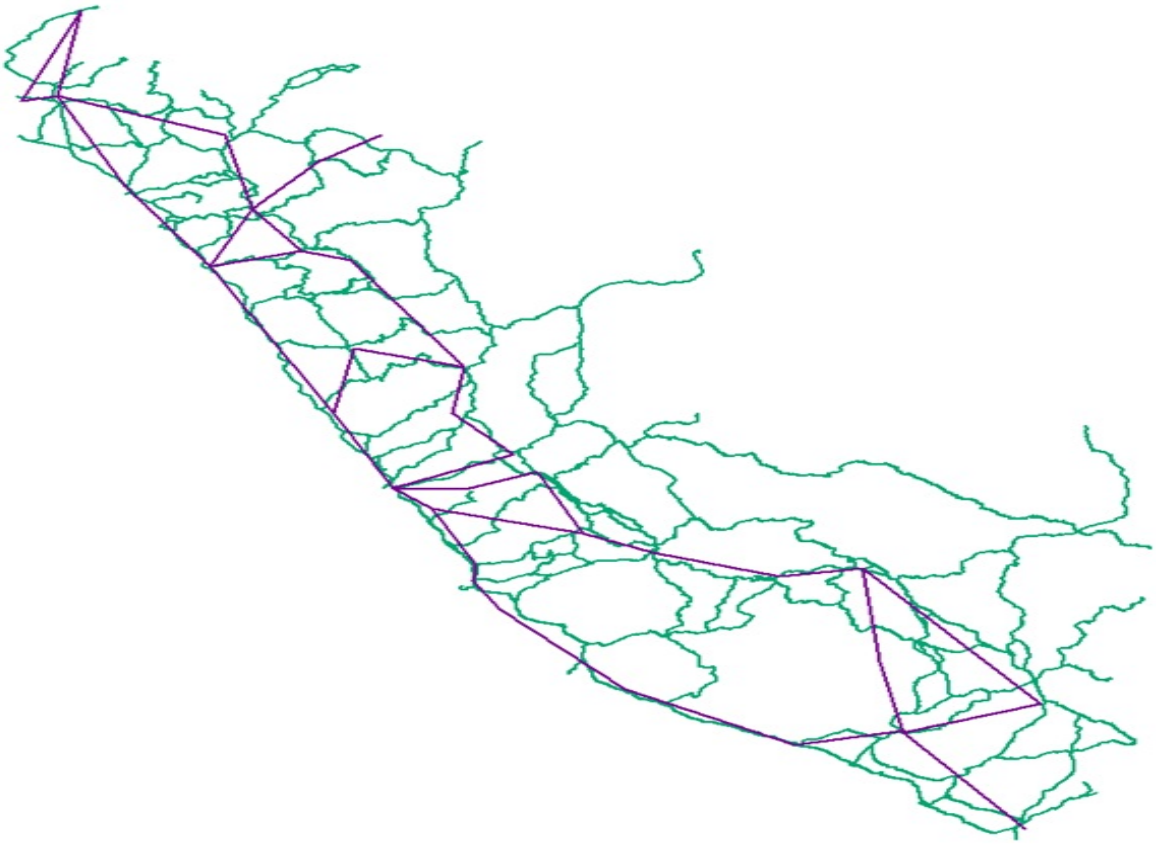

Figure 3: Colonial and Present System of Roads

of neighboring municipalities on present productive outcomes is also not related to present productive outcomes. Table 4 and below estimations show this statement.

The third instrument we use is the distance to colonial roads. This colonial roads were used by commercial routes within Peruvian territory or beyond for the case of commerce with other parts of the vice royalty (Glave, 1989). This roads were used by "arrieros" that transport goods using the newly mixture of animal they called "mula". As the transportation using "mulas" is far more flexible, this network was only partially used by present engineering standards as is shown in figure 3. This network no longer reflects the system of present transportation and communication, the distance of municipalities to colonial roads would reflect a third variable of historical state presence but this will not be related to present productive outcomes.

Estimation Outputs - Instrumental Variables

Two stage instrumental variables method is used to test our model predictions about state capacity on productive outcomes. As a parametric method, we will assume values for the coefficients of the network matrix (i.e. δ_1 and δ_2 equals 1) and a linear functional form for state efficiency (i.e. $g(\mathbf{c_i}\varphi + \mathbf{x_i}\beta) = a + \mathbf{c_i}\varphi + \mathbf{x_i}\beta$). In table 5 the results for the OLS and IV estimation of equation 17 are presented[14]. In both cases our baseline estimation include as controls latitude, longitude, surface area, elevation, average rainfall, distance to current primary highways, distance to current secondary highways, population, dummy variables for each department and a dummy variable for department capital. We include the historical variables of state presence and distance to royal roads as instruments for the first stage and final stage of best response equation. For IV outcomes we use the same controls for the second stage and, for the first stage, we instrument neighbors state capacity with historical neighbors state capacity, neighbors distance to royal roads, and we also include the idea of Bramoulle, Djeebari, and Fortin's (2009) of using neighbors of neighbors variables applied to historical state capacity for instrumentation of present neighbors state capacity.

As this is a network framework, errors are corrected using the robust spatial correlation variance matrix. This is build using a different matrix of variance of residuals and plug-in in the robust variance matrix of the IV framework[15].

In table 5 we present our baseline estimates of the best response function between municipalities using preliminary OLS and the IV output that controls by current population. All

[14]For our instrumental variables estimation we also instrument current population with the population of the National Census of 1876. The results are quite similar in almost every case in the best response equation and productive outcome estimations.

[15]The robust variance matrix of the IV estimator is:

$$(X'Z(Z'Z)^{-1}Z'X)^{-1}X'Z(Z'Z)^{-1}Z'\hat{W}Z(Z'Z)^{-1}Z'X(X'Z(Z'Z)^{-1}Z'X)^{-1}$$

Then, spatial correlation is considered in the construction of $\hat{W}$ as:

$$\hat{W} = (\xi_i\xi_i') * I + \frac{2}{3}\left\{\left[(\xi_i\xi_i') * H(\delta)\right] + \left[(\xi_i\xi_i') * H(\delta)\right]^{-1}\right\} + \frac{1}{3}\left\{\left[(\xi_i\xi_i') * H^2(\delta)\right] + \left[(\xi_i\xi_i') * H^2(\delta)\right]^{-1}\right\}$$

Again, * denotes element by element multiplication

reported estimates are the final average marginal effects and the standard errors in parentheses are obtained by delta method using the covariance matrix corrected by spatial correlation (Conley, 1996) but restricting to the network nature of the model[16]. When the number of state agencies is used, the estimates show that there is no response between the investments in state capacity by local levels. Nevertheless, when we use the number of municipality employees results are positive and highly significant. This gives us evidence of strategic complementarity in the municipality decisions that is weak enough to assure the existence of a unique equilibrium in the theoretical model. This difference could be related by the kind of state capacity we are considering in the construction of the variable[17].

In order to interpret the results, for one neighbor municipality moving from the median of employees (27) to the mean (93) gives an increment of 1.4% in own state capacity. Two appraisals on this results are a) this is only the direct effect that one neighboring municipality causes in own state capacity (this do not take into account the effect in common neighbors response and the feedback effect of the own response); b) this results clarify the importance of having a weak level of complementarity and a convex cost function to obtain a unique equilibrium for the model. The rest of variables relates colonial state presence to current state capacity, a higher colonial state presence is highly significant and positively related to current state capacity (due to collinearity when agencies, officials and distance to colonial roads are included; we choose this especification of the model to overcome wrong signs and not significance). For first stage of the endogenous variable $\mathbf{H_i}(\delta)\mathbf{y}$, results show that instruments used have the correct sign in every case and are highly significant. Neighbors and neighbors of neighbors colonial state presence is associated with higher levels of current neighbors state presence for both measures of state capacity used. This give us confidence about the relevance of our instruments used.

Next, estimation of productive outcomes on state capacity are presented in table 6. The

[16]This means that the covariance matrix is constructed using the $H(\delta)$ matrix which restricts the effect of each municipality to the adjacent ones

[17]For future work, we will construct a more firm related state capacity to test this sub-game.

Table 5: Best Response Estimations

State Capacity Mesured as:	**Num. of Loc. Agen.**		**Num. of Mun. Employees**	
Estimation Method	**OLS**	**IV**	**OLS**	**IV**
Final Stage:				
ds_i/ds_j	-0.0012	-0.0002	0.0043	0.0036
	(0.0011)	(0.0013)	(0.0012)	(0.0012)
ds_i/d(Colon. State Off.)			0.0743	0.0735
			(0.0198)	(0.0196)
ds_i/d(Colon. State Agen.)	0.1274	0.1318		
	(0.0443)	(0.0449)		
ds_i/d(Colon. State dist. to colon. roads)	-0.0104	-0.0102	0.0464	0.0467
	(0.0268)	(0.0268)	(0.0344)	(0.0344)
First Stage: For Hi(δ) y				
Neig. State Off.				0.8397
				(0.1705)
Neig. State Agen.		1.7698		
		(0.3579)		
Neig. Dist. to royal roads		-3.3542		-4.6715
		(0.5631)		(0.9567)
Neig. of Neig. State Off.				0.8743
				(0.2803)
Neig. of Neig. State Agen.		1.886		
		(0.5343)		
Neig. of Neig. Dist. to royal roads		0.184		0.1227
		(0.325)		(0.5131)
Colonial State Off.				0.0025
				(0.0371)
Colonial State Agen.		-0.0534		
		(0.0456)		
Colonial State Dist. to royal roads		0.3652		0.5501
		(0.0783)		(0.1315)
R^2		0.7348		0.7492
F-test for excl. instr.		66.58		73.15
F-test P-value		0		0
Overiden. Test statistics		7.3490		12.7802
Chi-squared p-value		0.0616		0.0051
Log Population		Control		Control

outcomes evaluated are the number of formal firms, the percentage of non-microfirms, the median lifecycle of the firm, the median size of the firms and the median sales by worker of the firms; using preliminary OLS and IV methods. For IV method we use two first stage estimations, one for own state capacity and the other for neighbors state capacity that are not presented for the ease of presentation[18]. In all cases we present the marginal effects for own state capacity ($2\theta y$), for one neighbor municipality ($\rho^j average(\mathbf{H_i})$) and the spatially corrected standard errors in parentheses. Firstly, the number of formal firms is positively and affected by state capacity using both measures of state capacity and in both estimation methods. This effect is significantly different from zero. For state agencies, a 1% increase in state capacity is associated to a 0.7% increase in the number of formal firms. Using the number of municipality employees, a 1% increase in state capacity is associated to a 0.5% increase in the number of formal firms. In both cases we confirm our model predictions that state capacity favors the formation of formal firms. Related to the direct effect of neighbors, we only obtain significant positive results for state agencies. In this case, the effect of a 1% increase in neighbors state capacity is related to 0.02% increase in own number of formal firms (using the results of best response estimates, there is no feedback response between municipalities).

The second dimension explored is the effect of state capacity on the percentage of non-microfirms. Here the own effect is smaller but the neighbor effect is larger; in both cases positives and highly significant. For both state capacity dimensions we obtain an increase of 0.4% and between $0.02\% - 0.01\%$ when own and neighbor state capacity increases 1%, respectively. This is a second dimension in accordance with our theoretical model if we interpret the continuum of entrepreneurs as a continuum of microbusiness which size growth as state invest in public goods and services. The third dimension studied is related to the median lifecycle of the firms. In almost all cases we have positive and significant marginal effects. For both state capacity dimensions we obtain an increase between $0.5\% - 0.3\%$ and

[18]The first stage for y_i^2 and $\mathbf{H_i}(\delta)\mathbf{y}$ considers a polynomial specification of forth grade in the colonial instruments. This is used to exploit the nonlinear relationship of the final form equation of the model.

0.01% when own and neighbor state capacity increases 1%, respectively.This is in accordance with our theoretical model if we interpret this static model as the decisions made within the electoral cycle of a mayor, and so each electoral period implies a decision of the firms of whether to stay or exit the productive economy. Note that this dimension is right-censored, we do not see the closure of all firms, so we are actually sub estimating the effect of state capacity on the lifecycle of the firm.

The forth dimension studied is related to the median size of the firms. For both state capacity dimensions we obtain an increase between $0.7\% - 0.3\%$ and 0.01% when own and neighbor state capacity increases 1%, respectively.This is in accordance with our theoretical model giving the same explanation hold in the percentage of non-microfirms. Finally, when the sales by worker measure is taken into account, estimates are not statistically different from zero. This means that state capacity do not seems to be a good predictor of this approximate measure of productivity.

As a final step of this baseline estimation table 7 offer a resume and a comprehensive look at the direct effect of own state capacity in the productive outcomes of formal firms. As mentioned, there are three main channels through which state capacity affects firms, 1) the direct own effect, 2) the direct effect of neighbors state capacity on own firms, and 3) the indirect effect of neighbors state capacity across the optimal response of own state capacity. As our preliminary estimates do not show peer effects in all cases (2) and, also, for state agencies the optimal response is not significantly (3); we decide to show only the first type of effect and so, the counterfactuals may be interpreted as subestimated effects. Table xxxx shows the direct effect on the number of formal firms, percentage of non-microfirms, median lifecycle of the firms and median size of the firms of a change on the state capacity indicators. We try two experiments one for each state capacity measure. First, we study an increase of 10 municipality employees on the median number of state capacity employees. The effects of this change on productive outcomes are an increase of eleven formal firms on the median number of formal firms, an increase of 0.21% in the percentage of non-microfirms,

Table 6: Productive Outcomes Estimation

State Capacity Measured as:	**Num. of Loc. Agen.**		**Num. of Mun. Employees**	
Prod. Outcome Measured as:	**Number of Formal Firms**			
Estimation Method	**OLS**	**IV**	**OLS**	**IV**
Final Stage				
dp_i/ds_i	0.633	0.6993	0.524	0.4688
	(0.0282)	(0.1292)	(0.0145)	(0.0665)
dp_i/ds_j	0.0058	0.0038	-0.0008	-0.0014
	(0.0016)	(0.0016)	(0.001)	(0.0012)
Prod. Outcome Measured as:	**Percentage Non-Microfirms**			
Estimation Method	**OLS**	**IV**	**OLS**	**IV**
Final Stage				
dp_i/ds_i	0.1949	0.3872	0.2377	0.3516
	(0.034)	(0.1896)	(0.0224)	(0.1219)
dp_i/ds_j	0.0181	0.0173	0.0110	0.0085
	(0.0038)	(0.0039)	(0.0024)	(0.0027)
Prod. Outcome Measured as:	**Median Lifecycle of firms**			
Estimation Method	**OLS**	**IV**	**OLS**	**IV**
Final Stage				
dp_i/ds_i	0.1305	0.463	0.1563	0.3039
	(0.0317)	(0.1548)	(0.0207)	(0.0928)
dp_i/ds_j	0.0056	0.0059	0.0024	0.0013
	(0.0019)	(0.0024)	(0.0012)	(0.002)
Prod. Outcome Measured as:	**Median Size of firms**			
Estimation Method	**OLS**	**IV**	**OLS**	**IV**
Final Stage				
dp_i/ds_i	0.127	0.6601	0.1105	0.3359
	(0.0337)	(0.2091)	(0.0259)	(0.0908)
dp_i/ds_j	0.0133	0.0110	0.0085	0.0046
	(0.0047)	(0.0042)	(0.0031)	(0.0028)
Prod. Outcome Measured as:	**Median Sales by worker of Firms**			
Estimation Method	**OLS**	**IV**	**OLS**	**IV**
Final Stage				
dp_i/ds_i	0.0166	0.0003	0.0394	0.0003
	(0.0366)	(0.1221)	(0.0276)	(0.1221)
dp_i/ds_j	0.0033	0.0056	0.0026	0.0056
	(0.0021)	(0.0022)	(0.0013)	(0.0022)

an increase of more than 7 months in the median lifecycle of firms and an increase of 0.3 workers in the median size of the firms. Second, we study an increase of 5 local state agencies on the median number of local state agencies. In this case we obtain an increase of thirteen formal firms on the median number of formal firms, an increase of 0.19% in the percentage of non-microfirms, an increase of more than 8 months in the median lifecycle of firms and an increase of 0.5 workers in the median size of the firms. Remembering that this is not taking into account the peer effects, the impact on productive outcomes seems to be importants.

Table 7: Counterfactuals - only direct effect of own state capacity

State capacity	Productive Outcome	Med. of state capacity	Change in state capacity	% of change in state capacity	% of change in Prod. outcome	Med. of Prod. outcome	Final Prod. outcome
Municipality officials	Num. Formal Firms	27	10	37.0%	17.4%	64	75
	% of non-microfirms	27	10	37.0%	13.0%	1.67%	1.88%
	Lifecycle of firms	27	10	37.0%	11.3%	5.6	6.2
	Size of firm	27	10	37.0%	12.4%	2.5	2.8
Local State Agencies	Num. Formal Firms	17	5	29.4%	20.6%	64	77
	% of non-microfirms	17	5	29.4%	11.4%	1.67%	1.86%
	Lifecycle of firms	17	5	29.4%	13.6%	5.6	6.3
	Size of firm	17	5	29.4%	19.4%	2.5	3.0

Estimation Outputs - Falsification Test

Our baseline estimates show that state capacity has a significative and important effect over several productive outcomes analyzed. Nevertheless, we need to justify that our results are not affected by non observables that will lead to inconsistency in state capacity coefficient. Until now, we argue that state capacity is affected by historical state capacity, but also that our productive outcomes are affected by this historical measure only through its effect over present state capacity. Another possible argument is that historical state capacity affect historical welfare outcomes and this initial positive impact is persistent over time. This means that there is another factor affecting both state capacity and current productive outcomes: the persistent distribution of historical welfare. In this subsection we test this assertion empirically.

To empirically evaluate this statement, we use one of the first national census carry out in Peru. The census of 1876 shed light on the racial distribution of the population

and indicators of welfare like illiterate population, number of people that could read and write. This historical source helps us to evaluate the impact of historical state capacity (our instruments) on the initial welfare for the set of municipalities that existed in that time[19]. The set of controls included in this first estimation was geographical variables like latitude, longitude, surface, elevation, rainfall, departmental dummys, department capital dummy, and historical population. The second estimation examines the persistence of this initial welfare. We evaluate how our productive outcomes are explained by this initial welfare measures using as additional controls the variables used in our baseline estimation.

Table 8: Falsification Test Over Historical Prosperity Channel

Historical Welfare and Instruments						
Historical Welfare	**Illiterate Pop 1876**	**Reading Pop 1876**	**Writing Pop 1876**	**Illiterate Pop 1876**	**Reading Pop 1876**	**Writing Pop 1876**
Method	**OLS**	**OLS**	**OLS**	**OLS**	**OLS**	**OLS**
Neig. Col. Off.	-0.0344	-0.0144	0.0487	-0.0122	-0.0155	0.0276
	(0.0719)	(0.0204)	(0.0653)	(0.0728)	(0.0207)	(0.0661)
Neig. Col. Agen.	0.132	-0.0126	-0.120	0.0834	-0.0101	-0.0734
	(0.243)	(0.0688)	(0.221)	(0.244)	(0.0692)	(0.221)
Neig. Dist. Col. Roads	0.0312	-0.00815	-0.0232	-0.00839	-0.00615	0.0144
	(0.0435)	(0.0123)	(0.0395)	(0.0485)	(0.0138)	(0.0440)
Neig. Of Neig. Col. Off.	-0.0142	-0.0257	0.0401	-0.00613	-0.0261	0.0324
	(0.0941)	(0.0267)	(0.0855)	(0.0941)	(0.0267)	(0.0854)
Neig. Of Neig. Col. Agen.	0.161	0.0675	-0.229	0.137	0.0687	-0.206
	(0.326)	(0.0922)	(0.296)	(0.325)	(0.0924)	(0.295)
Neig. Of Neig. Dist. Col. Roads	0.0695	-0.0168	-0.0526	0.103*	-0.0185	-0.0849*
	(0.0518)	(0.0147)	(0.0471)	(0.0550)	(0.0156)	(0.0499)
Control for hist. Pop.	No	No	No	Yes	Yes	Yes
Observations	602	602	602	602	602	602
F-Test for joint signif.	25.31	7.01	23.27	24.79	6.80	22.82
F-Test p-value	0.00	0.00	0.00	0.00	0.00	0.00
R-squared	0.603	0.296	0.583	0.605	0.296	0.585

Historical Welfare and Current Welfare					
Current Welfare	**N. Formal Firms**	**Perc. Of non-microfirms**	**Med. Lifecycle**	**Med. Size**	**Med. Sales x Worker**
Method	**OLS**	**OLS**	**OLS**	**OLS**	**OLS**
Illiterate Pop. 1876	-28.98	3.243	1.368	12.97	20.29
	(233.9)	(5.859)	(221.0)	(180.1)	(40.70)
Reading Pop. 1876	-35.35	3.157	-1.155	8.816	20.45
	(234.0)	(5.863)	(221.1)	(180.2)	(40.72)
Writing Pop. 1876	-26.42	3.307	3.186	13.30	20.47
	(233.8)	(5.857)	(220.9)	(180.0)	(40.68)
Control for pop.	Yes	Yes	Yes	Yes	Yes
Observations	602	602	602	602	602
F-Test for joint signif.	28.71	12.82	3.44	2.71	2.35
F-Test p-value	0.00	0.00	0.00	0.00	0.00
R-squared	0.625	0.427	0.166	0.136	0.120

Table 8 presents the two exercises described, the initial effect of historical state capacity on historical welfare and how this historical welfare persisted over time and affect current productive outcomes of firms. Our results satisfactorily falsifies the rival hypothesis that it is persistent welfare that accounts for current productive outcomes. In the first panel of table

[19]In 1876, Peru was conformed by 602 municipalities distributed across the territory. We do not include in this count the municipalities of the provinces of Arica and Tarapaca that were lost years later in the Pacific War against Chile.

8, we do not obtain significance in any case (moreover, estimations presents contradictory signs), that is, the relationship of historical state capacity and historical welfare is not statistically different from zero (this result is agrees with the explanation advanced in the exclusion restriction subsection). In the second panel of table 8 we evaluate the persistence of historical welfare on current productive outcomes. As it can be seen, results demonstrates that this persistence is not significant as an explanation of current welfare in all cases. This important results give us confidence about the channel of causation in the model estimated.

Estimation Outputs - Specification Test

The reduced form equations estimated so far were obtained from the structural model developed above. Now we compare our baseline estimation outputs with a simpler misspecified reduced form relationship between the productive outcomes analyzed and state capacity in its two measures. The equations estimated will include two variants of specifications linear in state capacity, with interaction (equation 20) and without interaction (equation 21).

$$p_i = \kappa_i y_i + \phi y_i \mathbf{H_i}(\delta)\mathbf{y} + \rho \mathbf{H_i}(\delta)\mathbf{y} + X_i\beta_u + \Lambda_i^D + \epsilon_i \tag{20}$$

$$p_i = \kappa_i y_i + \rho \mathbf{H_i}(\delta)\mathbf{y} + X_i\beta_u + \Lambda_i^D + \epsilon_i \tag{21}$$

Table 9 presents all estimations results of our linear specifications. The covariates included are the same as in our baseline model. As it can be seen, all marginal effects obtained in linear specification 21 are very similar to the ones obtained in our baseline model (as our empirical strategy works based on two separate equations that estimates the interaction and the final effect independently). Moreover, when we estimate the interaction equation and calculates the marginal effects[20], the impact of neighbors on own state capacity increases

[20]As was mentioned above, standard errors of marginal effects are calculated using the delta method applied to the spatially robust covariance matrix adapted to our network framework.

Table 9: Specification Test for Productive Outcomes Estimations

Productive Outcomes depending on linear relationship with State Capacity					
State Measured as:	**Loc. Level State Agencies (Linear with Interactions)**				
Welfare Measured:	**Num. of Formal Firms**	**% of Non-Microfirms**	**Median Lifecycle**	**Median Size of Firms**	**Median Sales by Worker**
Method:	**IV**	**IV**	**IV**	**IV**	**IV**
dp_i/ds_i	0.8097	0.4828	0.3793	0.6162	-0.0759
	(0.0965)	(0.1533)	(0.1477)	(0.1504)	(0.0718)
dp_i/ds_j	0.1838	0.1057	0.0754	0.1029	-0.0193
	(0.0238)	(0.0538)	(0.0326)	(0.0456)	(0.0112)
Observations	1746	1734	1746	1735	1734
State Measured as:	**Loc. Level State Agencies (Linear without Interactions)**				
Welfare Measured:	**Num. of Formal Firms**	**% of Non-Microfirms**	**Median Lifecycle**	**Median Size of Firms**	**Median Sales by Worker**
Method:	**IV**	**IV**	**IV**	**IV**	**IV**
dp_i/ds_i	0.6969	0.3052	0.4015	0.6193	-0.1177
	(0.1235)	(0.1833)	(0.1618)	(0.1735)	(0.0885)
dp_i/ds_j	0.0054	0.0183	0.0063	0.0113	-0.0006
	(0.0018)	(0.0042)	(0.0025)	(0.0045)	(0.0011)
Observations	1746	1734	1746	1735	1734
State Measured as:	**Municipality State Officials (Linear with Interactions)**				
Welfare Measured:	**Num. of Formal Firms**	**% of Non-Microfirms**	**Median Lifecycle**	**Median Size of Firms**	**Median Sales by Worker**
Method:	**IV**	**IV**	**IV**	**IV**	**IV**
dp_i/ds_i	0.6905	0.5521	0.3003	0.4819	-0.0383
	(0.0475)	(0.1137)	(0.1047)	(0.0847)	(0.0473)
dp_i/ds_j	0.1695	0.1387	0.0764	0.1079	-0.0136
	(0.0108)	(0.0293)	(0.0205)	(0.0210)	(0.0086)
Observations	1746	1734	1746	1735	1734
State Measured as:	**Municipality State Officials (Linear without Interactions)**				
Welfare Measured:	**Num. of Formal Firms**	**% of Non-Microfirms**	**Median Lifecycle**	**Median Size of Firms**	**Median Sales by Worker**
Method:	**IV**	**IV**	**IV**	**IV**	**IV**
dp_i/ds_i	0.6388	0.4032	0.3659	0.4536	-0.0786
	(0.0828)	(0.1609)	(0.1176)	(0.1005)	(0.0784)
dp_i/ds_j	0.0004	0.0101	0.0024	0.0053	-0.0000
	(0.0011)	(0.0029)	(0.0019)	(0.0030)	(0.0007)
Observations	1746	1734	1746	1735	1734

considerable as it takes into account the weighted effect of all neighbors.

This results give us confidence that estimation results are not functional form dependent and, also, that our reduced form equations obtained are good approximations of real dynamics.

Estimation Outputs - Robustness

As was mentioned, the Peruvian case has some special features related to its cultural diversity, geographical obstacles and mining activities that are important for the performance of firms. For example, The Andean mountains suppose great efforts in the logistic of firms related to the transportation of inputs or outputs to the market. This is more intense for the municipalities located near this mountain range. Second, indigenous population tend to focus in agricultural and commerce activities. Also, there are claims that this share of Peruvian population is continuously forgotten in the provision of public goods by central authorities and so conditioned in its performance in labor markets (Figueroa, 2003). Third, the mining activities are important activities that affect the overall growth of the economy. In general, the exploitation is carry out by large foreign firms usually established in highlands. The impact of mineral activities has been extensively studied by many authors like Loayza and Rigolini (2015), Aragon and Rud (2013), and Escobal and Ticci (2015).

All this dimension are not explicitly considered in the baseline model, and so they are included in the error term. As is mentioned above, it is highly plausible that this error term will be correlated to our relevant covariates in the baseline specification driving to inconsistent coefficients. In this section we test for all this factors in tables 10 and 11 in order to evaluate the robustness of our results. In table 10 we present the marginal effects of state capacity measured as state agencies on the different dimensions of productive outcomes. The same marginal effects for the case of municipality employees are presented in table 11. In both cases we study 5 different variations on controls. First we keep all the controls of the baseline model except the distance to the present highways. Second we keep all the baseline

controls and we include geographical controls like share of agriculture suitable lands, share of protected lands, mean slope of the surface, the natural region to which belongs and the density of rivers at the municipality. Our third case include all controls of the second case and the share of indigenous or native population is included. The forth case keep all controls of second case and include the intensity in mining in the municipality. Finally, our last case includes all controls of second case, the share of indigenous population and the intensity in mining.

Table 10: Robustness Evaluations I

State Measure	**Loc. Level State Agencies**				
Controls	**Without controlling for distance to current highways**				
Welfare Measured:	**Num. of Formal Firms**	**% of Non-Microfirms**	**Median Lifecycle**	**Median Size of Firms**	**Median Sales by Worker**
Method:	**IV**	**IV**	**IV**	**IV**	**IV**
dp_i/ds_i	0.8299	0.4379	0.4022	0.7057	-0.1304
	(0.1312)	(0.1854)	(0.1544)	(0.1941)	(0.1050)
dp_i/ds_j	0.0085	0.0202	0.0051	0.0115	-0.0004
	(0.0021)	(0.0039)	(0.0025)	(0.0038)	(0.0012)
Observations	1746	1734	1746	1735	1734
Controls	**Controlling for current highways, geographic and landscape covariates**				
Welfare Measured:	**Num. of Formal Firms**	**% of Non-Microfirms**	**Median Lifecycle**	**Median Size of Firms**	**Median Sales by Worker**
Method:	**IV**	**IV**	**IV**	**IV**	**IV**
dp_i/ds_i	0.8584	0.4728	0.5491	0.597	-0.1366
	(0.1101)	(0.1952)	(0.2037)	(0.1521)	(0.1007)
dp_i/ds_j	0.0045	0.0088	0.0073	0.0058	-0.0021
	(0.0031)	(0.0046)	(0.0047)	(0.0047)	(0.0018)
Observations	1692	1680	1692	1681	1680
Controls	**Controlling for current highways, geographic, landscape and indigenous population share covariates**				
Welfare Measured:	**Num. of Formal Firms**	**% of Non-Microfirms**	**Median Lifecycle**	**Median Size of Firms**	**Median Sales by Worker**
Method:	**IV**	**IV**	**IV**	**IV**	**IV**
dp_i/ds_i	0.8237	0.455	0.5477	0.5807	-0.1448
	(0.1089)	(0.1930)	(0.2037)	(0.1437)	(0.1078)
dp_i/ds_j	0.0032	0.0076	0.0059	0.0051	-0.0027
	(0.0031)	(0.0046)	(0.0047)	(0.0047)	(0.0018)
Observations	1692	1680	1692	1681	1680
Controls	**Controlling for current highways, geographic, landscape and intensity in mining covariates**				
Welfare Measured:	**Num. of Formal Firms**	**% of Non-Microfirms**	**Median Lifecycle**	**Median Size of Firms**	**Median Sales by Worker**
Method:	**IV**	**IV**	**IV**	**IV**	**IV**
dp_i/ds_i	0.8379	0.4586	0.5695	0.5907	-0.1455
	(0.1107)	(0.2002)	(0.2078)	(0.1535)	(0.0995)
dp_i/ds_j	0.0057	0.0095	0.0061	0.0063	-0.0018
	(0.0031)	(0.0046)	(0.0048)	(0.0047)	(0.0018)
Observations	1692	1680	1692	1681	1680
Controls	**Controlling for current highways, geographic, landscape, indigenous population share and intensity in mining covariates**				
Welfare Measured:	**Num. of Formal Firms**	**% of Non-Microfirms**	**Median Lifecycle**	**Median Size of Firms**	**Median Sales by Worker**
Method:	**IV**	**IV**	**IV**	**IV**	**IV**
dp_i/ds_i	0.8032	0.4436	0.5769	0.5747	-0.0773
	(0.1099)	(0.1989)	(0.2087)	(0.1454)	(0.0718)
dp_i/ds_j	0.0044	0.0083	0.0046	0.0057	-0.0018
	(0.0031)	(0.0046)	(0.0048)	(0.0047)	(0.0014)
Observations	1692	1680	1692	1681	1680

As is observed, marginal effects are positive, significant and slightly larger to the ones

Table 11: Robustness Evaluations II

State Measure	Municipality State Officials				
Controls	**Without controlling for distance to current highways**				
Welfare Measured:	**Num. of Formal Firms**	**% of Non-Microfirms**	**Median Lifecycle**	**Median Size of Firms**	**Median Sales by Worker**
Method:	**IV**	**IV**	**IV**	**IV**	**IV**
dp_i/ds_i	0.5896	0.3945	0.2870	0.4326	-0.0512
	(0.0680)	(0.1262)	(0.0989)	(0.0970)	(0.0593)
dp_i/ds_j	-0.0007	0.009	0.0004	0.0033	0.0002
	(0.0017)	(0.0033)	(0.0022)	(0.0030)	(0.0008)
Observations	1746	1734	1746	1735	1734
Controls	**Controlling for current highways, geographic and landscape covariates**				
Welfare Measured:	**Num. of Formal Firms**	**% of Non-Microfirms**	**Median Lifecycle**	**Median Size of Firms**	**Median Sales by Worker**
Method:	**IV**	**IV**	**IV**	**IV**	**IV**
dp_i/ds_i	0.6729	0.4513	0.4858	0.4467	-0.0661
	(0.0754)	(0.1511)	(0.1588)	(0.1121)	(0.0745)
dp_i/ds_j	0.0027	0.0067	0.0045	0.0036	-0.0014
	(0.0018)	(0.0032)	(0.0038)	(0.0035)	(0.0014)
Observations	1692	1680	1692	1681	1680
Controls	**Controlling for current highways, geographic, landscape and indigenous population share covariates**				
Welfare Measured:	**Num. of Formal Firms**	**% of Non-Microfirms**	**Median Lifecycle**	**Median Size of Firms**	**Median Sales by Worker**
Method:	**IV**	**IV**	**IV**	**IV**	**IV**
dp_i/ds_i	0.6816	0.4466	0.4738	0.4523	-0.0751
	(0.0758)	(0.1516)	(0.1583)	(0.1128)	(0.0734)
dp_i/ds_j	0.0023	0.0061	0.0038	0.0035	-0.0019
	(0.0018)	(0.0032)	(0.0038)	(0.0036)	(0.0014)
Observations	1692	1680	1692	1681	1680
Controls	**Controlling for current highways, geographic, landscape and intensity in mining covariates**				
Welfare Measured:	**Num. of Formal Firms**	**% of Non-Microfirms**	**Median Lifecycle**	**Median Size of Firms**	**Median Sales by Worker**
Method:	**IV**	**IV**	**IV**	**IV**	**IV**
dp_i/ds_i	0.6578	0.4421	0.4967	0.4413	-0.0707
	(0.0747)	(0.1538)	(0.1621)	(0.1140)	(0.0731)
dp_i/ds_j	0.0036	0.0072	0.0035	0.004	-0.0012
	(0.0018)	(0.0033)	(0.0039)	(0.0036)	(0.0014)
Observations	1692	1680	1692	1981	1680
Controls	**Controlling for current highways, geographic, landscape, indigenous population share and intensity in mining covariates**				
Welfare Measured:	**Num. of Formal Firms**	**% of Non-Microfirms**	**Median Lifecycle**	**Median Size of Firms**	**Median Sales by Worker**
Method:	**IV**	**IV**	**IV**	**IV**	**IV**
dp_i/ds_i	0.6681	0.44	0.4859	0.4474	-0.0773
	(0.0750)	(0.1542)	(0.1614)	(0.1148)	(0.0718)
dp_i/ds_j	0.0033	0.0066	0.0028	0.004	-0.0018
	(0.0018)	(0.0033)	(0.0038)	(0.0036)	(0.0014)
Observations	1692	1680	1692	1681	1680

obtained in our baseline model. In the case of the median sales per worker, we obtain the same result as the baseline model, the marginal effect is not statistically different from zero. This robust exercise show that own state capacity is stronger when controlled by this important characteristics of our case study. The results presented give us confidence about the sign and magnitude of the impact of state capacity in this important dimensions of firms life.

Concluding Remarks

Our research has try to deepen in the connection between how state affect social welfare by explicitly modeling and estimate the relationship between state authorities and productive firms. This relationship is studied in a network framework where sub national authorities decisions on the level of public goods and services provided are interrelated. We choose Peru as our first case study to evaluate the predictions of our model. Using an instrumental variables approach we integrate the network approach by controlling for the weighted state capacity of neighbors on the own state capacity decision and on own productive outcomes, and also, as our framework addresses spatially related factors, we use the spatially corrected covariance matrix adapted to our network framework (the adjacent municipalities).

Our preliminary results, in the sense that only the direct own effect is evaluated, show positive and sizable impacts of state capacity in productive outcomes of firms operating in each municipality. Positive changes in local state agencies or local municipality employees are related with increases of 11 and 13 in the median number of formal firms, 0.22% and 0.19% in the median percentage of non-microfirms, between 7.5 and 8.5 month in the median lifecycle of firms, and 0.3 and 0.5 workers in the median size of the firm, respectively in all cases.

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