UNIVERSITY OF CALIFORNIA, SAN DIEGO

Electoral Competition, Income Inequality and Public Goods: A Sub-national Assessment

A dissertation submitted in partial satisfaction of the
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in

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by

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The dissertation of Rogelio Alexander Ruiz Euler is approved, and it is acceptable in quality and form for publication on microfilm and electronically:

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DEDICATION

To my parents, Rogelio and Alexandra,
who taught me the value of justice.

To my sister and brother, Nadja and Hans,
who share my origins.

To Lara,
savior, mirror who has taught me so much about myself.

To my friends,
candles in the dark, surfin' with me.

EPIGRAPH

Once when Jacob was cooking some stew, Esau came in from the open country, famished. He said to Jacob, "Quick, let me have some of that red stew! Im famished! "

Jacob replied, "First sell me your birthright."

"Look, I am about to die," Esau said. "What good is the birthright to me? "

But Jacob said, "Swear to me first." So he swore an oath to him, selling his birthright to Jacob.

Then Jacob gave Esau some bread and some lentil stew. He ate and drank, and then got up and left.

So Esau despised his birthright.

—Genesis XXV: 29-33.

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shaping the final stages of my work. It is easy to get lost in the details of your work after you have been imbued in the topic for so many years. This getting lost involves necessarily losing the perspective of where our work fits in the broader debate, and Steph's course was key in bringing me back to the more general perspective I had lost over the course of the past years.

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ABSTRACT OF THE DISSERTATION

Electoral Competition, Income Inequality and Public Goods: A Sub-national Assessment

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Does democratization increase redistribution? Does inequality affect the quality of democracy? This dissertation explores these questions by focusing on the effects of electoral risk and income inequality on the provision of basic infrastructure at the household level in Mexico. The first part of the dissertation accounts for the state of the literature, and I propose a way to start thinking theoretically about inequality as a condition of social heterogeneity that signals the presence of elites prone to capture politics. A main challenge for testing these hypotheses is the lack of data, which I address by carefully constructing inequality measures at the municipal level in the second part of the dissertation using a 10% sample of the Mex-

ican census. I also generate cleaner measures of provision than the ones provided in aggregate by the Mexican government. I additionally use two different measures of electoral competition to measure political incentives for parties. Building on work by others scholars, I introduce the concept of *bundles* of public goods, and show that public goods are better understood this way and not as individual goods. The empirical analysis, using three-level hierarchical logit models, shows a robust negative relationship between income inequality and the probability for Mexican households to have full coverage of running water, sewerage, electricity and literacy (schools). A change from very low to very high inequality would represent a probability drop of 20% for a household in the first quartile of income. I also find that state electoral incentives have no association with these probabilities, but at the municipal level the structure of the party system matters while the margin of victory does not. I find systematically no significant interaction effects between inequality and electoral risk, suggesting these are both sufficient, and not necessary, conditions to shift the provision of public goods. Overall, the results show heterogeneous effects for different public goods and different levels of government, and should be taken to suggest a more careful look at the level of analysis we use to answer questions on democracy and ex-post redistribution.

Chapter 1

Introduction: Democratization, Income Inequality and Public Goods

Wealth inequality is pervasive to social life. It appears with varying degrees of strength in all cultures and all times since the dawn of human civilization. Historically, patterns of unequal income distribution are the norm rather than the exception, and the reduction of wealth inequality during the latter century appears to be an historical anomaly that responded to well-identified contingencies such as the worldwide economic depression in the turn of the *XXth* century and both World Wars (Piketty, 2014). The unequal distribution of resources is the structural backdrop against which all politics happens –the underpinning social to reality Lasswell's (1950) famous dictum of who gets what, when and how. There is a long tradition in social and philosophical thought, leading at least to Aristotle's *Politics*, that links an excessive concentration of wealth in democracy with bad government because elites will more easily serve their own rather than the public's interests. The relationship is not, however, that clear empirically.

The relationship between income inequality and democracy is complex and bi-directional. A vibrant scholarly debate which stems from the seminal work of

the work by Meltzer and Richard (1981) links democratization to an increase in redistribution because universal franchise extends the income of the median voter to whom politicians and parties must appeal in order to win elections. In a more recent iteration of this relationship, scholars have devoted attention to inequality as a determinant of democratization and extension of suffrage. Under this view, democratic institutions are the result of a collective bargain in which the masses demand access to political representation for policy when the costs of the elites of repression become prohibitively high, when the masses become mobilized, and when capital is not mobile (Boix, 2003; Acemoglu and Robinson, 2006). Recent work, however, has critiqued the role assigned to redistribution for the latest democratic transitions. Haggard and Kaufman (2012), for instance, find that only over half of all transitions from 1980 to 2000 are linked to distributive conflict. There is thus mixed evidence of the extent to which distributive conflict in fact drives regime choice.

From the reverse causal direction, a strong hypothesis suggests that democracies increase taxation and redistribution, and thus we would expect to see a decrease in income inequality with democratization. Rodrik (1999) finds that real wages and the labor share of national income increase with democratization, and Persson and Tabellini (2005) and Lindert (2004) find an increase in social spending (specifically for education) under democracy. However, the evidence in this regard is also mixed, with a number of recent studies finding no robust relationship between democracy and redistribution. Gradstein and Milanovic (2004) find in their meta-study a weak association between the extension of franchise and reduction of inequality (specially with the extension of voting to women), and Acemoglu et al. (2013) find a robust increase in tax revenues with democratization but no robust effect on income inequality.

An important parallel avenue of research on the pro-poor properties of democracy focuses on the role of failures in the political markets in new democracies, and how these distort the dynamics we should expect from electoral competition (monitoring, decrease in corruption, programmatic competition, citizen participation and so on). In particular, much attention has been devoted to the role of poverty and how it elicits perverse incentives for vote- and turnout- buying through the provision of private and targeted goods to the poor (Stokes, 2005; Díaz-Cayeros et al. *forthcoming*; Nichter, 2008; Keefer and Khemani, 2005; Golden and Min, 2013; Weitz-Shapiro, 2012; Van de Walle, 2003; Díaz-Cayeros et al., 2006; Wantchekon, 2003; Kitschelt and Wilkinson, 2007; Gonzalez-Ocantos et al., 2012; Golden and Min, 2011; Brusco et al., 2004; Kramon and Posner, 2013) .

Leaving the nature of the ideological leaning of the targeted population aside, scholars argue there is a trade-off between the provision of targeted and public goods, and there is a growing body of evidence that suggests this trade-off in fact exists (both in the demand and the supply of public goods). For example, survey data in the Philippines shows a robust negative association between reported vote-buying and the delivery of primary health services (Khemani, 2013), in Mexico aggregate evidence suggests that politicians trade-off public and private goods in electoral portfolios aimed at minimizing electoral risk (Díaz-Cayeros et al., 2007), and survey evidence from Benin shows women (traditionally excluded from clientelistic offers) prefer public rather than excludable goods (Wantchekon, 2013).

These studies are particularly relevant for the discussion about democracy and redistribution because they suggest vote- and turnout-buying in fact reduce the pressure for redistribution via the usual channels (government spending, public goods, etc.). That is, short-term handouts typically associated with vote- and turnout-buying are a form of redistribution through informal channels, which ex-

ploit the necessity of voters to the advantage of political parties because they allow them to win votes cheaply, freeing up resources to be spent elsewhere to win more votes. Redistribution via government spending in, say, public goods, requires massive financial investments. Clientelistic hand-outs are cheap and, given the evidence presented above, seem to be crowding out other types of redistribution through the usual, formal channels that scholars have devoted attention to.

Despite these theoretical and empirical advances, most of the scholarly attention among political scientists (in sharp contrast to the focus of economists) has focused on the interaction between poverty and electoral competition to understand the perverse dynamics in the provision of public goods typically associated with increases in redistribution. A crucial element of the discussion which has been conspicuously ignored is the role not of poverty, but of *income distribution*. This is unfortunate because it leaves aside the powerful dynamics of elite capture that appear where a strong, moneyed elite has an extreme advantage over policy output vis-a-vis an impoverished and politically underrepresented mass of voters, and where the party elites share kinship, economic and social ties with the economic elite. The primary focus on poverty has advanced our knowledge of the failures in electoral markets that accrue when voters have high marginal utilities for the consumption of cheap goods (a sack of cement, construction material, handouts of all sorts). However, poverty is a condition of individual voters, not of the collective. Focusing exclusively on poverty cannot capture political dynamics that arise necessarily out of aggregate conditions –the distribution of income– that have an important intellectual tradition in Western political thought. It also prevents an important discussion on the same grounds with the work done by economists who focus mostly exclusively on income inequality. This dissertation thus shifts attention to income inequality and redistribution vie public goods to walk towards a more unified theory

about the political implications of income inequality than can harness the powerful but yet disparate insights in the literature on the redistributive effects of democracy, on the one hand, and failures in political markets on the other.

To be fair, a key element in the lack of discussion about the role of income inequality is the availability of high-quality data. Most, if not all, of the available data on income inequality is at the national level, which poses a serious inference problem because it constrains the analysis to the country-level, whereas most of the debate has focused on sub-national dynamics. The within-country availability of data on poverty exceeds by far the availability of data for income inequality, and so a debate on the role of inequality must start by generating data at the adequate level of interest for the debate.

There is, however, a more compelling reason why there has been little focus on the role of income inequality for the provision of portfolios of public and private goods in new democracies: we lack a theoretical framework to properly link income inequality and the under-provision of public goods. As will be argued more extensively below, most of the debate focuses on the beneficial effects that democratization has on the provision of public goods, where the stylized argument is that politicians need to cater to a broader base of voters and so public goods become an efficient too to garner political support. The available data shows, however, that public goods that enhance the welfare of poor households directly are not necessarily being provided more after democratization (Keefer, 2007; Devarajan and Reinikka, 2004; Keefer and Khemani, 2005), and that the harmful practices of vote- and turnout-buying have undergone a resilient adaptation after democratization through increasingly complex methods of clientelistic transfers (Van de Walle, 2003; Beck, 2008; Díaz-Cayeros et al., 2006; Levy, 2008; Levitsky and Murillo, 2005; Brusco et al., 2004). The extent of this adaptation to a new institutional setting

that promotes competition has been aptly dubbed "competitive clientelism" (Lust, 2009).

There is therefore a mismatch between what the evidence shows and the theoretical tools we have to understand the mechanisms by which public and private goods are provided, because our democratic theories predict a higher provision of public goods under democracy. As argued above, then, the main focus of the scholarly debate has been on the role of poverty, and little has been done to explore, both theoretically and empirically, the extent to which failures in political markets can be linked to income inequality, and through which channel mechanisms.

This dissertation takes a step in this direction by developing a theory of how income inequality elicits perverse dynamics in the *context of poverty*. A central claim here is that inequality is not harmful or not per se, but becomes a highly relevant condition in the presence of a mass of poor voters. The reason for this is that the combination of these two factors creates (or reflects) the conditions of social heterogeneity that increase the likelihood of the capture of politics by a small, closed and powerful elite, with the knowledge, networks and political tools to bring policy closer to their preferred points. This dissertation also extends the classic distinction between systematic and transient risk and separates the systematic component of electoral risk into two complementary elements: one structural and one not.

It must be noted, however, that the current debate outlined above establishes a link between the provision of public and private goods, on the one hand, and poverty and electoral competition on the other, within the context of the classical discussion of probabilistic models on whether parties target "core" voters (Cox and McCubbins, 1986), "swing" voters (Lindbeck and Weibull, 1987), an efficient combination between ideological commitment and income levels (Dixit and Londregan, 1996), or reward core voters conditionally on ex-post electoral support (Díaz-Cayeros

et al. *forthcoming*). The argument in this dissertation, however, comes from a different line of thought that focuses on issues of elite capture and social heterogeneity to explain the incentives of politicians to redistribute to the poor.

In order to do so, this dissertation leaves aside one hand the theoretical and empirical branch of the problem that deals with the provision of private goods. I do so due to a normative claim that at this point of my research my interests lie more in the elements of politics that increase or decrease the *welfare of households*, which is the ultimate goal of any development policy –and, in fact, of all politics. Therefore the focus of this dissertation lies on understanding elements that increase the welfare of households in the long-run with basic public goods (as opposed to ephemeral increases typically associated with clientelistic hand-outs).

This dissertation also tackles the problem of the availability of quality data about income inequality at the sub-national level by developing novel and original measures of income inequality at the state and municipal level, using novel methods to build high-quality, clean data from household data that comes from the 10% sample of the Mexican census wave of 2010. The procedures to generate this data are easily scalable to multiple countries and regions of the world, and this dissertation is a first step into generating more subnational data for many countries and regions of the world to explore these issues in a cross-national with sub-national perspective.

In particular, this dissertation looks at how structural patterns of inequality in Mexico interact with new electoral pressures to shape the provision of water, sewerage, electricity and literacy. The choice of these specific goods is a corollary of the normative principle outlined above that strides to understand what dynamics shift the welfare of households and families. The consolidation of apparently contrasting goods into a single framework stems from the fact that they are all basic, minimal requirements for a dignified life of the members of a household, and the

social contract obliges governments to cover these bare minimals.

Low levels of institutionalization and accountability in democracies interplay with an increasingly liberalized electoral environment where short-term results are important for reelection. Time-horizons are shaped by the levels of political institutionalization. In countries with low levels of political representativeness and accountability (as is the case almost by definition in democratizing countries) politicians may not cater to the interests of their voters except when they campaign (Bates, 1984; Mainwaring et al., 2006; Smith, 2005) or may campaign on platforms that are then switched with low electoral costs (Stokes, 2001). Weak linkages between voters and their representatives make politics more personalistic and inhibit long-term investments (Kitschelt and Wilkinson, 2007).

To properly study the relationship between inequality and development from a political perspective we need to also include in the argument a measure of how effectively groups are able to *articulate* an effective demand for public goods. This is determined by the ability of groups to engage in collective action.

This additional element –which completes the basic framework for the rest of this dissertation– reflects a recurrent topic in the literature that links growth to societal characteristics of preference heterogeneity. Research along these lines has recurrently found a negative relationship between social heterogeneity and the provision of public goods. The usual account for this relationship lies in the increased costs of collective action that groups face when their preferences are not homogeneous over ethnicity (Alesina et al., 1999; Posner, 2004, 2005; Miguel and Gugerty, 2005; Habyarimana et al., 2007; Kimenyi, 2006), economic inequality (Dayton-Johnson, 2000; Khwaja, 2009), religion (Banerjee and Somanathan, 2007; Trejo, 2009) or landowner-peasant relationships (Banerjee et al., 2005). These findings underscore that groups with heterogeneous preferences face higher costs of collective action

and therefore provide on average less public goods. Heterogeneity of preferences is linked to a lower demand for public goods when groups sorted along some relevant dimension fail to coordinate over which public goods should be provided.

In my argument, income inequality is the key element defining heterogeneity, and thus subjects societies to the same collective action dilemmas discussed above. The ability of voters to coordinate in terms of a unified demand for public goods depends on the degree of preference heterogeneity. A compounding effect of income inequality is that it signals the presence of elites with a disproportionate access to political, economic and social networks that are prone to be captured in the defense of their shared interests. Thus, income inequality has the double effect of fragmenting preferences over policy, and giving one group an intrinsically disproportionate access to the policy mechanisms that govern public spending and policy in general.

This dissertation is, to the best of my knowledge, the first effort to look at these interrelated problems from the perspective of households, distinguishing for heterogeneity and electoral competition among multiple cleavages and multiple levels of government in Mexico. By focusing on a single country I am able to by-pass well-known inference problems that arise with cross-national analysis (Cox, 2009) such as unobserved variation among countries along unobserved variables, particular historical moments and dynamics, as well as measurement errors that are endogenous to government quality (Ross, 2006). The dissertation looks at the interaction between economic heterogeneity and electoral competition at the municipal and state levels. It then turns focus to model the probability of Mexican households having coverage of running water, sewerage, electricity and literacy.

My research adds four novel elements. First, the predictions of both theories have clear reinforcing effects but remain ambiguous as to the overall effects when they run in opposite directions. I suggest a framework to begin understanding this

ambiguity. Second, I assess the relative weight that each source of heterogeneity has on the probability of full coverage for households by looking at multiple cleavages simultaneously. Third, most research in this area has been done using cross-national comparisons, which tend to obscure the relationship between these variables and potentially mis-specify the empirical models with a non-trivial number of omitted variables that are specific to each country. My research looks at a single country, Mexico, which automatically controls for a number of potential threats present in cross-national analysis. Fourth and last, I take research in this area a step further to understand how democracy and inequality relate to the probability of households having access to public goods, as opposed to countries or subnational units such as municipalities or counties. I claim it is important to distinguish the effects of electoral competition on household provision across levels of government.

This dissertation is structured as follows: the next Chapter 2 expands in detail the theoretical framework presented thus far. Chapter 3 provides basic descriptions of household welfare in Mexico in order to provide a reference of the social and economic context of the arguments presented here. Chapter 4 shows first the evolution of different inequality measures from a cross-national perspective, and then shows a detailed spatial and temporal description of the novel income inequality data generated for this dissertation. Chapter 5 explores in detail the evolution of electoral competition in Mexico during the last three decades, and presents two measures used here to capture different elements of electoral competition (one systematic, one transient). Having presented in detail the logic to construct the main variables of this dissertation, Chapter 6 then presents the bulk of the empirical analysis, first at the municipal, and then at the household level. Finally, Chapter 7 summarizes the results and discusses their theoretical implications, and discusses further avenues of research.

Chapter 2

What Affects the Provision of Public Goods? Institutions, Heterogeneity and Political Market Failures

There are two distinct lines of literature that attempt to explain the provision of public goods. The first one stresses the beneficial effects that democratic competition has, which may be stylized in the following way: when elites are required to compete for the popular vote they have an incentive to cater to their constituents and to monitor each other to expose inefficiencies or corruption from their competitors. Competition among the elites induces them to design policy that promotes the interests of citizens because their job depends on it. In authoritarian systems, access to office depends on an elite organization that need not satisfy the demands of the citizenry to maintain power.

The second line of literature looks at the negative effects in the provision of public goods of societal characteristics usually branded as "social heterogeneity", that is, the degree to which interests (preferences) in a society diverge. Social conflict, or its milder version social heterogeneity, can have an effect on the prevalence of free-riding because there is no overarching identity that cements all groups into

a single one to provide for itself. Social heterogeneity can manifest itself through various channels, but recurrent topics in the literature are ethnicity, religion and economic inequality. Groups that are more homogeneous along any relevant social identity will have less trouble providing a good for the consumption of all its members.

These two stylized accounts of two broad lines in the literature of why public goods are provided have opposing predictions. In the first one, more electoral competition generates more public goods, while in the second one more heterogeneity generates less public goods. It is unclear what happens in the interaction of these two opposing forces. Is there a threshold on any of them after which the other one predominates, or does one always prevail over the other? If so which one? Does elite competition in new democratizing countries necessarily interact with increased social heterogeneity to produce polarized elites and masses, or is this only one out of multiple outcomes? Under what conditions can we expect the interaction of increased elite competition and social heterogeneity to inhibit the provision of public goods?

This dissertation presents a framework to begin posing these questions properly by developing a typology of conditions under which we can expect social heterogeneity to interact with democratization in a harmful way. I measure harm as the under-provision by governments of basic infrastructure and literacy, that is, of capabilities that have profound effects on the development of human capital. This typology should ideally serve us to roughly locate a country within a set of conditions, and then check whether the predictions are consistent with the data.

Before exploring the multiple relationships that democratization and inequality may share, it is important to discuss the latter two approaches in detail to avoid the pitfalls of stylization. The following two sections elaborate on each line of re-

search enumerated above.

2.1 Heterogeneity-based Explanations

The basic formulation of the public goods problem, that stems from the work of Hardin (1968) and Olson (1965), is that a shared preference for individuals within a group does not necessarily entail the achievement of a goal, mainly because the probability of defecting without being sanctioned is increasing in group size.

In this framework, unity of purpose does not necessarily translate into unity of action. Even if all members of a group want to achieve the same goal –i.e. even if there is preference homogeneity– the free-riding problem emerges and, in the absence of credible communication and/or sanction, no public good is provided at all in the logical extreme. Experimental evidence suggests that this logical extreme points in the right direction but is never fully realized as predicted by theory (Fehr and Gächter, 2000; Fischbacher et al., 2001; Ledyard, 1994; Marwell and Ames, 1979).

Later formulations argue that the costs of cooperating and defecting have not been properly internalized in the property-rights structure of a group (Ostrom, 1990; Dayton-Johnson, 2000). The provision of public goods is conditional on the ability of the group to sanction members who do not contribute for the public good, which in turn depends on its monitoring capabilities.

In a related hypothesis to understand the relationship between preferences and public goods, citizens sort at no cost across geographical units to maximize the trade-off between taxes and quantity of public goods received. Individuals observe tax-rates across governments and sort into those that provide an optimal combination (Tiebout, 1956). This in turn leads to geographic units where individuals have *homogeneous* preferences over public goods. Analytically, Tiebout's model fixes pol-

icy and allows for costless sorting of individuals across jurisdictions in their efforts to optimize policy bundles (tax-rates and public goods).

The notion of a Tiebout equilibrium has shaped a substantial part of the debate over public goods and community selection. Recently, Rhode and Strumpf (2003) revise this hypothesis empirically with long historical series in the United States and conclude that, despite reduced mobility costs as a consequence of technological change, preference heterogeneity has increased, and not decreased as Tiebout predicts, within local jurisdictions.

A different line of research linking preference homogeneity to the provision of public goods reverses the mechanism: it fixes people and allows for variation in the policies that governments implement –that is, people within a geographical unit choose over policy bundles that in turn influence redistribution via public goods. Much of the attention devoted to the preference fragmentation hypothesis comes from studies of ethnic identity. The study of African ethnic conflict literature on Africa is ripe with examples on the effects of ethnicity on the provision of public goods. For example, Horowitz (1985) and Bates (1984) link ethnic conflict to economic and political outcomes that influence welfare. Under this line of research, ethnic fragmentation hinders the provision of public goods on two levels.

At the elite level, politicians strategically arouse identities to maximize the electoral returns of political mobilization (Posner, 2004, 2005; Chandra, 2006), and at the mass level, higher levels of ethnic fragmentation are related to lower levels of trust and cooperation across non co-ethnics (Habyarimana et al., 2007; Kimenyi, 2006) creating the conditions for more stringent collective action dilemmas to arise, lowering with this the overall provision of public goods.

Outside of Africa, Alesina et al. (1999) review a number of studies in the United States to support their hypothesis that ethnic fragmentation is correlated

with lower provision of certain public goods. They find that "voters choose lower amounts of public goods when a significant fraction of tax revenues collected on one ethnic group are used to provide public goods shared with other ethnic groups" (p. 1244).

There is a two-fold insight in literature: ethnic heterogeneity provides the conditions by which elites can manipulate –up to a certain extent– some ethnic cleavages over others to optimize political support, and the masses face their own collective action dilemmas related to the amount of trust and cues for cooperation they elicit.

Other cleavages have also deserved attention of scholars. Banerjee, Iyer, and Somanathan (2005) analyze the effects of colonial power and landowner-peasant relations in India on the provision of public goods. They find a lower good provision in districts that were under British colonial power, and where landowner-peasant relationships were biased towards the landowners. Alesina and La Ferrara (2000) suggest there is a systematic negative relation between social heterogeneity and the propensity to participate in civic, religious or recreational activities in the United States. They also explore the effect of income inequality but their data suggests that racial fragmentation has the strongest negative effect.

The existence of social capital has been proven critical for the successful implementation of development organizations working on the ground. It is known that higher levels of social capital are correlated with better economic development[1] (De Tocqueville, 1945; Putnam, 1995). Nevertheless, social capital requires a minimum basis of homogeneity under some relevant dimension. Khwaja (2009) finds negative effects of economic inequality and social heterogeneity on the ability of communi-

[1]But see Berman (1997) for an account of the negative effects of dense social networks on the demise of the Weimar Republic and the eventual rise of Nazism.

ties to engage in effective collective action, but finds that their effects on project implementation are conditional on project design.

A different but related approach focuses on the effects of heterogeneity on the tragedy of the commons. Bardhan and Dayton-Johnson (2007) find a negative association between economic inequality and collective action in their study of the effects of preference heterogeneity on canal maintenance in villages of Mexico and India. They also find positive quadratic effects of income inequality on water-related conflict within villages, suggesting that the effects of inequality on cooperation are negative but diminishing in inequality. Particularly for India, they find that caste homogeneity has a positive and significant effect, providing additional evidence that homogeneity indeed induces cooperation.

In the same vein, Dayton-Johnson (2000) finds that economic inequality lowers cooperation among the commons in his study of water-allocation in rural Mexican *ejidos*. His results suggest that the relationship is also non-monotonic and of lesser importance than other measures of social heterogeneity.

These studies gauge the effects of preference heterogeneity on the ability of communities (or the commons) to resolve their collective action dilemmas. The recurring result in this scholarly work is that heterogeneous social preferences are indeed correlated with a lower output of public goods. Whether by inhibiting trust, introducing noise into the cultural cues that foster cooperation, reducing the costs of defection or increasing the costs of monitoring, higher levels of heterogeneity induce a lower provision of public goods.

This literature analyze the social dynamics that link heterogeneous preferences to sub-optimal levels of a good wanted by all. The main element here is a group providing something to itself through member cooperation (effort, taxes, and so forth). There is a second line of literature that looks at the effect of higher levels

of democratization on the output of public goods. I now turn to the literature that focuses on the effects of the political regime as such on the provision of public goods.

2.2 Accountability-based Explanations

A distinct strand of theoretical work and empirical looks at the effect of democratization on the provision of public goods. Evidence shows that the provision of public goods is conditioned by favored political elites and by differences in monopoly power in political markets (Deacon and Saha, 2005), the ratio between size of winning coalition and selectorate (Bueno De Mesquita et al., 2005) and the costs of entry and exit into political markets (Lake and Baum, 2001). The conclusion of this literature is that democracies provide more public goods than authoritarian regimes.

This line of the literature should not, however, be viewed as dichotomous with regards to the social cleavage literature. Electoral competition (or more precisely, the structure of the party system expressed in the effective number of parties) captures a complex interaction between electoral systems and social cleavages. The dichotomy in the literature between cleavages and electoral systems has been overcome by the definitive work of Cox (1997), which harmonizes the dichotomy in a sequence of steps involving politically active cleavages that allow for the strategic coordination between masses and elites competing in an environment set by the mechanical and effects of electoral systems.

However, leaving the societal origins of the party system aside, institutional variation within democracies also accounts for variation in the provision of public goods. The mechanical effects of electoral systems influence the type of public goods provided (Shugart, 1999; Lizzeri and Persico, 2001). Specific federal arrangements

are also strongly and positively correlated with a more responsive provision of public goods at the local level (Faguet, 2004). Politicians might prefer to invest in private goods over public goods because private goods are excludable, whereas pure public goods are not (Stokes, 2005). Geographically or socially targeted investment in public goods allows politicians to capture, solidify and increase the size of their electoral coalition and maximize the electoral return of their investment (Díaz-Cayeros, Magaloni, and Estévez, 2007; Kitschelt and Wilkinson, 2007). Other factors affecting politician's decision of where and how to spend is the political mobilization of groups (Banerjee and Somanathan, 2007).

This literature shows that democracies have on average higher public goods and spending than authoritarian regimes, and it also points out to the subtle but important institutional differences that arise when comparing democracies. At the core of this literature is the implicit notion that that politicians, as rational actors, will find the most efficient tools to mobilize political support. What this line of the literature also assumes is that public goods are, because they affect everybody in a locality, are the preferred mechanism to obtain support.

However, the literature on failures in the political markets (discussed in more detail in the next section) suggests that viewing public goods as an efficient tool assumes away the distortions that social and economic structure imposes. Particularly, because politicians can efficiently exploit the need of the poor by offering private transfers instead of providing them with public goods. The high levels of public investment (and time) required to provide some public goods will likely affect the strategic choices of politicians. Parties are faced with two electoral strategies: provide cheap, private transfers to a broad segment of the population, or provide a local public good that requires high investment and has relatively little electoral return (simply because the benefited population is smaller).

Additionally, the argument that public goods are efficient tools seems to rely on the assumption that politicians would *want* to use universal allocation via public goods. Although this might be in fact true in some cases, the truth of the matter is that in may cases politicians do not want such tools. The literature on clientelism shows that using targeted goods is in fact a very powerful tool to strategically reward support and punish defection. In this sense, providing a good that is enjoyed by both supporters and defectors is unlikely to discipline voters in an efficient way.

Thus, the relative costs of public vs private goods, as well as the inability to strategically reward support (or swing votes) makes the provision of public goods in fact a dominated strategy.

2.3 Failures in Political Markets

The literature discussed above consistently suggests that social heterogeneity of preferences can yield a lower supply of public goods. The mechanisms underlying ethnic diversity are a special case of a broader class of problems that link social conflict to collective outcomes. Which specific conflict is politically activated and constructed as a political issue is historically determined. Whenever a line of conflict structures politics in a meaningful way it has the potential to influence the strategic coordination of voters and elites (Lipset and Rokkan, 1967; Cox, 1997).

Income inequality is an instance of such a division that closely fits the historical experience of some countries. The distribution of income in Latin American countries is a more salient cleavage than ethnic conflict. To be sure, this does not imply the absence of politicized ethnic conflict in these countries. However, ethnic conflict in Latin America, if present, resembles nothing the type of politically active and mobilizing ethnic cleavages that we see in many African countries. Except

perhaps in Bolivia and Ecuador, ethnicity does not structure party politics in a fundamental way, nor does it influence party platforms and electoral competition. Income inequality does[2].

The claim here is therefore that income inequality elicits cooperation dilemmas between the rich and the poor. In the absence of a strong middle-class to act as a buffer (that is, at high levels of income inequality) these dilemmas yield a sub-optimal provision of public goods. However, the division of society into groups with different preferences over public goods is not a sufficient condition to reduce the provision of public goods. Typical explanations in this sense organize the discussion in terms of collective action dilemmas *á la* Olson with "bottom-up" dynamics, but "top-down" explanations (provision by politicians or parties) have more overall explanatory power to understand how public goods are provided (Banerjee et al., 2007).

This is crucial here because heterogeneous preferences in society can be innocuous for the provision of public goods if there is no systematic capture of policy tools by one of these groups. It is only when one group has systematically more influence over policy decisions that heterogeneous preferences should have any politically meaningful role in the provision of public goods.

My argument above is not at this point analytically distinct from the redistributive argument in Meltzer and Richard (1981), Boix (2003) and Acemoglu and Robinson (2006). There is nothing in the argument provided that precludes the

[2]To be sure, there is a more subtle relationship in the region between ethnicity and inequality. The levels of inequality are highly correlated with ethnicity, such that indigenous peoples have historically been excluded and are the poorest segments of society. Democratization has reduced the historical exclusion, and in some countries ethnic movements have been transformed into viable political parties (Van Cott, 2005) and armed conflict with a religious undertone (Trejo, 2009). But evidence suggests the party systems in the region haven not been able to successfully include indigenous groups, as suggested by the high levels of electoral volatility (Madrid, 2005) and low levels of ethnic polarization (Madrid, 2008). Ethnicity in the region is becoming more salient but is far from being as powerful a cleavage as in many African countries.

conclusion that redistribution is a tool to stave off extreme levels of social conflict. However, providing public goods is only one of two strategies that political elites can follow. The second strategy is the provision of targeted, excludable, private goods. Some scholars have previously argued that public goods become an optimal strategy under universal voting because, given a limited budget, they can provide more benefits to a broader coalition of voters, thus maximizing their electoral returns (Bueno De Mesquita et al., 2005; Banerjee and Somanathan, 2007). It follows that, if excludable goods are cheaper to provide than public goods, the former will prevail. This problem touches upon the heart of under which conditions clientelism becomes an optimal strategy for both voters and politicians.

A second mechanism through which inequality affects the provision of public goods is by proxying the existence of local elites that have asymmetrical access to resources such as wealth, party networks –both within and outside the community–, knowledge, family and business ties and so on. The asymmetrical control of resources puts elites in a privileged position of influence over policy decisions. Income inequality serves as a simple proxy for a broader phenomenon of asymmetrical access to community resources.

The presence of elites in incipient democracies is related to under-developed political and economic markets. Elites control and use the state's tools in order to limit the access to the governing elite in order to maximize their extraction of rents. Limited access orders (North et al., 2009) sustain political order through the creation and strategic allocation of rents. These political orders (in which clientelism is more likely to be found) are characterized by the use of rents and limited access to social assets by a relatively small but privileged elite. The political system manipulates the economy in order to maximize the extraction of these rents for themselves but also to stave off violence –the threat of revolution in terms of Moore (1966), Boix

(2003) and Acemoglu and Robinson (2006). Institutions in limited access orders are underdeveloped and personalistic relationship characterize the interaction within elites and with the broader population (Cox et al., 2012).

Limited access orders involve the presence of economic and political elites that control the distribution of rents through the limitation of access into productive sectors and the political market. In my argument, income inequality is a proxy for the broader context of an elite-driven social order that limits population access to social assets to maximize the extraction of rents. Inequality is a proxy for a limited access order characterized by the exclusion of a broad segment of the population into the rent-sharing agreement. The claim here is that the existence of elites is correlated with asymmetries in income, which echoes a central claim in Bourguignon and Dessus (2009). That is, it is likely that in a community where income is unequally distributed those in control of higher income are also part of the broader extractive elite. Thus one can proxy elites in the sense described above with income inequality since both attributes are likely to be bundled together.

However, income inequality is not a sufficient condition for clientelistic dynamics to appear. If there are high levels of inequality but average income is high (or, importantly, if income inequality is low such that there is a middle-class) then political parties will have to expend more resources to buy votes. Therefore, in my argument, another condition for the appearance of clientelistic dynamics is that income inequality (elites) should appear in the context of poverty.

Poor voters are especially prone to be captured in clientelistic networks (Weitz-Shapiro, 2012; Stokes, 2005; Díaz-Cayeros, Estévez, and Magaloni, Díaz-Cayeros et al.). Poor voters are more easily captured by entrenched interests and are less educated. Overall, poor voters are politically disempowered and command little political resources with which to confront the attempts of capture and politi-

cal manipulation by elites. On the other hand, the poor represent a very attractive electoral investment because they are cheaper to buy[3] and present weak resistance to political manipulation.

As previous research has shown, poverty plays a key role for the emergence of clientelism, but the central relationship of clients to patrons is sustained by extractive elites that arise with (and reproduce) income inequality. Inequality in the context of poverty reinforces the strategic relevance of clientelism because it reflects a segmentation of income in which there is a high number of poor voters relative to the elite. Because their votes are cheaper to buy, political parties have an incentive to cater to these votes, with which they maximize their electoral investments by providing material goods for immediate consumption, and the existence of elites who command organizational resources and control broader community resources underpin the credibility of brokers to deliver.

Finally, the fourth element in the argument is the role of electoral competition. Elections impose to politicians short-term considerations that can trump longer term time-horizons that are crucial for the investment in public goods. A central feature of public goods is that they require both high levels of investment and relatively long time frames to be completed and enjoyed by voters.

[3]Poor voters are cheaper to buy because they derive higher marginal utility from consumption than the rich. At lower levels of consumption, an additional unit provides higher marginal utility than at higher levels of consumption. The low average consumption among the poor makes them particularly prone to offers of consumption. Poverty induces an inter-temporal substitution of consumption whereby the future is highly discounted. In contexts of low levels of income, consumption in the present is preferred over consumption in the future. The relationship between income and patience is a recurrent theme in classical thought and in more contemporary analysis of time-preferences, whereby income is related to variation in preferences over inter-temporal substitutions, such that the rich will be much more patient and for future consumption, while the poor are much more impatient and would rather consume sooner than later (von Böhm-Bawerk, 1890; Von Mises, 1959; Fisher, 1930; Hausman, 1979; Lawrance, 1991; Frederick et al., 2002; Harrison et al., 2002). In my own field research in Mexico in poor rural villages, it is not uncommon to hear the phrase "we are living day by day", which reflects this type of short time-horizon of consumption.

Given a limited budget, politicians define investment portfolios with a mixture of private and public goods that will attempt to minimize their electoral risk (Díaz-Cayeros et al., 2007). In the context of a broad mass of poor voters with cheap vote prices, the large investment in public goods represents an opportunity cost in terms of the public/private goods trade-off in two senses.

The longer average time-frame for the completion of a public good carries the inherent risk to a politician that the completion time of the project exceeds her time in office. This is problematic from an electoral standpoint because credit-claiming becomes harder for the current politician, and so any associated electoral benefits will accrue to future politicians. The incentive is therefore to look for investment in goods that are more immediate and allow present politicians to claim ownership with an eye on the next election. Second, politicians are aware of the time-preferences of poor voters discussed above, and they know that they value more assured consumption today of a lesser good (a sack of cement, a stove, a meal) than doubtful consumption tomorrow of a more valuable good (water, schools).

An sharp unequal distribution of income divides groups into subgroups with heterogeneous preferences over taxation and redistribution, which will in turn affect their ability to overcome collective action dilemmas to provide public goods. Income inequality is likely correlated to other forms of elite predominance in which the distribution of other resources (productive, organizational and political) is also unequally distributed. This gives elites a comparative advantage within the group to credibly act as brokers in the clientelistic exchange between parties and voters. Access to productive activities, political power and social prestige are circumscribed to a small segment of the population with disproportionate control over policy outcomes. Elite predominance over the mechanisms of provision of public goods biases policy towards those who design it. Therefore it is likely that those public goods

that benefit the elite are given preeminence over those that benefit the poor –for example macroeconomic stability versus public education.

The case of public education is emblematic of this problem: the lack of investment in education for the masses increases the relative advantage of those who can access the private market for education and thus increases present and future rents for insiders; similarly, investing in public education creates higher future pressures in the labor market for elites and derives in the dissipation of rents for them (Ansell, 2010). More generally, investments in outsiders (e.g. through public goods) provides assets that can lead them to claim parts of the rents in the future through pressures on entry to the coalition (Cox et al., 2012).

Besides the incentives of the established elite as a whole, politicians face strong inter-temporal dilemmas that arise from the cost and time-frame of completion of public goods projects.

In order for credit-claiming to be more effective, politicians might prefer to deliver goods that can be consumed by voters within the electoral cycle. This decreases credible commitments for investments in long-term projects –as is usually the nature of public goods– and increases the need for extra-institutional commitments to solve the problem of voter defection. Local elites serve as brokers in this exchange because they have both the organizational resources to mobilize voters and the vested interest in a continuous relationship with national elites that exchange rents and limited access for political order.

Thus the redistributive pressures that stem from income inequality are not necessarily channeled through the provision of public goods. This seems to be one possible outcome. Another possible outcome is the one outlined here, in which inequality serves as the overarching structural characteristic for elite capture and limited access to rent-sharing, while elections and poverty provide the chronic in-

centive to the provision of immediate goods.

In sum, the basic argument in this dissertation is that income inequality becomes a source of heterogeneity which induces collective action dilemmas among relevant sectors, much in the same way as ethnicity does in some regions of the world (of which Africa is particularly prone to). It is a key part of the argument, however, that this source of heterogeneity need be a *politically active* division in society, since the collective action dilemmas generated would be innocuous if a given cleavage does not structure politics in any meaningful way. The collective action dilemmas that emerge with heterogeneity along income induce conflict over two basic redistributive tools of modern states: taxation and spending.

However, in sharp contrast with ethnicity in Africa, heterogeneity along income lines has an inherent characteristic that makes it much more contentious. By definition, heterogeneity along income involves an *asymmetric control* of economic resources, such that one of the groups is inherently better off in terms of resources to mobilize policy in its favor (something that, although prevalent in Africa societies, where an ethnic group might systematically control business or politics, is not a *necessary* condition that stems directly from ethnic heterogeneity, whereas it does from income).

This asymmetric control of economic resources involves, for those privileged, an additional element of influence. Being a small elite in the context of a generally poor mass of people involves additional rents than the merely economic. The claim here is that economic asymmetries are correlated with asymmetries in other areas –political influence, access to quality higher education, knowledge, kinship ties with the political elites, and so on.

Thus, in the argument presented here, inequality signals the presence of elites with a disproportionate access to resources in multiple dimensions at the same time.

These asymmetries have a specific political effect: it allows the elites to control policy more tightly, and to bring it closer to its preferred ideal point in order to maximize their rents.

Furthermore, in the context of a broad mass of politically demobilized voters, in order to win votes (and deter violence) elites provide cheap handouts to the poor, who have high marginal utility of consumption and are politically demobilized, making them the perfect target for this sort of exchange. Finally, electoral pressures impose short-term constraints on parties and politicians, whose incentives thus align with those of the broader elites in the provision of handouts to the poor.

In order to provide evidence for this theory I focus on Mexico. It is an ideal case to test this hypothesis for multiple reasons. First, from a substantive standpoint, Mexico effectively solved the problem of violence with the establishment of a broad winning coalition that was based on the peaceful circulation of elites and the widespread distribution of rents across social groups (Wilson, 1950; Meyer et al., 1978; Smith, 1979; Lajous, 1981). Contemporary Mexico is an example of a mature limited access order (North et al., 2009) where violence has been effectively controlled, but is still a tool that organized groups can use to bargain up their rents.

Second, entrenched insiders in the rent-sharing arrangement posses huge advantages for the accumulation of productive, financial and political resources that are conspicuously absent for outsiders (Díaz-Cayeros, 2013). Those who benefit from the limitation of access and the concentration of rents wield disproportionate power and access to politicians and party leaders, as well as to overall rents.

Observers have highlighted key elements in Mexico to explore the limitation of access by elites: a self-centered banking system, the failure of land reform tied to demands for redistribution during the Mexican revolution, the capture of regulation and the stock market by a few dominant groups, the regulatory framework that

protects large business from competition, and the use of oil rents to insulate the ruling coalition from social pressures (Levy and Walton, 2009; Haber, 2009; Elizondo Mayer-Serra, 2009). Insiders to the ruling coalition are entrenched in a system of privilege and actively block attempts to reform.

Third, the levels of inequality are high, even when compared to the rest of Latin America. Around forty percent of its population falls within a category of poverty, while at the same time has strong and long-standing elites with world-class wealth. As per the discussion above, income inequality is an active political and social cleavage in Mexican society, and it structures politics and other narratives in a powerful way.

Fourth, as discussed in the introduction, it is important to bypass the traps of cross-national analysis where historical idiosyncrasies shape subnational dynamics, representing a serious historical threat to internal validity. These national differences can hardly be captured by simply including dummy variables for each country. This paper moves in the direction of taking the data-generation process seriously by looking at a single but complex case such as Mexico.

Furthermore, from a methodological standpoint it is important to understand these subnational dynamics with the appropriate data and statistical methods. There is no solid theoretical reason to believe that the dynamics we are looking for in the data must appear only at the national level with aggregate data –as is common with cross-national research. The emergence of more active subnational actors is inherent to any process of democratization. Particularly for Latin America, the third wave of democratization was accompanied by a massive devolution of powers to local governments without the concomitant tools for accountability (Diaz-Cayeros, 2006; Willis et al., 1999; Faguet, 2012; Cornelius, 1999). Governors, mayors and local organizations have more game under democracy (because they must also

answer to local voters), so it is not advisable to look only at national level dynamics. Of course, the availability of quality data is problematic to infer mechanisms in a meaningful way, and solving the subnational problem of each country first seems reasonable for a strategy that aspires to cross-national analysis with many countries.

In this spirit, a major contribution here is high-quality data for Mexico on income inequality at both the municipal and state levels, as well as public goods for households. This allows a data-driven approach to explore the hypotheses presented at different levels of government. This level of detail has not been undertaken for Mexico.

2.4 Towards a Unified Framework

These two theories of how public goods are provided need to be linked to make sense of the opposite effects discussed above. On the one hand we have a theory that predicts higher levels of public goods at lower levels of social heterogeneity. On the other hand we have a theory that predicts higher levels of public goods at higher levels of electoral competition.

A first corollary of this discussion is that societies that are homogeneous and with high levels of electoral competition should have on average (much) better overall levels of public services, and symmetrically societies with high heterogeneity and low electoral competition should have on average less public services. The predictions for the cases with the same direction are unclear. The results of different combinations are still unclear. Table 2.1 summarizes these expectations.

What predictions can we make for a country that democratizes in a context of high social heterogeneity? Will this always lead to lower provision of public goods? Or will the losses of heterogeneity be offset by the gains of democratization? Under

Table 2.1: Expected effects of heterogeneity and electoral competition.

		Electoral competition	
		High	*Low*
Heterogeneity	*High*	?	–
	Low	+	?

what conditions does the former happen? Is more heterogeneity always detrimental to the provision of public goods or does the type of political regime interact with societal dynamics to produce the final result?

To start looking systematically at these questions we need to start looking systematically at the interaction between both effects to parse out the predictions at different levels of both. To do this we must theorize about the conditions under which we might expect democracy to interact negatively with social heterogeneity to reduce output of public goods. This section outlines a proposal to begin thinking about this problem. I make use of the theory of social cleavages and I draw from recent advances in the ethnicity literature to generate more general postulates. I then generate predictions about the provision of public goods.

In general terms, a social cleavage may be understood as an identity that has been aroused, which sorts individuals into separate social groups. I purposefully link the notion of identity to cleavages in the basic definition to stress the fact that cleavages depend on public and private identities. These identities must be "sticky" in the sense that they are difficult to change (Chandra, 2006), and are most likely circumscribed to specific historical processes (Lipset and Rokkan, 1967) or structural characteristics of societies (Iversen, 2001).

Standard cleavage theory establishes a sequential process for the formation of social cleavages. An identity by itself need not necessarily be translated into a

social cleavage. Many identities exist that are never translated into public identities. Personal preference for the type of food we like the most, say, or how we spend our leisure time do not usually translate into public identities.

Of the set of all possible identities, only some do become part of the collective identity of individuals, in which individuals recognize each other, making the distinguishable from each other along that specific dimension. Take for example the futile debate over which operative system is better, or the sociolect we use to communicate with our close peers, or our opinions about marriage. These are identities that have been aroused, creating a public identity of individuals, but they do not necessarily have special political transcendence.

But out of the latter social cleavages, some might have political transcendence. Our opinions about marriage, for example, may be politically innocuous when discussing heterosexual couples rights to marriage, but may be politically sensitive when discussing the rights of gay couples. Whether individual attitudes about gay marriage become political or not depend not so much on the *nature* of the issue, but more on the *context* of that opinion. If everybody holds the same opinion as I do, it is a non-issue. If not all people share the same opinion as I do but there is a general acceptance that it is a private matter, it is a non-issue. If the context where I hold this opinion is traditional and conservative then it is likely to become a politically active issue[4].

The last element in the sequence involves the effects of a politically active

[4]Note that I am being agnostic about the specific conditions that lead from one stage to the other. This is outside the scope of this work. We can nevertheless conjecture that the transition from a politically inactive to active issue relates to the stakes involved: is lack of agreement on this issue likely to affect my life in a fundamental way or not? If it does, it is likely to become a political issue –hence the stridency of issues like gay marriage and adoption, abortion, euthanasia and the recreational use of drugs, because they touch upon fundamental elements of the way we live our lives. This notion of fundamental stakes as the basis of politics echoes Schmidt's (1927 [2007]) definition of the political as the relationship between two incompatible existential traits, which must become enemies.

cleavage. Of all politically active cleavages, a few will be strong enough to shape the political discourse and induce the elite-mass coordination necessary to form political parties (Lipset and Rokkan, 1967; Cox, 1997). My analysis stops one step before and stresses that within the subset of politically active cleavages we can distinguish a gradation of levels of conflict. Some political cleavages will be stronger than other –perhaps those that involve higher stakes for individuals and groups will be more virulent cleavages. Under this logic, some political cleavages will be so strong as to forcefully shape politics[5].

This brief recapitulation of cleavage theory is relevant to my argument because it establishes the logical possibility of different sources of identity forming the basis of social cleavages, and allows for the possibility that the same identity be important in one context, and irrelevant in another one. Furthermore, it sets a gradation of conflict depending on the stakes involved in the formation of politically active identities and groups. Finally, it allows for a single cleavage type to be so central that it structures politics in a fundamental way.

Thus, in general this theory can be made consistent with the idea that fragmented groups provide less. In fact, I argue that cleavage theory is a fundamental element that underlies the negative effect of social heterogeneity on the provision of public goods, which a conflict ridden society might provide well below optimally.

But although having a politically active cleavage is a necessary condition to observe a suboptimal level of public goods provided, it is by no means a sufficient condition. The institutional context is of course also important to attempt any predictions about the effect of social heterogeneity. A power-sharing institutional

[5]Note that in this sense I do not agree with Posner (2005; 2004), who argues identities are "chosen" from the available repertoire to maximize political effectiveness in the formation of minimal winning coalitions. My definition is perhaps closer to Chandra's (2006) definition of "sticky" identities.

framework will decrease the negative effects of social heterogeneity on the provision of public goods by guaranteeing that all relevant groups have a say in how policy is designed, and more importantly, how budget is spent – as for example the Dutch or Belgian consociationalist versions, or the South African and Lebanese power-sharing agreements, all characterized by proportional electoral systems and mutual veto powers (Lijphart, 1985, 1999).

This notion of a cleavage that structures politics in a fundamental way is helpful to understand the scope and limits of the huge literature of ethnic politics, which looks at the effect of ethnicity (of *active* ethnicity) on party and congressional politics. Ethnicity is just one among many cleavages that may arise in a society. Ethnic problems may exist latent or actively in a given society, but it will only inhibit the provision of public goods when a) it is an active cleavage which b) structures politics. In this sense, the notion of ethnicity lowering the provision of public goods could be seen as a special case of a broader set of collective action dilemmas. These arise when groups have divergent preferences –fight– over resource allocation –in this case, budget for public goods.

These active and politicized cleavages reflect different preferences over which public goods should be provided, and they create governance problems. But this is only the demand side. Most of the existing literature on this subject has focused more on the demand side of the problem, and arguing away the politics by using heuristic tools such as the tax rate. I argue that the ethnicity hypothesis is the proper mechanism but it is context-dependent on the politically active cleavages in any given society. I generalize the argument to include any politically active cleavage that structures politics in a meaningful way.

Given my foundational claim that income inequality is a politically relevant cleavage in Mexico, I can now turn to series of concatenated predictions that stem

from the discussion above. First, income inequality is negatively associated with the provision of public goods. Second, the effect of inequality should be stronger in contexts of poverty. Third, more electoral competition should be linked to a higher provision of public goods, but fourth, the beneficial effects of competition should be hampered by income inequality.

The next chapter turns to describe the social and economic situation of Mexican households.

Chapter 3

Basic Infrastructure and Literacy Among Mexican Households

The modernization of Mexico during the last fifty years has generated welfare for millions of families, but has neglected a substantial portion of the population. Communities all across the country lack basic infrastructure like running water, electricity, sewerage and the ability to read and write, which are basis of long-term development (Sen, 1999), are an historical commitment of the Mexican state in the post-revolutionary (Wilkie, 1970; Lajous, 1981; Meyer et al., 1978) and new democratic eras, and can be linked to modern conceptions of human freedom (Rawls, 1971; Nussbaum, 2001; Prendergast, 2005).

This chapter analyzes the extent to which the Mexican state has been successful. It does so in a general way, which is always incomplete. I first present an overview of income, ethnicity, and the geographic dispersion of communities. These are important because they set the context (and give rise to some dilemmas) of development policy in Mexico. I then analyze the distribution for 16 profiles of household infrastructure. This is the dependent variable in this dissertation. The next section shows the progression of basic infrastructure during the 1990-2010 period, and shows that the official data are misleading to profile households because

they overestimate the actual provision. The section then adjusts with a more realistic understanding of what it is to "have" running water, sewerage and electricity. Finally, the section after that makes the case for profiles of public goods by analyzing patterns in municipal provision.

3.1 Some Structural Characteristics of Households

A fundamental problem that the Mexican state faces at all three levels for the provision of basic infrastructure (including schools) is the level of geographic dispersion of some communities. My own field-research has revealed this structural problem in a number of states, particularly Oaxaca and Chiapas in the southeastern region of the country, but also in the central and northern states of San Luis Potosí and Baja California. It is not uncommon in rural Mexico to find very small human settlements in remote areas: a couple of wood or tin shacks, some animals (mostly chicken) and one or two couples that recently started a new locality. In some most areas of the country these are called *rancherías*.

In my experience, the formation of these micro-localities follows some variation of the following pattern: a young couple from nearby localities (already small to begin with) decide they want to start a family. After saving money for some time and rising their own animal they "get together"[1]. Then they choose a spot to build their home, but the location is usually not in the same settlement of neither of their parents, but within a radius of a couple of kilometers.

This is such a standard practice in many rural areas that the Mexican bureau of statistics (*Instituto Nacional de Estadística y Geografía*, INEGI) designs the census to capture all these micro-localities. The census disaggregates data at the

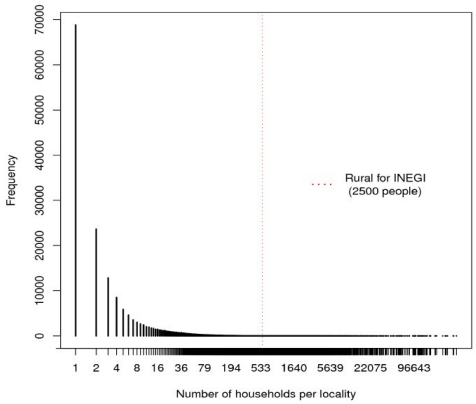
[1] *Se juntan*, in Spanish.

household level of course, but the next level of aggregation is the locality, which it defines as any human settlement of two or more "homes" (*hogares* in Spanish). Homes are a human unit, usually related by some sort of familial ties, that share the expenses and some basic areas of a household, like a kitchen and restroom, or equivalent. Thus the census allows us to distinguish, say, one household with multiple homes from one household with only one home.

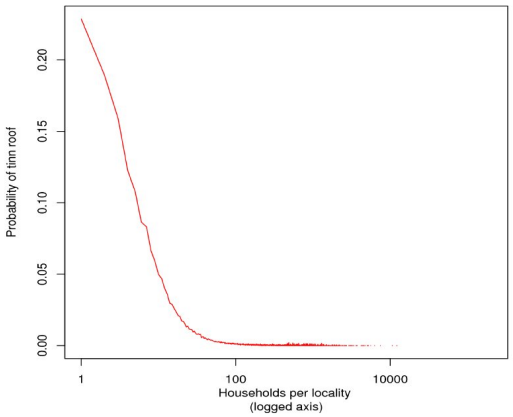
With these level of disaggregation we can explore how generalizable the impressions presented above are. Figure 3.1 shows four different structural characteristics of Mexican households.

Panel 3.1a shows a measure of locality fragmentation. The horizontal axis represents the number of households per locality, and is therefore an indirect measure of population. Values to the right are bigger-sized localities. each household has on average 4.4 individuals (in 2010). The official threshold to consider a locality as rural is 2500 people, or 568 households; this threshold is marked with a dotted line. The distribution shows a very clear pattern of high fragmentation of the population. There are about 70,000 localities of a single household. The curve starts to stabilize around 100 households per locality. This substantially increases the cost of providing basic infrastructure because the grid of services needs to be expanded geographically in an important way. Many of these very small localities are up in the mountains or on rugged terrain, which further increases the cost of provision. Panel 3.1b show a related phenomenon: the relationship between population dispersion and poverty (the latter measured as the probability of a household having a tin-roof at different locality sizes). As the number of households per locality decreases, the probability of having a tin roof increases. The latter two graphs show how rural poverty is highly concentrated in areas with very little population density.

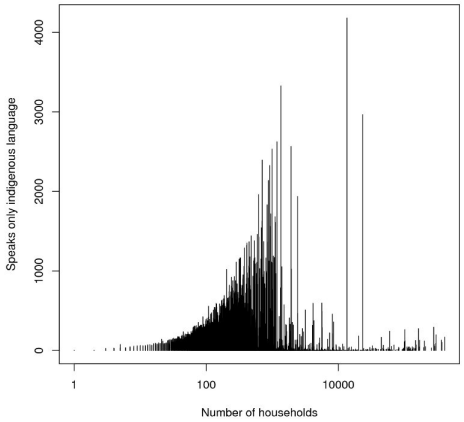
Another dimension compounding the latter effect is that of ethnicity. Panel



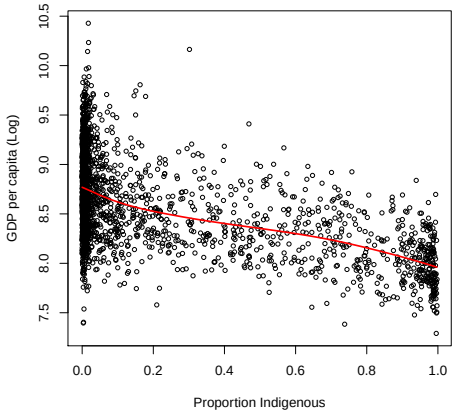
(a) Fragmentation of households.



(b) Poverty and locality size.



(c) Indigenous composition by locality size.



(d) Income by ethnicity.

Figure 3.1: Structural characteristics of localities: income, population dispersion, ethnicity.

3.1c shows the number of households that speak *only* an indigenous language against locality size. The data suggests that the percentage of indigenous households increases as locality size decreases, meaning that smaller localities tend to be more indigenous. Panel 3.1d shows the relationship between municipal GDP in 2005 and the percentage of the population which self-ascribed as indigenous in 2000. It confirms a higher proportion of indigenous peoples per locality is correlated with a lower GDP per capita. What is perhaps more relevant is the dispersion patterns in the data. In general there are municipalities in the lower end of income at all proportions of indigenous population. Municipalities become sparse in the .1 to .9 proportion range; most of municipalities are either very indigenous or very non-indigenous (mestizo, white, black, etc.). The range of income, however, is about half the size for indigenous communities compared to non-indigenous communities. This means that not all poor communities are indigenous, but all indigenous communities are poor.

The evidence in this section shows just how complex the context for providing infrastructure is in Mexico. Many households in very small localities which are very poor and are geographically isolated pose a serious challenge for government provision of water, sewerage, electricity and schools. The costs of providing under such conditions become prohibitively high[2]. and, in the context of a high mass of

[2]State governments are well aware of this. The previous governor of Chiapas Juan Sabines, long-time PRIista converted into PRDista in 2006, implemented a pilot project called *Ciudades Rurales* (rural cities) in the municipality of Santiago El Pinar, with partial funding from the United Nations Development Programme. *Ciudades Rurales* consists in relocating people from dispersed localities (always poor and indigenous) to the municipal seat, where it is less costly to provide housing, schooling, health clinics and other services per capita because the infrastructure is already there. This policy reverses the logic of providing public goods by moving people into places where the public grids already exist, instead of providing new services to settlements that already exist. This sounds questionable in theory if people are somehow coerced into leaving their communities. In addition, field-research shows that people are provided with mediocre housing, still have no electricity and sometimes no running water, and they are provided with a stove, which they do not use because traditionally women cook using fire. The United Nations' final report (an addendum) on the matter is also cautious about the results of this program, due primary to its lack

poor voters and small elites, it is likely that politicians would rather free resources from these massive investments by providing cheap hand-outs, and reallocate the surplus into populations with a higher electoral return.

3.2 Household Profiles and Full Coverage

Typical research of the provision of public goods use aggregate data of isolated goods (Alesina et al., 1999; Banerjee et al., 2005; Banerjee and Somanathan, 2007), additive indexes derived from aggregate data (Díaz-Cayeros et al., *forthcoming*) , or using spending as an indicator of provision (Zhang et al., 2004). But inferring distributive dynamics exclusively from these isolated goods could be misleading because governments could favor constituencies with multiple (and not one) public goods at the same time (Kramon and Posner, 2013).

There is a tendency for this research to look at public goods either in isolation of each other or at aggregate levels (and combinations of them). Conceptually, this assumes that the provision of each public good is independent of the other. But this assumption is questionable. Evidence from Mexico suggests that politicians minimize the risk of their electoral investments by diversifying their portfolios (Díaz-Cayeros, Magaloni, and Estévez, 2007), that is, by investing in *bundles* of public and private goods that minimize electoral volatility. From the point of view of a politician who is trying to maximize the electoral returns of the budget invested in her constituents (Kitschelt and Wilkinson, 2007) it is unclear if considerations about which public goods to provide are independent of each other. This is, at most, an empirical, and not a logical, question.

This section presents evidence that suggests that thinking of public goods

of "viability" in the absence of proper capacity-building of relocated people (UN, 2012), although it does not mention the serious lack of basic infrastructure that still pervades among the relocated.

as bundles, rather than isolated goods, is useful in advancing this research agenda. Building from the insights of the literature, this section profiles each household in terms of *bundles* of infrastructure, not of isolated goods (individual or aggregated). The first necessary step is to define and count the occurrences of each bundle in a population. If we restrict our analysis here to *basic infrastructure* (water, sewerage and electricity) and *literacy* we get a four-dimensional vector of binary outcomes that captures whether a household has or not the public good. This means there are $\sum_{k=0}^{4} \binom{4}{k} = 2^4 = 16$ different combinations of four public goods. For Mexico, the distribution of these bundles is summarized in Table 3.1.

Table 3.1: Sixteen bundles of public goods in Mexico (2010) at the household level, ordered by their frequency (n=2,848,922). The profile (1,1,1,1) is full coverage, and is the dependent variable in this dissertation.

Water	Electricity	Sewerage	Literacy	Freq.	$\hat{p}$
1	1	1	1	1,255,386	0.441
1	1	0	1	715,807	0.251
0	1	0	1	271,126	0.095
1	1	0	0	191,911	0.067
0	1	0	0	109,388	0.038
1	1	1	0	104,925	0.037
0	1	1	1	62,018	0.022
0	0	0	1	47,157	0.017
0	0	0	0	32,204	0.011
1	0	0	1	26,407	0.009
1	0	0	0	14,941	0.005
0	1	1	0	10,757	0.004
1	0	1	1	3,681	0.001
0	0	1	1	1360	$\sim$0
1	0	1	0	1345	$\sim$0
0	0	1	0	509	$\sim$0

Each one of the sixteen possible bundles of public goods that are described in Table 3.1 has a non-zero frequency. By far, full coverage is the most prevalent bundle (44%), which is consistent with the extensive process of modernization that

the country has experienced in the last 50 years. Nevertheless, still 56% of all households lack at least one good, either basic infrastructure or literacy, and about 32,000 (1.1%) still have none.

The total number of households is 2.85 million, which corresponds to a 10% sample of the 2010 census. There is a substantial level of variation in the different combinations of bundles for the Mexican households. The category with the least observations are those families with only sewerage. Furthermore, a high percentage of households do not have sewerage, and a very low percentage has sewerage and not the other ones, suggesting that sewerage might be a relevant good to look at.

This data allows me to look beyond usual measures that rely on allocated budget as opposed to actual provided goods which is problematic because looking at allocated budget assumes away the complex political and technical procedures by which budget is transformed to infrastructure. The data also allows me to go beyond aggregate measures which, although useful, necessarily prevent us from making inferences about the relationship between household characteristics and aggregate phenomena (e.g. income and vote distribution).

The variable of choice and the unit of analysis in this chapter take into account these claims by focusing on the *bundles* of public goods available for *households*. If there is variation in these bundles, what explains it? More specifically, which characteristics of households and more aggregate measures influence the probability of a household falling within each bundle? To address these questions I first look at all variables in detail.

3.3 Reconstructing Official Figures

The Mexican census has gathered information about the basic infrastructure of dwellings since its 1970 round. At the very least, respondents are asked whether their household has running water, electricity and sewerage. More recent rounds of the census began specifying the availability of the resource and not only the existence of the infrastructure, that is, besides of asking people only if they have running water, it also asks how many times a week they have it, and whether those days they receive water during all day or only for a few hours; For electricity the answer has traditionally been simply whether they have or not electric power, and the 2010 census asks also whether the household has a electric meter; finally, for sewerage, the census now asks whether the sewerage is connected to the public grid or if it flows into a river, lake, ditch or septic tank.

When one looks at the official data, there has been a steady increase in the coverage of basic infrastructure since 1990. Table 3.2 shows the proportion of households in Mexico that have access to basic infrastructure, according to official records.

Table 3.2: Progression of coverage at the national level, 1990-2010. Figures marked as "Official" correspond to government figures, "Adjusted" to figures recalculated with more standard developmental criteria, as discussed below.

	1990		**2000**		**2010**	
	Official	*Adjusted*	*Official*	*Adjusted*	*Official*	*Adjusted*
Sewerage	.62	.51	.75	.50	.89	.51
Water	.80	.76	.95	.80	.98	.81
Electricity	.875	.871	.95	.92	.98	.96

According to these official figures, the provision of running water has increased by around 13% every decade to the actual level of .89. Sewerage jumped

from .8 in 1990 to almost full coverage in 2010, and electricity, which shows systematically the highest proportion, went from almost .85 in 1990 to .98 in 2010. It seems, if we believe in this data, that there has been substantial progress in the last two decades, with the supply of running water remaining as the only relevant challenge in terms of basic infrastructure.

A word of caution, however, must be said regarding the official figures. The census has only two response categories for electricity (*yes* and *no*), but it has multiple categories for the remaining two services. The item for sewerage has the following options: household is connected to the public grid, household has a septic tank, has pipeline but leads to ditch or crack, has pipeline but leads to a river, lake or ocean, and finally household has no sewerage or drain. The item for running water in turn has the following options: has piped (running) water within the household, has running water within terrain but outside the household, collects water from public water-tap or hydrant, receives water from tank-truck, collects water from a well, river, lake or river. This item does not include a response for no-water, which suggests that the Mexican government is really asking how people get water in general, and not specifically whether the household has basic infrastructure. The raw distribution of these response categories[3] is shown in Table 3.3.

These response categories present the challenge of defining what we will understand by basic infrastructure. Governments have the duty to provide a minimal level of well-being to their citizens. Under this very minimal definition we should expect the government to report the percentage of households covered with decent infrastructure, i.e. having running water inside the household (or within the terrain), and having a decent disposal system in which human waste flows to a government operated systems of drains and sewage.

[3]Excluding missing values, which amount to around 1% of the cases on average.

Table 3.3: Raw proportions of coverage, by response category.

		1990	**2000**	**2010**
Water	*n*	*8,049,113*	*2,290,228*	*2,888,185*
	Within household	.49	.50	.52
	Within terrain	.27	.30	.29
	Public tap / hydrant	.03	.03	.02
	From another household	–	.02	.02
	Tank truck	–	.02	.02
	River, lake, creek	–	.13	.13
	No water	.21	–	–
Sewerage	*n*	*7,966,262*	*2,295,591*	*2,874,519*
	Connected to grid	.51	.50	.50
	Septic tank	.09	.13	.25
	Ground, river, lake	.03	–	–
	Ditch, crack in ground	–	.03	.02
	River, lake, ocean	–	.02	.01
	No sewerage	.37	.32	.22
Electricity	*n*	*8,113,051*	*2,300,180*	*2,885,227*
	Yes	.87	.92	.95
	No	.13	.08	.05

One cannot construct measures of basic infrastructure coverage including as covered, for example, those households that get water from a river or lake. In my own research conducted during 2007-2008 in the state of Oaxaca (southern Mexico) I was able to visit very marginalized communities up in the mountains[4] where people got water from a nearby river. Although close in distance, the terrain in these communities is so rugged that people must walk for two hours carrying two or three full buckets of water, every day. According to the Mexican government, these households have water and are counted affirmatively in the construction of official figures.

Similarly for the case of sewerage, the official data includes in the affirmative those households that have a septic tank, have some sort of drain that leads to a ditch or some crack on the ground, a lake, river or an ocean.

In all cases except for sewerage in 2000, I was able to reconstruct the official data within a 3-4% margin of error.

It seems the official –albeit unspoken– measures of the Mexican government during the last three decades have insisted in assuming that people who somehow get water –however they do it, whether they just open their faucets taps or they have to walk one hour to get the daily requirements– all of these cases fall within the same satisfactory category for the government. Households who must deal with their waste dumping it to a river or lake, ocean or ditch, also fall within a satisfactory category. It seems, for the official narrative, that the serious dignity and health risks associated with these practices do not matter. The columns marked as "Adjusted" correct for the classification of the official figures. Figure 3.2 plots the adjusted values in Table 3.2.

My figures include only those situations in which a household has a decent

[4]San Antonio Sinicahua and Yosocaua Sinicahua in the Mixteca region.

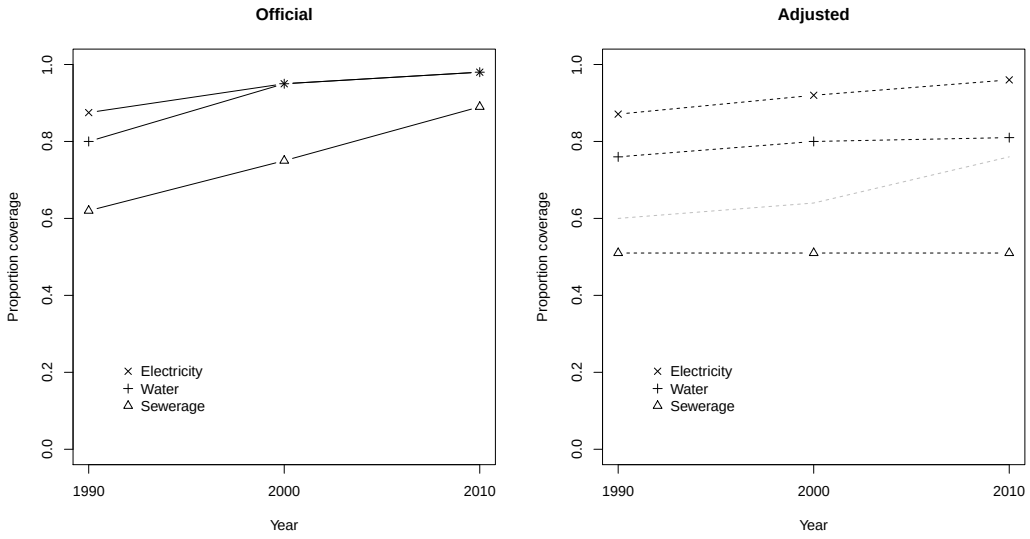


Figure 3.2: Official and adjusted criteria for coverage. Dotted line in right panel is the sum of sewerage and septic tanks.

infrastructure: running water within the household or within the terrain but outside the household, and sewerage connected to the public sewage and drain grid. The figures show a substantially different story. The extension of infrastructure to provide running water to households seems to have plateaued at around 50% of the households in the country. This means that provision has not stalled. The provision of real sewerage has increased a meager 5% above population growth in the last two decades, but electricity has indeed reached almost full coverage.

These figures must be interpreted in light of population growth. If the provision of some basic infrastructure is as fast as the population growth (or more specifically, the rate at which new households are formed) then we should see no movement across time, as is the case with sewerage. If the rate of provision is faster than the rate at which new households form, then we would see an increase in the proportion of coverage, as is the case, albeit weak, for running water and electricity.

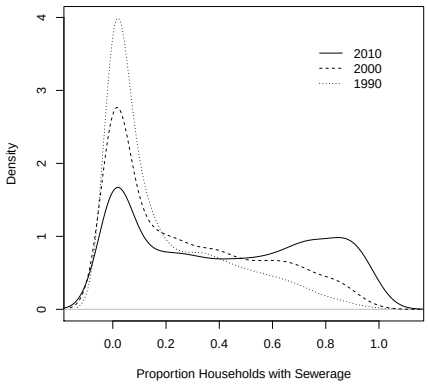
Instead of looking at the national average as in Table 3.2, we can look at

how the proportion of coverage behaves when we cluster the data by municipalities. The mean values are the following (for 1990, 2000 and 2010 respectively): for water .59, .72 and .81; for sewerage .19, .27 and .42; finally for electricity .77, .89 and .95. In general, when we adjust by municipality the estimated proportions become lower than when we look at the national average. This suggests that there is a territorial component to the provision of public goods. More specifically, it suggests that the increases in coverage happen within the municipalities that already have high coverage. Figure 3.3 shows the evolution of the densities of municipal proportion of households with basic infrastructure.

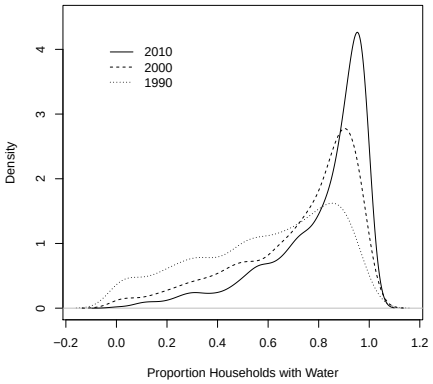
A different set or insights arise when we look not only at coverage, but also to the *quality* of coverage. Table 3.4 shows the distribution of proportions of the weekly availability for those households with running water in the household or inside the terrain for 2010. There are 2,335,178 households in the sample which fall into these categories, out of a total of 2,903,640, which corresponds to the 81% of water coverage shown in Table 3.3.

Around 64% of these households receive water every day, 20% receive more than twice a week, and around 16% receive water less than twice a week. This means that even when households are connected to the public water system, shortage of liquid is still somewhat pervasive. Out of all households in Mexico, only $(.64)(.81) = .52$ have a daily supply of running water. This figure substantially revises the level of .89 according to the Mexican official figures.

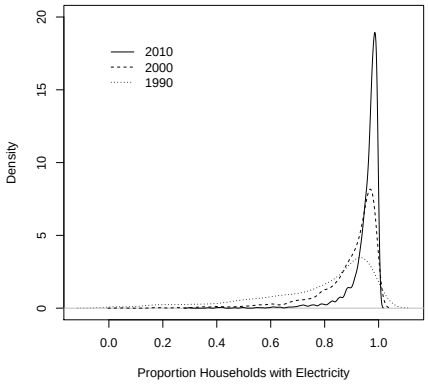
A similar finding emerges when we look at electricity. The most recent census is that it asks households whether they have a electric meter at home. As is common in other developing countries, there are a number of households legally connected to the electricity grid, but many others connect illegally to the grid by, literally, hanging cables to existing electricity lines, called *diablitos* in Mexico. These households do



(a) Sewerage.



(b) Water.



(c) Electricity.

Figure 3.3: Municipal proportion of households with infrastructure 1990-2010.

Table 3.4: Proportion of water availability by source.

	Water availability [a]				
	Daily	*>Twice week*	*Twice week*	*Once week*	*Sometimes*
Household	0.46	0.11	0.03	0.02	0.03
Terrain	0.19	0.09	0.03	0.03	0.03
Public tap	–	–	–	–	–
Other household	–	–	–	–	–
Tank truck	–	–	–	–	–
River, lake, creek	–	–	–	–	–

[a] Proportions sum slightly above 1 due to rounding.

not have electric meters, and so the existence of a electric meter is a rough proxy of how many people are truly being provided electricity by the government. Table 3.5 shows the proportions of people with electricity that are legally connected to the electricity grid.

Table 3.5: Proportion of legal coverage of electricity.

	Electric power	
	Formal	*Informal*
Electricity	0.85	0.11
No electricity	–	0.04

The total proportion of Mexican households that have electricity in 2010 is around 96%, which corresponds closely to the 95% reported coverage in Table 3.3. However, 11% of all Mexican households that have electric power are connected informally to the power grid. If we believe that official figures should reflect the amount of people that are provided electric power by the government, within the legal framework, then the real coverage in Mexico goes down to 85%.

It might be useful to summarize our results. Table 3.6 shows a more finely adjusted coverage than that of Table 3.3.

Table 3.6: Summary of total adjusted results.

	2010	
	Official	*Adjusted*
Water	0.89	0.52
Sewerage	.98	0.51
Electricity	.98	0.85

The official narrative of the Mexican government tends to overestimate the true proportion of households with coverage of basic infrastructure. Of course the crux of the matter is how we define coverage. The data presented here takes more

stringent criteria to classify coverage, but this stringency is nothing out of the ordinary. Households should be classified as covered when the service provided conforms to basic standards of human decent living: a) having running water inside the household every day, b) having a system to dispose human waste that does not drain to a river, ocean or ditch, and c) consuming electricity within the formal bounds of governmental provision.

Chapter 4

The Evolution of Inequality in Mexico 1990-2010

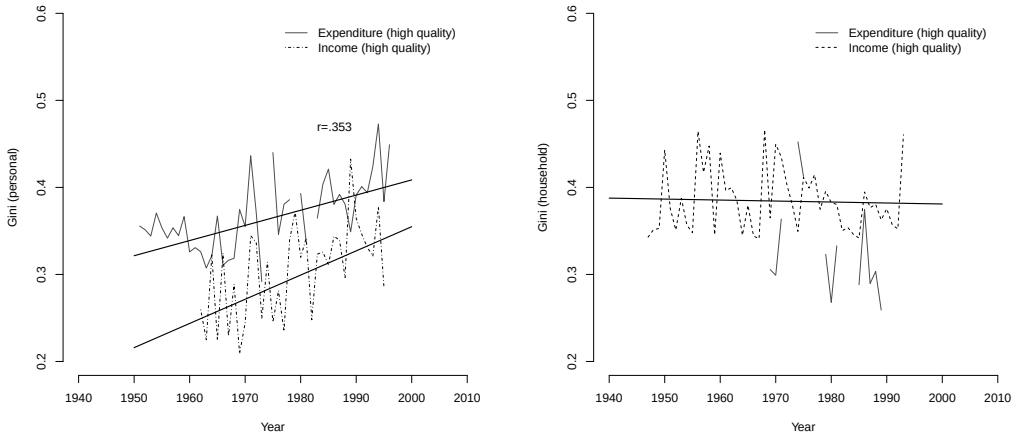
The interaction between income inequality and electoral competition, and their effect on the probability of having full coverage of public services is the main interest in this dissertation. The previous chapter was a detailed explanation of the dependent variable of this dissertation. This chapter presents a detailed analysis of the evolution of income inequality and electoral competition in Mexico during the decades of 1990 through 2010, which are the two main explanatory variables of interest. First I look at the evolution of (work-related) income and inequality during 1990-2010, with a discussion about the relationship between income and inequality. The next section looks at how the state and municipal electoral landscape during that same period. The final section presents some descriptive data of how these two measures have evolved in tandem during the last 30 years.

4.1 The International Context: Inequality in the World

Before describing the evolution of inequality in Mexico, it is perhaps best to begin with a description of how income inequality looks for countries and regions around the world. One of the most important limitations of any research dealing with income and its distribution is the quality of the data. In particular, the most important problem is the degree to which data are comparable, both horizontally or longitudinally. It is difficult to find time-series whose that cover a good amount of countries. The quality and availability of data is potentially correlated with country income, raising serious concerns on the bias of our observed measures of inequality around the world. Furthermore, even when quality and availability are not an issue, there are multiple ways of gathering and processing information about income to build inequality measures, yielding time-series that are not only unbalanced in the number of country-cases per year, but are also not harmonized in terms of the underlying data to construct the measures.

Deininger and Squire (1996) (DS hereafter) produced a data-series to address these specific measurement and methodological problems. Their series covers 138 countries over the period of 1890-1996, but the data is unfortunately still unevenly distributed across countries. Their innovation was to systematically trace back reported measurements in the literature to reliable primary sources, as well as to apply three criteria to distinguish high quality measurements: first, data must come from individual or household observations and not from tax records or national accounts plus some assumed functional form of income distribution (this would precisely preclude the research leverage to study inequality); second, the individual-

level data should come from nationally representative samples, and not be truncated to some specific subgroup of the population (such as urban population); third, it should capture income and expenditure in the broadest possible terms (to include insofar as possible non-wage earnings or the more elusive non-monetary income).



(a) Using personal income.

(b) Using household income.

Figure 4.1: Deininger and Squire (1996) Gini for all (yearly available) countries, using only high-quality data points.

Figure 4.1 shows the evolution of income inequality measured with the Gini index as reported in the widely used DS time series, constructed using the subset of observations considered as high quality. Panel 4.1a shows the index from around 1950 to 2000 (depending on the series) using the average of all available yearly measures. These Gini measures are constructed using personal (not household) data. The two series shows in turn how Gini measures differ when using personal income versus personal expenditure[1]. The Gini measures constructed with personal income (the dotted line) show for the most part lower levels of inequality than when

[1]The personal income series covers 35 years with 167 cases, and the personal expenditure 121 cases along 43 years.

using expenditure. In terms of their tendency, the naive regression lines show an upward trend for both with a slightly faster increase when measuring with income. The correlation of both measures stands at $r = .353$.

A different context arises in panel 4.1b, which shows the evolution of Gini measures using household instead of personal data. Again, there are two different series, one corresponding to Gini constructed looking at income, and the other one using expenditure. The problem of sparseness in the data that uses expenditure makes it unusable: there are observations only for 24 countries across 15 years. In turn, the income data shows a well populated series with 333 cases distributed along 47 years. However, the tendency looks very unlike the previous panel. Looking at the evolution of Gini using household income, the naive regression shows a tendency that is negative and very close to zero.

The selection of cases is erratic, which is reflected in the point-values of the index. In this sense the apparent instability of the measurement could well be a statistical artifact that arises from the fact that not all countries have data for all years. Comparability becomes thus difficult from year to year, although on average the measurements should reflect the overall tendency of inequality more properly.

There are therefore at least four problems in this data, which are endemic to the study of inequality (Deaton, 1997; Sen, 2006; Milanovic, 2002; Deininger and Squire, 1996; Jenkins, 1991; Van Kerm, 2002; Milanovic, 2008): the unit of analysis across countries or along years may differ, and if the levels and tendencies are correlated with the selection of the unit of analysis then our inferences will depend heavily on the choice of household or personal data; not all countries have regular data points, and so the series display high variation which might be indeed a statistical artifact originating from the data; even if the unit of analysis is harmonized, a third difficulty arises because inequality measures that look at income differ from

those that look at expenditure, and the levels observed (as well as tendencies) might also be correlated with this choice. Finally, the weight of the relative populations of each country can or cannot be taken into account when looking at yearly average inequality. Very populated countries like China or India will have a different effect on the overall distribution of income with each approach, regardless of whether we look at household or personal, expenditure or income data.

Other groups of researchers have undertaken similar efforts as DS to gather inequality data of long temporal scope that is at the same time comparable. The *Estimated Household Income Inequality* (EHII) dataset (Galbraith and Kum, 2005; University of Texas Inequality Project, 2008) builds upon the DS dataset but estimates new data points making use of manufacturing pay data of the Industrial Statistics database published by the United Nations Industrial Development Organization (UNIDO). The EHII dataset is a reconstruction of the DS inequality measures using the log of the Theil (1972) index for manufacturing pay per country as the main predictive variable, and then using the OLS parameters to construct the final estimates. It is, in essence, the expected value of a simple OLS model that regresses DS Gini on the dispersion of manufacturing wages. This is an important effort to construct comparable time-series of economic inequality, albeit its substantive and substantive shortcomings.

The main problem with this estimation procedure is that it assumes, but does not prove, a functional relationship between structure of manufacturing payment and income inequality. it could be that this effect is in fact conditional on the level of industrialization, with noisier measures corresponding to more rural or more service oriented economies, so this measure would be biased for cases with primary and tertiary dominated economies, but more accurate for industry-dominated economies. One of their central critiques is that the sparseness of DS means that the

yearly average will be dominated by those countries that have more measurements. However they provide indications of a strong relationship between pay inequality and overall income inequality using those cases for which there is no sparseness: Great Britain and the United States.

A second problem with the estimation is that it lumps together all measure types (household and personal, net and gross, income and expenditure) and controls for these types in the model using dummy variables. This is intrinsically problematic because the main problem that the DS dataset attempts to attenuate is precisely the variation in estimates of inequality depending on which data type is used –which, as we saw above, drastically affects our picture of the world.

A third problematic feature is that it uses additional control variables in the estimation procedure that potentially have serious collinearity: the ratio of manufacturing employment to population, the share of urban population, and the population growth rate. This might produce problematic estimates and is not properly addressed.

Another effort to produce systematic and comparable data across countries and years is the Luxembourg Income Study Database (LIS, 2013). It consists of a microdata repository from which income and wealth measures are aggregated for 47 countries (30 high income, 8 upper-middle income and 2 lower income). Microdata are provided by statistical bureaus or other official national data centers across countries, thus bypassing some of the problems associated with previous efforts that look at informal and/or aggregate measures from the literature. The LIS data however also reflects the heterogeneity in methods to collect data across countries. It has therefore microdata that come from both income and expenditure surveys, household and personal units, as well as gross, disposable (minus tax) and net (minus social security contributions) incomes. A major advantage is that all variables are

properly harmonized and standardized to minimize comparability problems across countries and time.

The LIS project has generated a time-series for Gini measures that range from 1967 through 2010[2]. The data were constructed from microdata for all available countries using disposable household income and excluding those observations where income was exactly zero. Figure 4.2 shows the evolution of Gini measures from 1967 through 2010. As in the previous figure, the continuous line in the middle corresponds to the world average (for all available countries in a given year), which ranges from .23 to .46. It should be emphasized to avoid confusion, that the term "world" here simply refers to the totality of available countries in the LIS dataset, with the caveat that LIS includes mostly high and upper-middle income countries. If income inequality is more pronounced in middle income countries (as Kuznets believed) then this series should be biased downward[3]. As is usual, countries have data at regular albeit not overlapping intervals, which explains partially the variability in the trend. However, the data shows on average a long-term increase in the average inequality. This result is misleading since some of the high inequality countries (e.g. Brazil, China, India) have data only for the latter part of the series, thus increasing the observed inequality simply by inclusion in the series.

The upper-most trend corresponds to countries in Latin America, motly located in the lower vicinity of .5 (the middle of the Gini scale). The LIS project only has data for Brazil (2006), Colombia (2004), Guatemala (2006), Mexico (1984, 1989, 1992 and then biannually through 2004), Peru (2004) and Uruguay (2004). For the LIS series, the inequality for Latin America is dominated by Mexico, so most of the information captured by that trend corresponds to a single country. The rest of the

[2]Some years are missing: 1968, 1970, 1972, 1976 and 2009.

[3]It is, however, premature to make conclusions with the state of actual data.

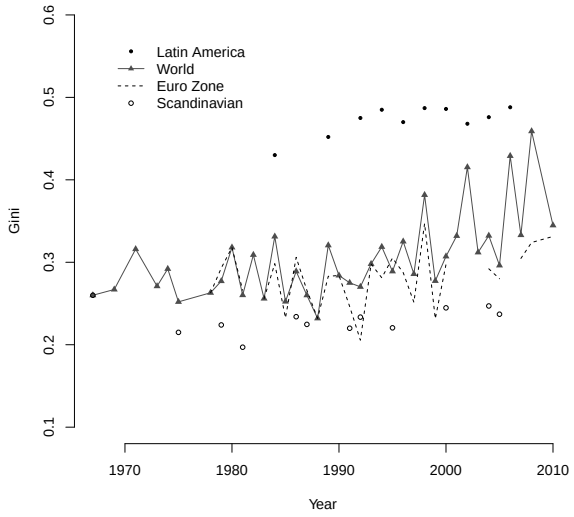
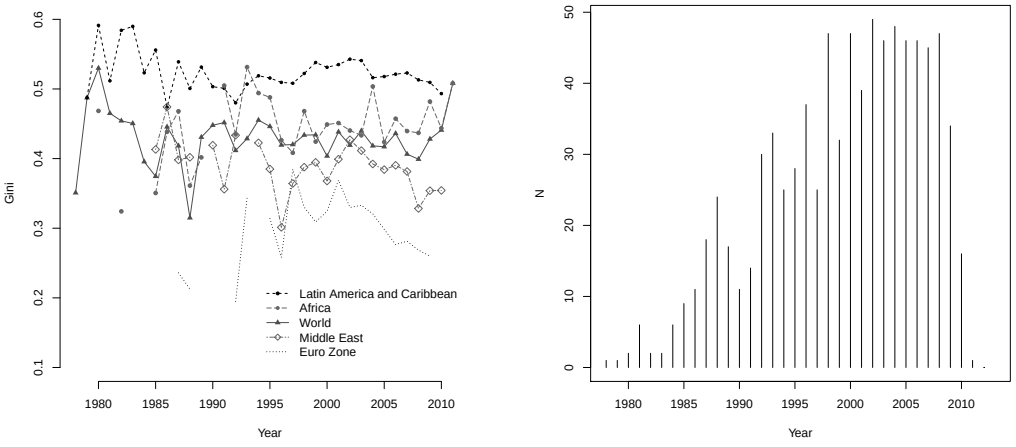


Figure 4.2: Luxembourg Income Study estimates of income inequality 1967-2010.

Latin American countries included are in the top positions of inequality along with China, India and South Africa. As with the world average, the inclusion of these high inequality countries in the latter part of the series increases the observed Gini measures, so it is not possible to compare properly inequality measures across time for any other than illustrative purposes.

The second-to-last line corresponds to the 14 countries in the Euro zone. The data is sparse before the decade of 1980 and (surprisingly) during the decade of 2000. The trend of inequality in the Euro zone follows closely the "world" trend. This is simply a statistical artifact that results from the sample of countries that are included in LIS. Most high and upper-middle income countries are located in Europe, in particular in the Euro zone. It is thus unsurprising that the evolution of inequality for all LIS countries follows closely the distribution of the European countries. Finally, the lower-most trend corresponds to Denmark, Finland, Norway and Sweden, which has a small range from .20 to .26.

International organizations have of course also undertaken massive efforts to construct quality data. The World Development Indicators ((World Bank, 2012b), WDI hereafter) are a comprehensive time-series of indicators for development for all nations officially recognized as such by the World Bank. The procedure by which these indicators are constructed is similar to other repositories of national data: member countries provide the raw data (usually in the form of census samples) which are taken face value by the World Bank. They are then processed by the research departments to produce these time-series.



(a) World and regional yearly averages.

(b) Frequency per year.

Figure 4.3: World Bank World Development Indicators Gini for all (yearly available) countries.

Figure 4.3 shows the evolution of the Gini index from 1978 through 2012 for all year/countries available in the WDI indicators. The dataset provides sparse measurements of inequality for 214 fourteen countries in the world. In terms of sheer numbers of countries included, this is the most comprehensive dataset. Panel 4.3a shows the trend for observed Gini for the world average and by regions, and panel 4.3b shows the frequency of observed Gini measures for each year. It is only until

after 1991 that we see a systematic increase in the number of countries with Gini measures.

As with the previous figures, these are measures that are usually periodic and non-overlapping, meaning that the increase in frequency is due to more countries generating data rather than more data being generated by the same number of countries. The relatively high frequency of observations ranging from 1991-2009 corresponds to the lower variation in the world average in the upper panel. In this range, there seems to be no overall change in the levels of inequality. Before 1990 the data are to sparse (and therefore too volatile) to know whether the trend corresponds to a central central tendency for the world. The same sparseness affects the latter part of the series, and so the big spike in 2012 is likely to reflect mostly sampling bias rather than changes in actual inequality.

As is usual, the region with the highest inequality is Latin America and the Caribbean. The middle eastern countries seem systematically below the world average, followed by the countries in the Euro zone. There are no data for Scandinavian countries or for the United States in the WDI (World Bank, 2012b).

The broadest effort to bring together data from multiple sources while retaining comparability comes from Milanovic (2008); World Bank (2012a). This dataset compiles Gini measures from 1950-2011 for 164 countries, taking data from seven preexisting databases[4], themselves based upon household survey data –and not any

[4]These are: "(1) Luxembourg Income Study (LIS) dataset that covers the period 1967-2006 and includes 33, mostly developed, countries. There are 168 Gini observations all calculated from direct access to household surveys. (2) Socio-Economic Database for Latin America and the Caribbean (SEDLAC) that covers the period 1981-2009 and includes 20 Latin American and Caribbean countries. There are 229 Gini observations all calculated from direct access to household surveys. The data are taken from SEDLAC Inequality LAC 2012, version 1 dataset, made available in mid-2012. (3) Survey of Income and Living Condition (SILC) conducted by Eurostat that includes only year 2008 with 28 countries. There are 28 Gini observations all calculated from direct access to household survey data. (4) World Banks Eastern Europe and Central Asia (ECA) database that covers the years 1990-2009 and includes 31 countries. There are 247 Gini observations all calculated from direct access to household surveys. (5) World Income Distribution (WYD) dataset that

assumption about underlying functional relationships between income and other structural variables.

The data is constructed sequentially to avoid double counting and overlapping of observations. The original datasets were ranked in an order of precedence[5] and missing values in prior datasets were filled using posterior datasets. The result is a dataset with 1,912 country/year observations. Most observations correspond to per capita household income –that is, total household income divided by the number of adult family members. As discussed by DS, this is useful to adjust our inequality measures so that the household income observation captures family size since poorer households tend to have more children. The second type of data is income vs expenditure. The third type of data is whether gross or net income is used to build the Gini measure. The distribution for each combination of data types is summarized in Table 4.1. The most frequent data types are gross and net per capita income. The least frequent types are gross and net household expenditure.

How does the evolution of inequality look for each one of these data types? Figure 4.4 shows the data series for all available years and countries. Each panel has two [6]: one corresponds to the measure of inequality using gross income (solid line), and the other one using net income (dotted line). Panel 4.4a shows Gini measures constructed only with per capita household income. The data corresponding to net per capita income becomes denser only from the decade of 1980 on. The sparseness

covers the period 1980-2010 and includes 151 countries. There are 606 Gini observations, about 80% percent calculated from direct access to household surveys. (6) POVCAL, World Bank-based dataset that covers the period 1978-2011 and includes 124 countries. There are 817 Gini observations, most of which are calculated from direct access to household surveys. (7) World Institute for Development Research WIDER (WIID1) dataset that covers the period 1950-1998 and includes 119 countries. There are 886 Gini observations compiled from various sources, some of which are based on direct access to household surveys and others to grouped data." Taken verbatim from Milanovic (2012: 1-2).

[5]LIS, SEDLAC, SILC, ECA, WYD, POVCAL and finally WIDER.

[6]Gini measures built using household expenditure are too few and are thus not included.

Table 4.1: Distribution of observations per data source in Milanovic (2012).

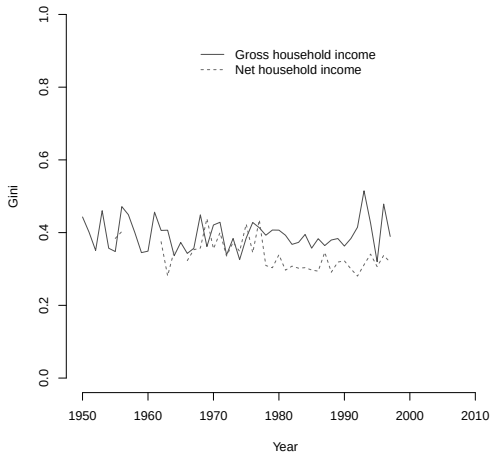
Data Source Type	n
Gross Per capita Income (GPI)	496
Net Per capita Income (NPI)	423
Gross Per capita Expenditure (GPE)	298
Gross Household Income (GHI)	280
Net Per capita Expenditure (NPE)	234
Net Household Income (NHI)	149
Net Household Expenditure (NHE)	22
Gross Household Expenditure (GHE)	10
Total	1,912

of the net income data makes it difficult to assess the relationship between both measures previous to 1980. After this year, however, the average Gini measures using gross income tend to dominate the time series, and there is substantial variation in the average from year to year.

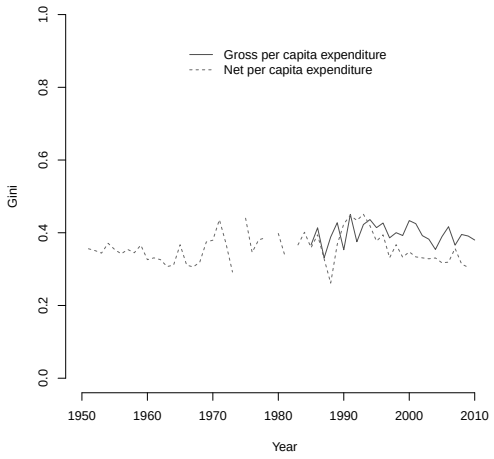
Panel 4.4b shows the evolution of Gini using the household income without adjusting by family size. Again, the series corresponding to measures of gross income goes further back in time. The gap between these two measures is not as pronounced as in the previous panel, and the average Gini per year has much less variation than when using per capita income. The last panel 4.4c shows Gini but looking at household per capita expenditure, instead of income. There is little data for gross per capita expenditure. The available data suggests however that looking at expenditure yields similar patterns of levels and variation in inequality as looking at total household income. In this last panel there seems to be no statistical difference between series

It is interesting to note that in all three measures, inequality is measured higher when using gross instead of net income. These two measures are not systematically statistically different from each other, but when they are, inequality using

(a) Per capita income.



(b) Household income.



(c) Per capita expenditure.

Figure 4.4: Gini measures with multiple data types. Source: Milanovic (2008).

gross income clearly dominates. The differences seem in fact wider when we look at inequality using per capita income, that is, adjusting for family size as in panel 4.4a.

Finally, an important effort to track income inequality in long time-series with a focus on top earners is that of Alvaredo, Atkinson, Piketty and Saez (2014), but these are limited to a handful of countries which fall mostly in the category of advanced industrial nation. Many missing countries in this series are difficult to construct because they have deficient tax records –which might in fact be correlated with the provision of other government services and goods (Ross, 2006).

All these databases provide a generic description of the state of inequality in the world, and of overall tendencies and rankings among regions. From a descriptive standpoint, these trends provide evidence, for example, of the relative ranking of Latin America and the Scandinavian countries. Our measures of inequality consistently show the latter being the most unequal (except for the UTIP series) while the former being the less unequal region in the world. These results seem independent of whether we look at income or expenditure, household or individual, gross or net income –provided, of course, the same measures are used to compare systematically along time. It is reassuring that these patterns emerge mostly regardless of the data input used, so we can be confident in our broad assessment of inequality across regions or on average for all available countries.

However, the time series presented above show systematically one fact: the picture we draw in our heads about the degree of economic inequality depends heavily on the type of data we use (Milanovic, 2013, 2008). It is for this reason that multiple measures are used, with each one serving a particular purpose. For example, the difference between inequalities could well be the effect of redistribution policy, since the different measure would capture the degree to which transfers are

smoothing income differences among the population. But this would only be possible to conclude if we had in fact statistical differences among measures of gross and net income, i.e. when using per capita income. This sort of analysis would be meaningless using the other two measures.

The volatility of inequality, as well as its overall trends depend markedly on the type of data used. This is in itself a recurrent (yet valuable) lesson when looking at inequality. The tremendous effect it can have on the quality of our inferences (our conclusions about the world) suggests that in order to use any notion of income inequality and track changes across time we must constrain ourselves to measuring changes over time for the same unit of analysis, using the same data type in each observation. The selection of the type of inequality we will be looking at depends thus on the question we are trying to answer. Given that we have options to choose from, this should be a theoretically guided choice. In practice however, it will be a choice guided by data availability. The inherent characteristics and biases with each measure of inequality described above should be incorporated in the broader discussion when dealing with any inference from empirical data.

4.2 Trends of Inequality in Mexico: National, Regional and Municipal

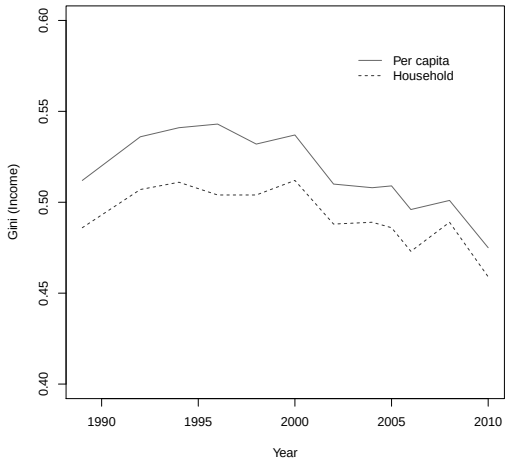
As a subset of the data presented in the previous section, this section elaborates on how inequality looks specifically for Mexico over time. The previous section showed the different tendencies of inequality for different measures and regions of the world. This section will provide the same information for Mexico at the national level, although the data is available only for a shorter time period, ranging from 1989 through 2010. This will set the scope and limitations of the current data that the

remainder of this chapter will address with original regional and municipal trends of inequality during the period from 1990 through 2010. This data will then be used as input in the actual testing of data in the remaining chapters. See Appendix A, equation A.6 for the equation used to construct Gini.

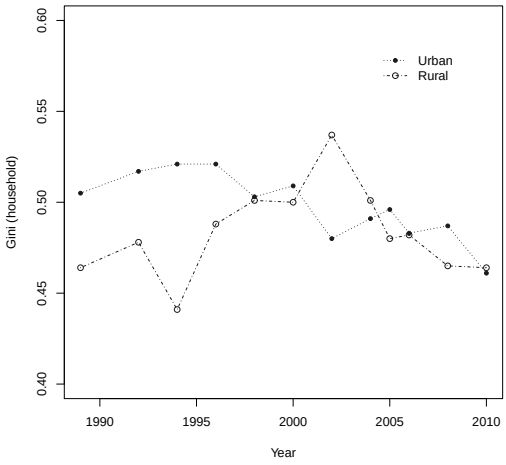
The Mexican government surveys the population every two years in an extensive income-expenditure survey[7]. This survey is the origin of the data that is then passed on to microdata repositories such as LIS and SEDLAC (2013) above. This section presents thus data that comes from the Mexican bureau of statistics, albeit processed by external organizations.

Figure 4.5 shows the evolution of income inequality for Mexico during the 1989-2010 period. Each panel presents different data types as in the previous section. Panel 4.5a shows the Gini index constructed using income. The upper solid line uses per capita income, whereas the lower dotted line uses total household income. The gap between both lines reflects therefore the effect on our measures of averaging total household income by family size. In 1994, the average size of poor households was of 5.8 members, while non-poor families averaged 4.3 members. The fertility rate for poor women was 5.1 children, more than double of than non-poor women, which was of 2.5 (Levy, 2006; Levy and Rodríguez, 2004). As is well known (e.g. Deaton 1997, Deininger and Squire 1996) this difference in the average number of members explains the gap between both series. Measuring inequality looking only at total household income blurs the fact that income is consumed and saved by all members of a family. Any given income will have a bigger effect when there are few family members than when there are many. The gap we see in the first panel reflects

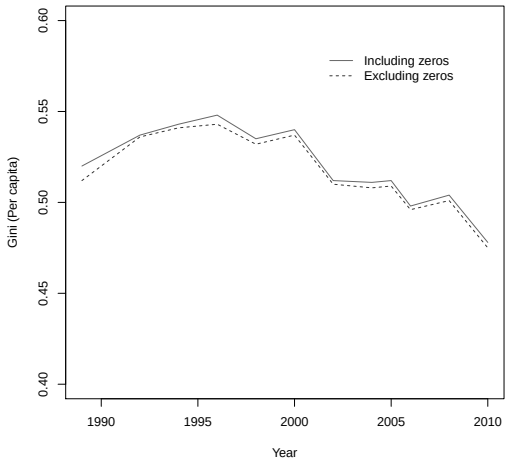
[7] *Encuesta Nacional de Ingresos y Gastos de los Hogares* (ENIGH), or National Household Income and Expenditure Survey. It is available for 1984, 1989, 1992 and then biannually. It is usually only nationally representative, but some waves are representative of urban and rural areas, and even fewer times is representative at the state level.



(a) Using income.



(b) Per capita.



(c) Per capita with/without zeros.

Figure 4.5: Gini trends for Mexico 1989-2010. Source: SEDLAC (2013).

that income inequality looks higher when we divide the income of households among all their members because poor households, which have on average more children, will in fact be adjusted downwards, and richer households, who have less children, will be adjusted upwards. This increases measured inequality.

Panel 4.5b segments Gini calculated with total household income (i.e. the lower line in the previous panel) into its urban and rural components[8]. The national statistics bureau considers any locality with more than 2,500 inhabitants an urban area[9]. Other than the data points in 1994 and 2002, both inequality lines follow very similar trends, with inequality increasing until around the year 2000, and then decreasing. The gap between them, however, is broader during the decade of 1990, and the gap virtually disappears after 2000. The big differential in measurements in 2002 is nonetheless dubious: although the SEDLAC database provides these data points, the official INEGI data does not provide data points for this year.

Finally, panel 4.5c shows Gini calculated using per capita income (i.e. tha solid line in the first panel) but including and excluding zeros in the calculation of inequality. That is, the solid lines includes in the calculation of the index all those households that appear with an income of zero in the ENIGH, while the dotted line excludes these households in the calculation. The graph shows no substantive difference between both methods. Although this is a methodological and not really a substantive point, it will be key in the next section because there a substantial number of zeros in the census sample microdata that are at the center of this dissertation. This graph shows that this is not a problem as it might seem at first.

In conclusion, all series show that inequality was higher during the decade

[8]The dotted line in the previous panel is therefore the mid-point between the urban and rural components in this panel.

[9]For the 1989 wave, however, a different criterion was used: urban was those localities with more than 15,000 inhabitants, and then in 1992 the current criterion begins being applied.

of 1990, and has progressively been decreasing. When using total household income instead of per capita income, the Gini index appears lower. This is due because poor families tend to have more children than non-poor families. The intrinsically lower income is therefore divided among more members, driving the relative income down. The opposite is true for richer families, and so the overall measure of inequality rises when using per capita income. Urban inequality was higher during the decade of 1990, but the gap with rural inequality has been closing progressively, such that by the last measure in 2010 there is no appreciable difference. These changes have been attributed by scholars to technological change, a shift in skills among the working population in the region, market-driven reforms and policy interventions from governments (López-Calva and Lustig, 2010).

4.3 Regional and Municipal Trends of Inequality 1990-2010

The previous section emphasized inequality series for Mexico during the last three decades. These measurements are important because they allow for comparisons across time and cross-national (with the caveats exposed above) of the inequality levels in Mexico. This virtue is also its weakness. The measures presented –in fact, to my knowledge the only ones in existence– are in fact not useful to understand regional and more local dynamics within each country. These dynamics are key to parse out fundamental problems of development, and in particular the relationship between income levels and distribution: regional and local dynamics are in fact the appropriate locus to test the Kuznets agenda (Kuznets, 1955). Cross-national analysis are not suited for this because the argument involved precisely the type of regional (urban-rural) dynamics that are unobservable with cross-national

data. The politics of development can also only be understood looking at these regional and local processes, parsing out the heterogeneous effects that electoral dynamics have at different levels of government.

This section (and in fact, this dissertation) takes the data presented in the previous one and presents an original construction of inequality trends in Mexico during 1990-2010. Measures of inequality are constructed following the methodological constraints outlined in the previous section. I present for the first time data of inequality at the state and municipal level in Mexico. This effort has hitherto not been achieved, and it presents a unique opportunity to study the aforementioned dynamics more properly.

The original data for these new measures come from the 5% census sample microdata that the Mexican statistical bureau makes publicly available. The Mexican census asks households for their average income, but the level of detail varies with each wave. In 1990, the census sample reports the monthly income, with no additional distinction. In 2000 the census for the first time reports different tables for individuals and for households. Each member of the household interviewed reports an income for work in the last 30 days which is then averaged to get a proxy of average household income per month. They also report income from other activities non related to work. The 2010 census further disaggregates measures of monthly income into work, government programs (related to the conditional cash-transfer program *Oportunidades*, the rural support program *Procampo*, scholarships, programs for single mothers, the elderly), pensions, remittances and other unspecified sources.

From the discussion above[10], it is clear that there is a fundamental choice about which measure of inequality to use, and how to construct it. The approach I

[10]See also Appendix A for a detailed discussion of different measurements and their trade-offs.

take in this dissertation is to use total household income before taxes and transfers. Gross income is the central measure of income that is used all along this dissertation, and therefore reflects the levels and distribution of income before the state has both extracted a proportion of income via taxes, and the redistributed through multiple ways through social policy. This has advantages as well as disadvantages.

The advantages are that they are a more realistic measure of how income levels and distribution look for Mexicans, because the distortions of government have not yet been implemented. This is important because these programs (e.g. *Oportunidades* and *Procampo*) are used precisely to curb the lack of household income, so they are endogenous. Because transfers raise the average income of households, analysis with these would implicitly include the effects of targeted policies. This is mostly a normative claim: whether we want to look at the movements of income from an ex-ante perspective or not depends on whether we think that redistribution policy should be considered a temporary palliative to unfair distributions of income (cfr. Rawls 1971, Nozick 1974). If this is the case, then we should be looking at ex-ante income. This is the normative stance underlying my choice of data use. However, to bypass the substantive variation in interpretation due to differences in type of data used (i.e. total household income versus household per capita income), I will use both measures.

Second, and related to the previous one, income due to remittances is also endogenous to my research topic: it is the poor (but in my field research usually not the poorest) who migrate and send remittances to households. This should not be used to gauge income in my setting because it reflects a failure of the Mexican government in the first place to provide the labor conditions for people not to migrate *forcefully* due to extreme living conditions.

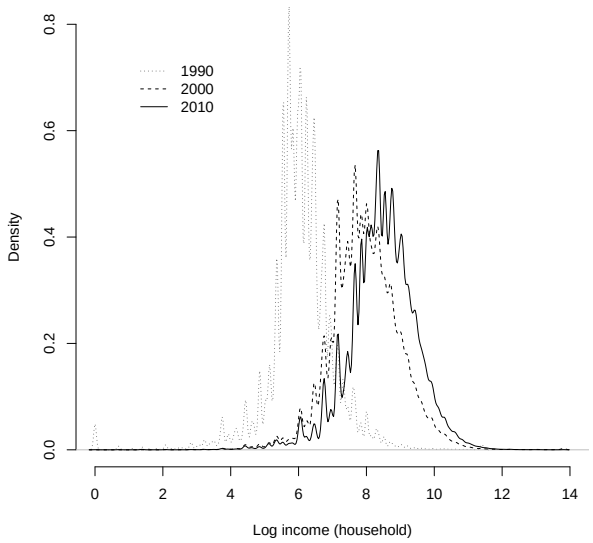
The census provides information for total household income *for work*. It is

difficult to disentangle what people have in their minds when answering this question. It might elicit different responses in an urban middle-class setting where people receive a monthly paycheck, or a household whose main income comes from an informal juice stand in a street corner, or in a rural, indigenous household where people make income selling some vegetables in the closest municipal market once a week. Some households may include this activity as work and some may not, generating an unaccounted variation in their assessment of their monthly income. Additionally, when firms register their workers in the social security system (particularly health and pensions), then the firm is said to be formal; when it does not, it is said to be informal, regardless of the legal status or size of the firm (Levy, 2008). The documentation of the census is not detailed enough to know what exactly is meant by "work"[11].

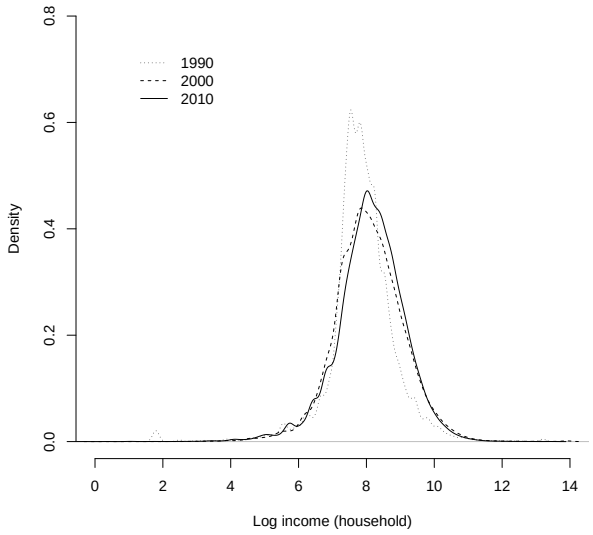
I use throughout this dissertation the average monthly income reported by households exclusively for work. The range of this variable goes from 0 to 999,997 pesos a month (the latter being a catch-all category for anybody reporting more than one million). When all members of a household responded 0, the final result is recorded as 0. When at least one member specified a monthly income and the rest did not, the household income equals to that members income. Income remains unspecified when all members of the household did not specify any income at all.

It is important to also emphasize that I use estimate income and inequality without taking the values of zero into account. From Figure 4.5c above we know that both the trends and the absolute values of income inequality measured including or not households with a record of zero do not change significantly.

[11] In sharp distinction, the National Household Income-Expenditure Survey (*ENIGH* in Spanish) provides a detailed account of how they construct different measures of income and distribution, where they match reported income with reported expenses, and they include self-consumption as an element of income.



(a) Nominal.



(b) Adjusted (base=2002) and smoothed.

Figure 4.6: Log household income for 1990, 2000 and 2010. Excluding values where household income $y_h = 0$ and $log(y_h) = -\infty$.

Figure 4.6 shows the distribution of income in Mexico for the period between 1990 and 2010. The left panel 4.6a shows the distribution of nominal income for all three waves. The furthest to the left corresponds to 1990, and the furthest to the right to 2010. Nominally, there has been a progression in income from $log(\bar{y}_{1990}) = 6.69$ to $log(\bar{y}_{2010}) = 8.94$. As a conjecture, the spikes in the distribution indicate possible clustering of answers into focal quantities due to remembrance or other concerns, as in Deaton (1997). When people are asked how much income a month they receive for work, some might answer the exact amount of income, but many others could simply truncate or round off their true income to the nearest "focal" quantity of income. For example, an individual who earns $987 pesos may round the figure to $990 or $1000. This would create the observed spiked distribution of incomes, with the spikes being the focal quantities.

Additionally, the top panel captures the magnitude of inflation during two decades. Up until the mid 1990's inflation was a recurrent problem in Mexico. The 1994 peso crisis destroyed the real income of people overnight, and the effects of prices over nominal income during this decade can be clearly seen in the shift to the right of the income curves. In the latter third of the decade of 1990 the peso was stabilized, and inflation control has been a solid commitment of the Mexican government regardless of government partisanship. The slowing down of nominal prices can be seen in the small gap between the distribution of income in 2000 and 2010.

In the right panel 4.6b nominal income has been deflated to reflect real income taking the year 2002 as base[12]. The curves show a slight increase in mean real

[12]The census for 1990 required an additional adjustment to make it comparable with 2000 and 2010 because, at the time, Mexico still used the *old pesos*, which were eventually divided by 1000 in a bold move during the Salinas administration to deal with the excessive digits of Mexican currency.

income, but they overlap considerably. Both panels show a smaller density for 1990.

The mean and variance of real household work-related income have progressed as shown in Figure 4.7. The means of log income are 7.86, 8.07 and 8.12 for 1990, 2000 and 2010 respectively. In Mexican pesos of 2002 this corresponds to actual income of $2,586, $3,204 and $3,354 pesos respectively.

The differences between the log of the means are statistically different from zero at a .05 level with respect to the value of the immediately previous census wave. The average household income shows a 24% increase from 1990 to 2000, and a much slower increase of 5% from 2000 to 2010, in real terms. The latter data points, constructed using my data, are similar to official data from the World Bank on GDP per capita, which shows an increase of 19.5% in in 1990-2000, and a much smaller growth of 8% in 2000-2010 –which are shown in gray.

Mean

	Logged Mean	*p*-val *	Value in 2002 pesos	Annual (USD)**	Δy	GDP pc ***	Δ GDP pc ***
1990	7.858	--	$2,586	$3,209	--	$4,966	--
2000	8.072	~0	$3,204	$3,976	24%	$5,935	19.5%
2010	8.118	~0	$3,354	$4,162	4.8%	$6,410	8%

* Compared with t-1.
** At average 2002 exchange rate.
*** Official World Bank figures.

Variance

	Logged Variance	s.d.	F	*p*-val *	Δσ²
1990	1.048	1.024	--		--
2000	1.015	1.007	1.033	~0	-3.2%
2010	1.008	1.004	1.007	~0	-1%

* Compared with t-1.

Figure 4.7: Mean and variance of household income (excluding zeros) in Mexico from 1990 to 2010. Figures in shaded region correspond to official data on GDP per capita.

Figure 4.7 also shows the dispersion in log income. These are all data points

constructed using my original dataset. The F ratio between the waves of 1990 and 2000 is $F = 1.033$, and is significantly different greater than one, indicating a significant reduction in the dispersion of work-related income around the mean of the distribution. The ratio of the chi-squared distributions for 2000 and 2010 is of $F = 1.007$ and is also significantly different than one, indicating that the distribution of income did in fact converge again to the mean, albeit at a slower rate (-3.2% in the latter case, -1% in the former).

Figures 4.6 and 4.7 jointly show evidence that pre-transfer and post-tax income in Mexico has a higher mean and also a more compact distribution in 2010 vis-á-vis 1990, which is consistent with the picture presented in Figure 4.5 above[13]. This simple exercise is however impossible with the information usually presented in official data, which report the central tendency of income but usually not the dispersion of the data, and so constructing confidence bounds is virtually impossible. A first contribution of this dissertation is to effectively show that the movement of income and its distribution has significantly shifted in the last two decades.

In terms of spatial distribution, income inequality shows a relatively clear pattern of concentration in the southeastern part of the country. Figure 4.8 shows the municipalities of Mexico shaded depending on whether their inequality levels are above or below the national median. The distribution shows some level of spatial clustering of more unequal municipalities in the south and southeaster regions of the country. In general the south of the country seems to have a higher number of municipalities with inequality levels above the median, while the northern municipalities seem to have a lower proportion. Figures 4.9a and 4.9b show a detail that focuses in the Southern states of Oaxaca and Chiapas respectively –the poorest and most indigenous (and historically violent) states in the country. The high number of

[13]Which, recall, is constructed mainly using expenditure data from ENIGH.

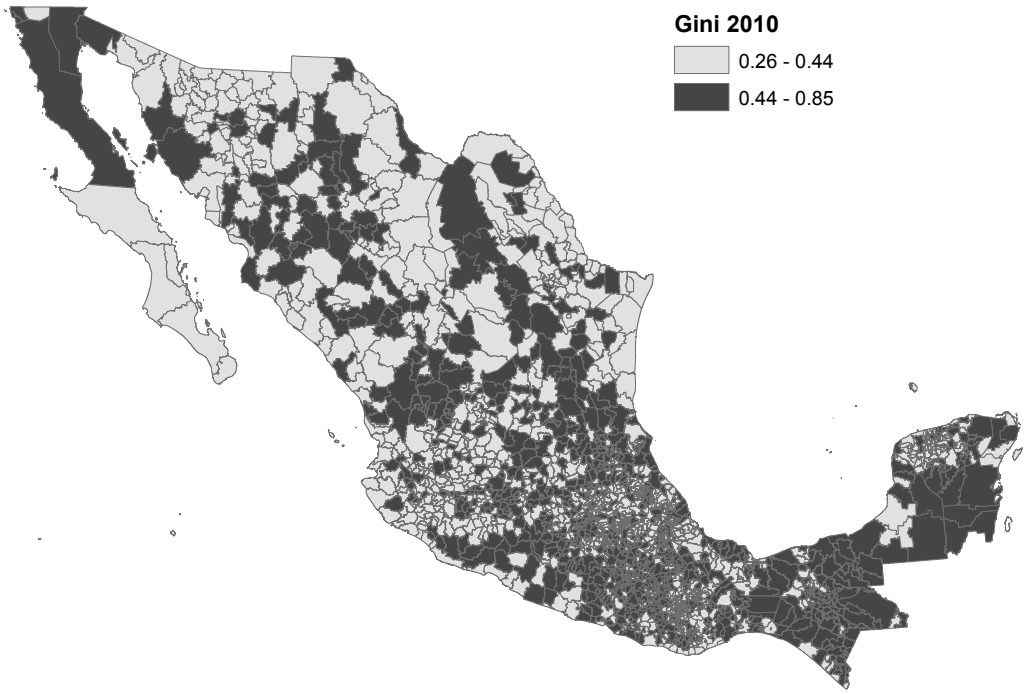
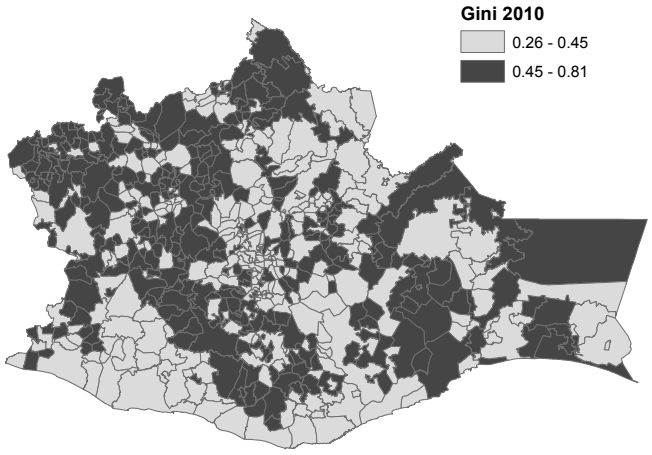


Figure 4.8: Spatial distribution of income inequality levels in 2010 (municipal). Lighter municipalities denote inequality values above the median, darker below.

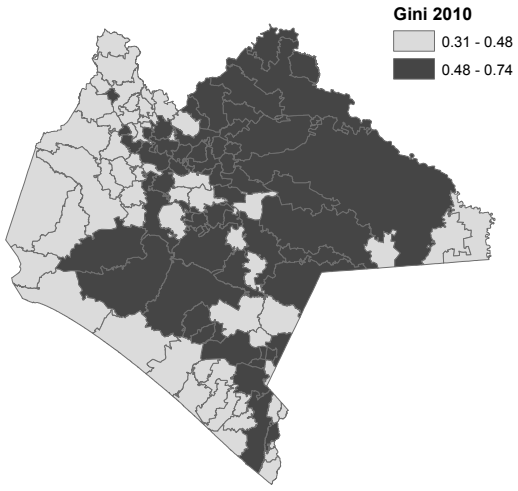
small-sized municipalities might mask patterns of spatial distribution when looking at the national map in Figure 4.8.

The map for Oaxaca shows that the more unequal municipalities are concentrated along the periphery of the state with the central valley being overall composed of less unequal municipalities. This distribution corresponds tightly with the distribution of municipalities in Oaxaca that abide by indigenous rules ("*usos y costumbres*"), a system of governance which has been shown to be correlated with a more egalitarian provision of public goods (Díaz-Cayeros et al., 2014). In Chiapas, more unequal municipalities are concentrated along the North-East and Center of the state, with the notable exeption of the "Altos" (the highlands), epicenter of the Zapatista rebellion that began in 1994. Overall, is is possible to conclude that the higher concentration of unequal municipalities in the South and South-East of the country shown in Figure 4.9 that is apparent in Figure 4.8 is not a graphical artifact that appears when looking at the country as a whole.

Both theoretically (Kuznets, 1955; Barro, 2008, 2000) and empirically for Mexico (Turner, 1910; Levy, 1991; Fox and Aranda, 1996; Levy, 2008), the central tendency and distribution of income differs across urban and rural areas. Thus a next natural step is to explore how these shifts differ by population density. Figure 4.10 shows the distribution of urban polygons in Mexico. As already suggested by the Oaxaca and Chiapas maps, it is worthwhile noting that there seems to be no strict correspondence between levels of urbanization and levels of inequality. Left panel 4.10a shows the urban polygons in Mexico, and when compared to the distribution of high-inequality municipalities in Figure 4.8 it is visually apparent that there is no strict correspondence between these two phenomena. Figure 4.10b shows the distribution of Gini coefficients divided by urban a rural municipalities (rural being those with more than 50% of their population dedicated to the primary



(a) Oaxaca.



(b) Chiapas.

Figure 4.9: Spatial distribution of municipal Gini measures in the Southern states of Oaxaca and Chiapas (detail).

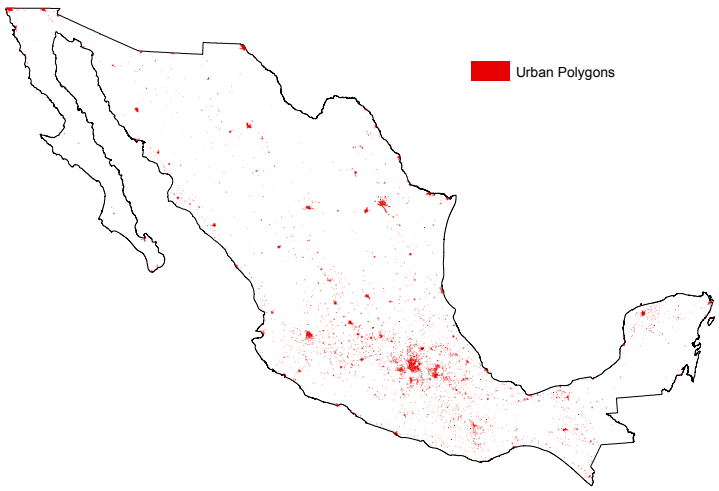
sector. Similarly, there seems to be no strict difference between urban and rural inequality.

Along time, the Gini measure I construct shows a similar movement towards a slightly more egalitarian distribution of income. The following figures all show different visualizations of municipal Gini for 1990, 2000 and 2010. Figure 4.11 shows progression of municipal Gini for three decades. The upper panel 4.11a shows the density plots, which show progressively tighter distributions around the mean. The lower panel 4.11b shows a boxplot for each census wave, which also reveals an increasing tightening of the inter-quartile range and a distribution progressively concentrated around the mean.

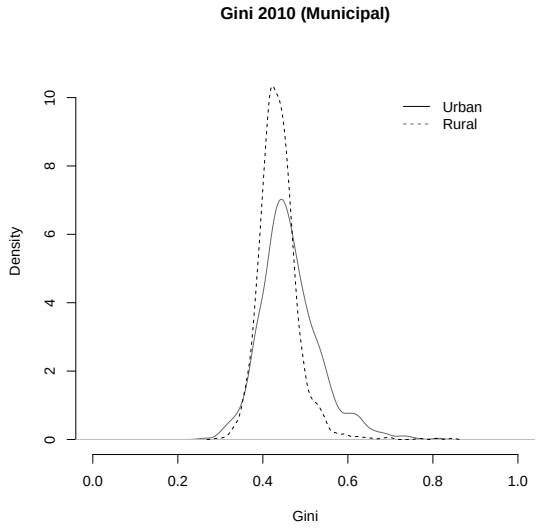
More rigorously, Table 4.12 shows the means and variances for the Gini in each wave of the census. The average Gini was .482, a slightly less level of .475 in 2000, and then .449 in 2010. All these averages are significantly distinct from each other. Table Table 4.12 also shows the dispersion of municipal Gini for all three census waves. The standard deviation of the measures was .15 in 1990, .09 in 2000 and .06 in 2010. Al of these dispersion measures are statistically different from each other as confirmed by the chi-squared tests.

Finally, Figure 4.13 plots the Gini coefficient for municipalities in Mexico crossed against GDP per capita in 2005[14]. Each dot corresponds to a municipality, and is shaded darker if less than 50% of households are in the primary sector, and shaded lighter is the opposite (capturing rurality and the predominance of agricultural sector). These graphs add interesting information to the previous tables and plots because they show that most of the movement in my measure of inequality has happened, in the last three decades, in poorer and more rural municipalities. Notice

[14]Real municipal GDP *per capita* for 2005 is used throughout as a proxy due to lack of data for previous years.

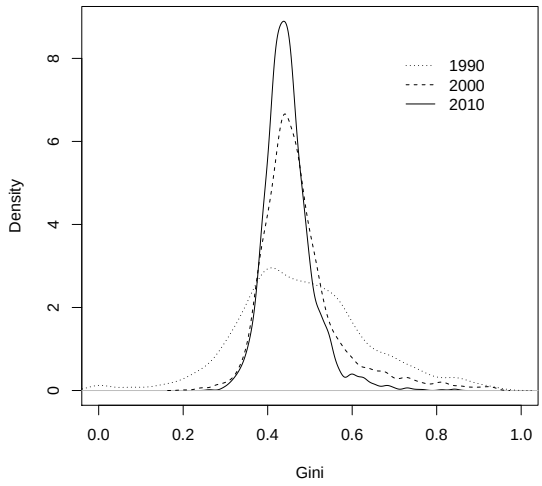


(a) Urban polygons.

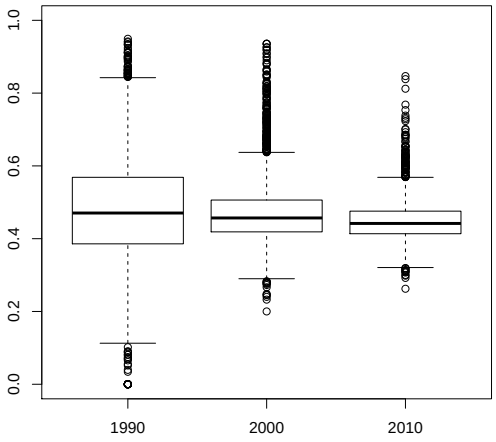


(b) Urban and rural income inequality.

Figure 4.10: Income inequality and urban development.



(a) Densities.

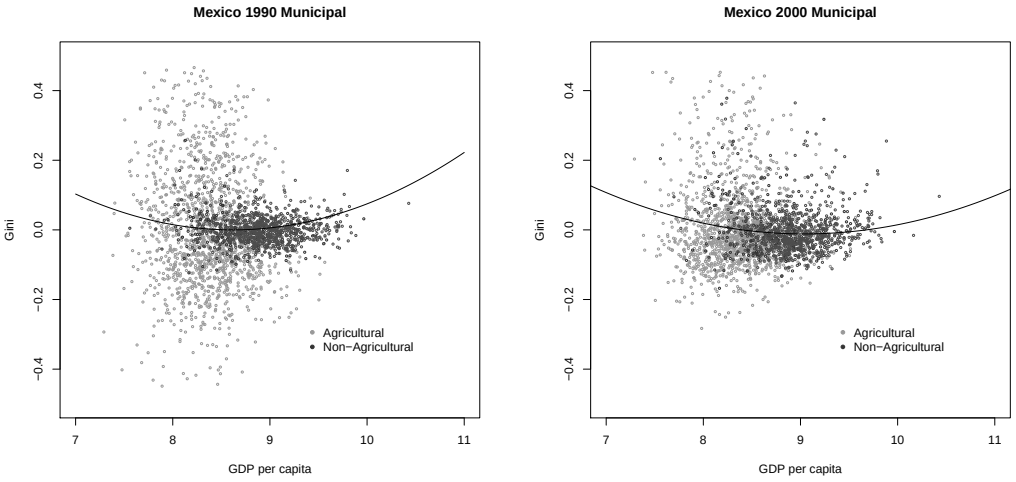


(b) Quintiles.

Figure 4.11: Municipal Gini for 1990, 2000 and 2010.

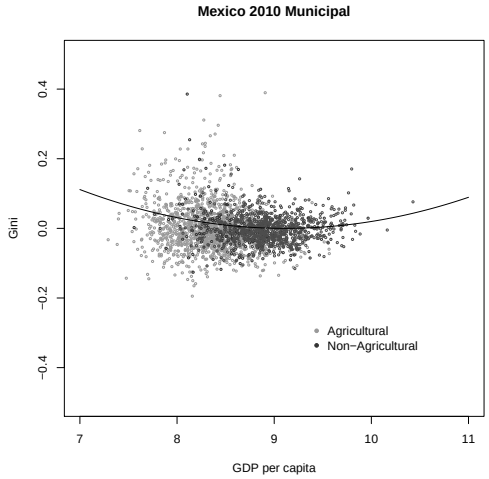
	Mean		*Dispersion*			
	Mean	***p*-val**	**Var**	**s.d.**	**F**	***p*-val**
1990	0.482	--	0.023	0.15	--	--
2000	0.475	0.09	0.009	0.09	2.52	~0
2010	0.449	~0	0.004	0.06	2.69	~0

Figure 4.12: Difference-in-means and *chi*-square tests.



(a) Municipal Gini 1990

(b) Municipal Gini 2000



(c) Municipal Gini 2010

Figure 4.13: Centered municipal Gini for 1990, 2000 and 2010 against municipal GDP (2005).

how disperse the Gini measures are in poor and rural municipalities in 1990, and how it progressively starts compacting as time goes by. In my data, the movements regarding the spread of Gini measures appear mostly in rural, poor municipalities.

Using my measures and the Census data I was able to reconstruct the official national Gini measures as reported by the Word Bank. My values and those reported by the World Bank are respectively: .574 in 1990 against .55 by the WB for 1989; .5342 against .5187 for 2000; and .5202 for 2010 against .5170 in 2008. These estimates are obtained by not including the zeros in the sample. The closeness of my measures to the official aggregate data serves as an additional check for consistency with official measures that use a more elaborate (and much more expensive) method to calculate inequality using income/expenditures national surveys.

Chapter 5

Electoral Competition 1980-2010

The democratic transition happened in Mexico sometime during the mid-decade of 1990, marked by an increasing weight of opposition parties in local and legislative politics, the diversification of party strategies to cope with competition, a collapse of the organizational basis of *presidencialismo*, and the rise of governors, municipalities and other (horizontal and vertical) veto points as a real locus of power (Magaloni, 2006; Elizondo Mayer-Serra, 2009; Cornelius, 1999; Weldon and Molinar, 1990; Díaz-Cayeros et al., 2000; Benton, 2008; Eisenstadt, 2007).

Rather than focusing on a specific point in time to locate the transition, observers could also think of democratization as a continuum along a electoral dimensional characterized by increasing levels of uncertainty for political parties about the results of the election –an uncertainty characteristic of democratic life (Przeworski, 2000, 2005). Building on this definition, in this chapter I present a distinction in the types of electoral uncertainty that parties face under electoral democracy: transient and structural. *Transient uncertainty* refers to a short-term electoral constraint *for the incumbent only* that happens from one election to the next one, and is therefore a type of electoral constraint that influences within-cycle party strategies. This type of risk depends on the attributes and resources available to candidates (Bartels, 1988; Ansolabehere and Snyder Jr, 2000; Katz, 2001; Box-Steffensmeier, 1996), and

the contingent and strategic dynamics of political issues in the media and among the masses (Iyengar and Kinder, 1988; Zaller, 1992) that make certain issues more salient than others, in the benefit of certain parties/candidates over others. For example, the charisma or the war chest of a candidate are transient elements of the campaign that affect the probability of success of a candidate, and thus belongs to the category of transient uncertainty.

Structural uncertainty refers to a longer-run electoral uncertainty of losing an election that *all political parties face*, associated with broader historical voting patterns and voter realignments, that in turn result from broader societal conditions that do not belong exclusively to the domain of electoral politics but powerfully shape it (e.g. the confrontation between labor and capital). These sources of risk determine the historical "average" likelihood that a political party will win an election, and stems from social cleavages that have been politically activated and are able to mobilize voters, as well as from the nature of electoral systems which incentive the coordination of voters and elites around certain politically active cleavages over others (Lipset and Rokkan, 1967; Cox, 1997; Rogowski, 1987; Kalyvas, 1998; Iversen, 2001).

To be sure, this is not the classical distinction in financial economics and risk analysis between systematic and unsystematic risk (cfr. Crain et al., 1993). Rather, it is a decomposition of the systematic component into a structural and a transient components, leaving the full specification of electoral risk as a sum of systematic and unsystematic components.

Political parties tailor their electoral strategies to minimize uncertainty. One such strategy is the diversification of portfolios into public and private goods with which they attempt to mobilize electoral support (Crain et al., 1993; Díaz-Cayeros et al., 2007). This dissertation is constrained to the provision of portfolios (or

bundles in my terminology) of public goods as the dependent variable.

Mexico has a mixed electoral system at the federal level. There are 500 *Diputados* (representatives), of which 300 are chosen from single-member districts (SMD) through majority rule, and the remaining 200 are chosen using proportional representation system (following the German model). Local congresses are chosen all from SMD also using simple majority. At the municipal level, only municipal executives are voted for, and the party that receives a majority of votes automatically manufactures a majority in the town council (the municipal legislative body). The only exception to this rule at the municipal level are the 422 municipalities in the Southern state of Oaxaca which abide by traditional indigenous customs (see Appendix D.3 for details).

The constructs I use to measure the dynamics introduced by uncertainty are the margin of victory of the winning party[1] and the effective number of parties[2], both for the immediately previous election to 2010. These measures are constructed for both state and municipal levels by classifying election results for the state level in 4 different groups (PAN, PRI, PRD, Other) and the municipal level in 7 different groups (PAN, PRI, PRD, PVEM, PT, Convergencia, Other) from 1980 through 2011[3].

Both of these variables are constructed using the same electoral data, but capture different aspects of electoral competition. Whereas the margin of victory

[1]Given by $(v_1 - v_2)/V$, where v_i is the proportion of votes for the i^{th} place, and V is the total number of valid votes in that election.

[2]Given by the inverse of $\sum_{i=1}^{n} v^2$, where v is the proportion of votes for each party i.

[3]The three main political parties in Mexico are, in order of historical appearance, Partido Acción Nacional (*PAN*, right), Partido Revolucionario Institucional (*PRI*, fluctuates but mostly center recently), and the Partido de la Revolución Democrática (PRD, left). The rest of the parties mentioned are mostly programmatically instrumental and shift allegiances accordingly, to the extent that, for example, the Green Party (*PVEM*), usually considered a family-owned bounty, has faced serious risk of expulsion from the Global Greens due to its hawkish support of the death penalty for kidnappers in Mexico.

looks at the uncertainty of winning that the incumbent faces, the effective number of parties looks at a covariant risk that *all* parties face at the same time, and which arises not from the status of incumbency but from the structure of cleavages and its interaction with the mechanical effects of the electoral system.

The effective number of parties captures the structure of the market of electoral competition, and is a measure of uncertainty relevant for this dissertation because it reflects the number of serious participants that all parties face when competing for votes. Analogously to the fragmentation of economic markets, a more fragmented electoral market begins to resemble a perfectly competitive electoral market, where we would precisely expect to see the beneficial effects of competition, whereas in highly concentrated markets (i.e. in an environment of low effective number of parties) we would not.

As usual, it is the details of coding where some of the issues may arise. I therefore now turn to a somewhat detailed explanation of the procedure. Coalitions at the subnational level in Mexico present a wide margin of variation in the size and ideological orientation of the political parties involved. But as a general rule (which makes sense when one considers the evolution of the Mexican party system as a counterweight to the party-regime of the PRI) none of the two big opposition parties make a coalition with the PRI. Outside of this "restriction", which is albeit violated in a handful of cases, all possible combinations seem to appear in the data.

Pragmatic considerations seem to prevail over ideological ones during the subnational coalition-building process in Mexico. For example, in the State of Mexico, a typical PRI stronghold and the state with the highest population, the PRI ran at the municipal level in 2006 with the PVEM only but we see a number of different coalitions between the opposition parties: PAN-PRD, PT-Convergencia, PAN-PRD-PT, PRD-Convergenica, PAN-Convergencia and PT-Convergencia.

In Michoacán, a PRD stronghold, in the municipal 2007 and 2010 elections there are coalitions between PAN-PRI (very rare event), PRI-PVEM, PAN-PVEM (who show a strident antagonism at the federal level) and other combinations. In San Luís Potosí in 2009 there is an even higher level of variation because there were coalitions across and within all tiers, regardless of the ideological leaning or federal stridency of the parties. In Zacatecas in 2010, there is a coalition between the right-winged PAN and the proto-communist PT in the municipality of Cañitas de Felipe Pescador.

This suggests that the purported polarization at the federal level –specially in the aftermath of the 2006 elections in which the PRD accused the PAN of having won by fraud– does not affect the alliances at the municipal level, which are guided it seems by pragmatic local and not ideological national considerations.

Coalitions at the municipal level can correspond with the line of the state level coalitions, but it not need be that way. For example in Chihuahua in 2004 the PRI built a coalition with PT and PVEM in all except in one municipality (Coyame del Sotol) in which the PVEM runs by itself. In Chiapas in 2007 the PRD presented alliances with PT and PVEM that ranged from a coalition of three to all possible combinations of 2 parties (PRD included).

Most of the times the distribution of municipal coalitions depends exclusively on the coalition agreements between parties, sanctioned only indirectly by electoral authorities. For example, in Durango 2010, parties made state-level coalitions for the municipal elections, so all political parties replicated at the municipal level the structure of the state-level coalitions. In some cases, however, for instance Michoacán, electoral legislation establishes that the coalition that presents candidates in coalition for municipal presidents must do so in at least a third of all municipalities.

Local electoral politics in Mexico are characterized by a myriad coalitions orbiting around the three main parties: the previous regime-party PRI, the right-winged PAN (which toppled the PRI in 2000 for the first time) and the left-winged PRD (which has never controlled the presidency). This poses a coding challenge to which I now turn.

Parties in Mexico must surpass a federal threshold of 2% to maintain their registry and financial prerrogatives. Some of the smaller parties have surpassed this threshold arguably by running in coalitions with one of the main parties. These small parties are widely considered personal ventures more than real vehicles for citizen demands. For example, the *Partido Verde Ecologista de México*, the Green Party, has been historically considered an hereditary political party since its formation in 1986; the *Partido de la Sociedad Nacionalista* lasted only one election and its leader allegedly stole most of the public money granted to it in their first and only election; or the more recent *Partido Nueva Alianza*, which was manufactured by the powerful and corrupt teachers' union leader Elba Esther Gordillo after she was expelled from the PRI for having supported the PAN administrations.

The federal electoral law obliges political parties since 2007 to count their votes independently. Voters cast a ballot for their preferred party independently of whether the party is part of a coalition or not, and only *ex-post* are votes pooled for a coalition[4]. This ensures that the percentage of votes for each party is determined by voters, and not by the coalition agreement as was customary before 2007[5]. A common candidacy means that parties register the same candidate but voters vote for different parties, so the same previous logic of separate votes applies.

These minor parties do garner some votes but have been historically and

[4]Although this need not happen at the local level, as in the state of Michoacán.

[5]In which parties decided before hand which percentage of the total coalition votes would be assigned officially to each party.

congressionally much less relevant than their bigger counterparts. At the state level these parties seldom, if ever, compete by themselves for the governorship. They form part of alliances with the older, bigger and more rooted political parties in Mexico: the PAN, PRI and PRD.

There is evidence in Mexico of coattails from the presidential race (Segovia, 1980; Molinar Horcasitas, 1991) and the gubernatorial race (Magar, *unpublished*) to the congressional race. I claim for coding purposes that there are similar positive effects for smaller parties of campaigning with one of the three major ones, even if their votes are not count together from the onset.

The historical and electoral landscape in Mexico suggests that a proper classification of electoral data[6] –one that captures the complexity of alliances and coalitions but is nevertheless at the same time easy to replicate– should start by dividing Mexican political parties into three tiers. First, we have the established three big parties mentioned above (PAN, PRI and PRD). If any coalition has any of these parties, the total votes for the coalition go to the major party. Then we have the "second tier" parties (*Partido Verde Ecologista de México*, *Partido del Trabajo* and *Partido Convergencia*) which have indeed survived the 2% threshold individually since 2007. If any of these parties were in the coalition, but no of the first tier parties, then votes would go to these parties. And finally we have the "third tier" parties such as the already mentioned *Partido Nueva Alianza* and the *Partido de la Sociedad Nacionalista*, which were always considered in the category of "Other". See Appendix C for a more detailed discussion on the coding of elections.

In some cases at the state level, both major opposition parties (PAN and

[6]Electoral data for governor and municipal elections were obtained in raw from Banamex-Accival (2005) and its current repository CIDAC (2011), which do not disaggregate the data enough to consider individual parties in a coalition, only the coalition as a whole. Only effective votes were used, which leaves out votes for unregistered candidates and null votes. See Appendix *B*.

PRD) ran as a coalition against the dominating PRI [7]. Most of these coalitions have been forged in recent elections, and have been useful for the opposition in 5 states. In these cases, I made the choice of assigning each of these two major parties half of the total votes of the coalition.

In sum, to classify votes for coalitions or alliances into parties in this context of extreme variation to create the inverse Herfindahl index with which I measure systematic risk, I took the most dissaggregated form possible. When parties ran by themselves, I assigned them with their votes. When coalitions, alliances or common candidates were presented in the election and reported in the raw databases I assigned the votes to the upper-most tier as defined above. When parties belonged to the same tier (e.g. PAN/PRD or PT/Convergencia), I reverted to the criteria above of assigning half and half to the major parties.

At the state level, the minor parties mostly replicate their behavior at the federal level, that is, they do not run by themselves. That is why I argue that coding electoral results into 4 groups (one for each major party, and the residual category) is enough to capture electoral competition.

Nevertheless, things do change at the municipal level. The second-tier parties PVEM, PT and Convergencia do run by themselves systematically, and they occasionally win municipal presidencies. Therefore, the 4 group classification that makes sense for the states does not apply to the evolution of electoral competition at the municipal level. My choice was to expand the number of groups to 7 (one for each first and second tier groups, and then the residual category "Other"). The variation we see in the possible coalitions and alliances at the state level substantially

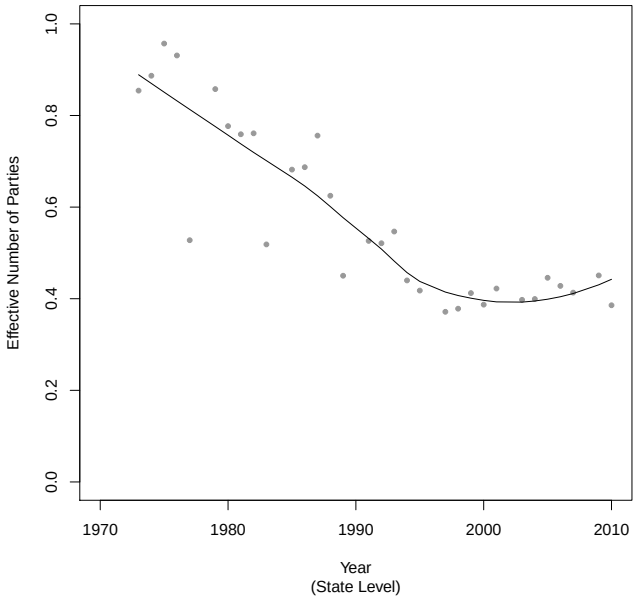
[7] These are: Chiapas 2000 (PRI lost), Chihuahua 2004 (PRI won), Coahuila 1999 (PRI won), Durango 2010 (PRI won), Hidalgo 2010 (PRI won), Nayarit 1999 (PRI lost), Oaxaca 2004 (PRI won) and 2010 (PRI lost), Puebla 2010 (PRI lost), San Luís Potosí 1991 (PRI won), Sinaloa 2010 (PRI lost) and Tamaulipas 1992 (PRI won).

increases when we look at the municipal level.

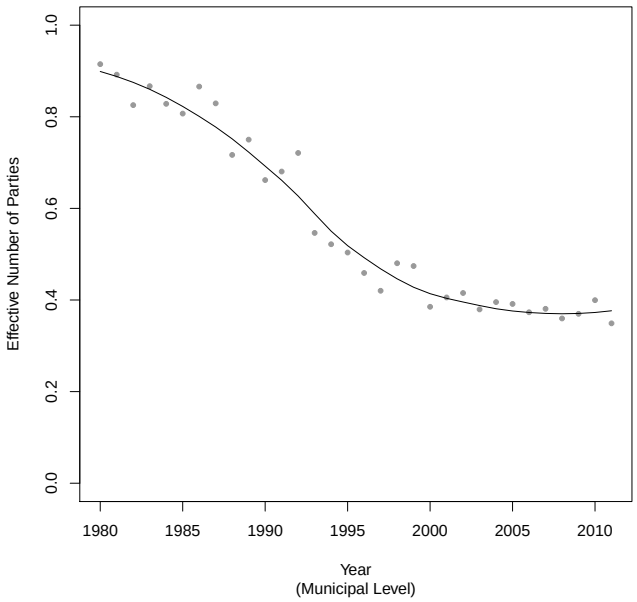
Using this classification strategy, Figures 5.1a and 5.1b show the evolution of the average effective number of parties at the state and municipal level respectively for the period 1973 through 2011, using the yearly average Herfindahl index of electoral concentration. By construction, this index runs from 0 (a perfect electoral market in the economic sense of perfect competition) to 1 (complete concentration in a single-party). The upper figure shows the evolution of the effective number of parties at the state level, that is, for governor elections, and has a total of 195 elections spanning 37 years, which yields an average of 5.27 elections per year. The lower figure shows the evolution of the same measure at the municipal level, constructed from a total of 24,143 observations consisting of municipalities per years. Each dot corresponds to the yearly average.

The data reveals the well-known trend of democratization in Mexico, at both levels, since the late 1970's. During these early years, the hegemonic party (Magaloni, 2006) in Mexico, PRI, controlled the presidency, Congress, governorships, local Congresses and in general all appointments in a complex system of rewards and punishments that had an all-powerful president at the cusp. Notice how in both Figures 5.1a and 5.1b votes were almost exclusively concentrated in a single-party. In fact, it was not until 1989 when the first governorship was lost to Gov. Ruffo in Baja California, which became the first state emanated from the opposition (PAN) in a series of municipal and state defeats that would lead to the PRI losing the presidency in 2000 (again for the PAN).

It is interesting that around the time Gov. Ruffo's historical win, the average concentration of votes was around 0.5 (or 2 effective parties). On average, the decline of vote concentration was steady from 1970 to 2000. At the municipal level, there is much less variation in the averages (so the votes are much more tightly concentrated



(a) Votes for Governor (Yearly Average Herfindahl Index 1973-2010).



(b) Votes for Municipal President (Yearly Average Herfindahl Index 1980-2011).

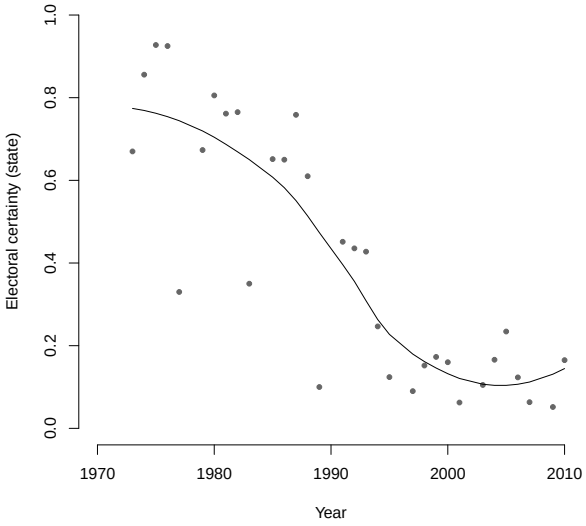
Figure 5.1: Vote Concentration at the Sub-national Level in Mexico (1973-2011)

around the loess curve). The average decline in municipal vote concentration started faster in the 1970's and then slows down around the early 1990's.

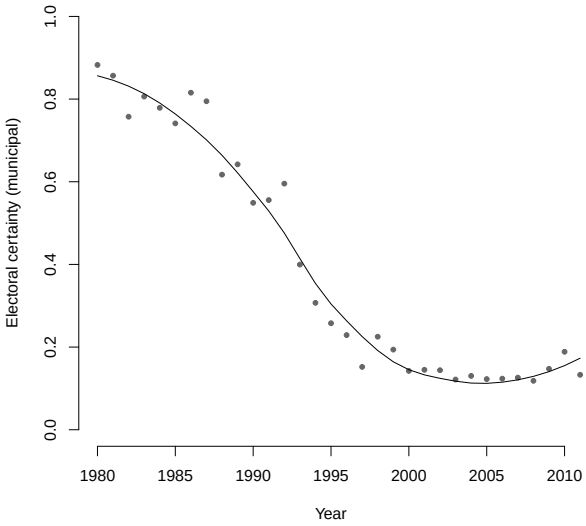
More recently, however, the trends show an important difference: whereas the municipal concentration of votes has just very recently reached what appears to be a minimum, at the state level the highest dispersion of votes happened in the year 2000 –an emblematic year that changed the political game completely when the PRI lost the presidency to the PAN. From this year on, the concentration of votes for governor has risen, meaning that votes are being concentrating in fewer parties and coalitions. This could be due to a combination of patterns at both the mass and elite levels, whereby the former realign according to programmatic or instrumental reasons in a process of democratic political learning (sanctioning and accountability), and the latter coalesce as a strategy to minimize the risk associated with this voter realignment. If there is a level of government where we would expect to see this is precisely at the state level, where the stakes are so much higher than at the municipal level.

The second variable I use to capture electoral risk is the margin of victory between the incumbent and the second place *in the previous election*. This temporal choice is important because the electoral dynamics that would lead to variation in the provision of public goods are set by the electoral results of the previous election. Figures 5.3a and 5.3b show the historical evolution of this margin of victory since 1970. Higher values on the vertical axis indicate a higher difference in votes between the winner and the second place, and lower values represent more uncertain demarcations (hence why I label it "electoral certainty" as opposed to "risk", but the measures are symmetric).

The Figures show interesting patterns. The differential between the incumbent and the second place moves, on average, downwards steadily until the mid-



(a) State Certainty (Yearly Average).



(b) Municipal Certainty (Yearly Average).

Figure 5.2: Electoral Certainty (1973-2010). This variable captures the percentage points difference between winner and runner-up.

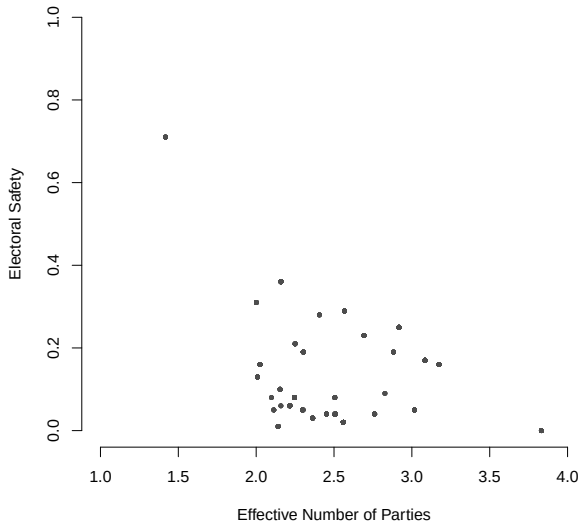
1990's, when it stabilizes at around 0.2. The trends suggest there are two different historical phases, one of adjustment (pre-1995) and another one marked by a more consistent differential between winners and runner-ups. Of course, in the early stages of this time-series the winner was always the PRI.

As in the previous Figure **??**, the averaged and smoothed results show a slight increase in the margin of victory at the state level since alternation at the federal level happened (considered to be the culmination of the process of democratization). This does not appear to be the case at the municipal level. The margin of victory at the state level has stabilized at around 15-20% at both levels.

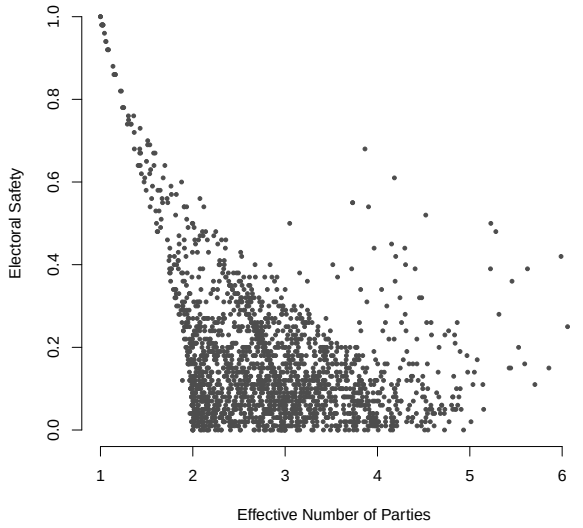
How do these two measures look together? Figure **??** shows the bivariate plot for a 2010 cross-section. On the vertical axis I plot the margin of victory, and on the horizontal axis I plot the effective number of parties (the inverse of electoral concentration)[8]. At the state level there is no clear pattern. Except for a strong outlier in the upper-left quadrant of the plot, the relation between these two variables appears to be very weak. At the municipal level, there is a very clear pattern by which margins of victory and vote concentration match at high levels of both, but as the effective number of parties progresses the margin of victory decreases with increasing variance (heteroskedastically). The variance at low levels of competition is low, and becomes very high at a high number of parties. This means that it is difficult to predict the margin of victory when there are two or more effective parties.

This chapter has presented two measures that capture two different aspects of electoral risk for political parties, which in turn shape their electoral strategies. The first type of risk, which I have called structural, is captured by the effective number of parties, a measure usually regarded as being a consequence of the interaction

[8]These two measures are thus equivalent.



(a) State competitiveness.



(b) Municipal competitiveness.

Figure 5.3: Effective Number of Parties and Electoral Certainty (2010).

between politically active social cleavages and the mechanical effects of electoral systems (both events largely exogenous to party strategy). The second measure is the margin of victory in the previous election, which I argue captures short-term, contingent, elements of party risk such as candidate quality, available financing, public opinion swoops and other elements of political life that lie largely outside the long-term, slow-moving, societal changes that the structure of the party system captures.

The historical progression of each of these measures repeats the well known-story of democratization in Mexico from below, with municipalities and states showing the most vibrant changes during the 1970's through 2000, the year when the federal executive was finally lost to the opposition after a period of democratic and electoral experimentation at the local level for the opposition. At both the municipal and state levels, the structure of the party system, as well as the average margins of victory seem to have stabilized after the historical election of 2000 –at around 2.5 effective number of parties and around 15-20% margin of victory by the incumbent. The relationship between these two sources of risk is very tight at low levels of competition, but the variance of the margin of victory increases rapidly as the effective number of parties increase.

The next chapter now introduces the main empirical analysis of this dissertation.

Chapter 6

Estimating Household-Level Probabilities of Full Coverage

The previous two chapters described in detail the dependent and the two independent variables of interest: public goods, income inequality and electoral competition, respectively. With the historical context in perspective, this chapter presents the empirical analysis for cross-sectional data in 2010. It describes other variables used as control, analyzes the data and presents the main empirical results of this dissertation that links the provision of public goods at the household level with structural characteristics of the municipalities they belong to, specifically the levels of electoral competition and income inequality.

6.1 Income, Elections and Public Goods: Joint Levels in 2010

This section describes joint levels for these variables for multiple combinations of these variables. The goal is to show that there are, even at the descriptive level, some emerging structural patterns and relationships between them. This is important to provide the more rigorous statistical analysis below with the simpler

robustness of descriptive data.

Table 2.1 above presents the theoretical expectations from two separate bodies of literature that explain variation in the provision of public goods in terms of the latter structural characteristics. Places with higher levels of democracy, or those with lower social heterogeneity, are expected to present higher levels of public goods. Both of these effects are reinforcing, so we expect to see a) the highest levels of public good output in places with high levels of democracy and low social heterogeneity, and b) the lowest levels in places with low levels of democracy and high social heterogeneity.

I am using as a proxy for each one of these measures two simple constructs. Democracy is proxied as electoral competition, and social heterogeneity Table 6.1 below populates the expectations with the observed proportion of full coverage at the municipal level for four combinations of electoral competition and inequality in 2010. Values labeled as *High* are all those observations which fall above the median of the relevant category, while those labeled as *Low* correspond to values below the median.

Table 6.1: Observed proportion of full coverage at four different levels of inequality and electoral competition (2010). Inequality historically precedes democratization. The number of observations in each cell corresponds to about 25% of the total because medians were used as cut-off points.

		Electoral competition	
		High	*Low*
Inequality	*High*	.47	.33
	Low	.5	.42
		n=2,848,922 total.	

The upper-right and lower-left cells are consistent with the reinforcing effects that both our theories predict. The highest relative proportion of full coverage is seen among those households living in municipalities with high electoral competition

and lower levels of income inequality, with 50% of the households having running water, sewerage, electricity and being literate. Similarly, the lowest level of full coverage is observed among those households that live in municipalities with low levels of electoral competition and high levels of income inequality. This descriptive data in itself is important to both bodies of research that deal with the effects of structural characteristics of societies on the provision of public goods.

A second result from Table 6.1 relates to the observed values in the remaining two cells, for which the theoretical baggage we have is still underdeveloped. It is in principle possible to observe two patterns. In the first one, the progression of coverage would start from the upper-right cell (high inequality, low competition, HL) to the upper-left cell (HH), then down to the lower-right (LL) and finally to the lower-left (LH). In this scenario, the ordering of proportions would be $HL < HH < LL < LH$. Notice that the initial reinforcing effects are maintained because $HL < LH$, which the theories do predicts.

The second pattern, which is the one actually observed, ranks the proportion of coverage as $HL < LL < HH < LH$. In this scenario, movements in the proportion of coverage move first along the low electoral competition and then switch to movements along the high electoral competition, always going from low to high inequality.

This observed progression –as opposed to the plausible but unobserved first scenario– suggests a first new finding in this dissertation, that should prove useful for later theory building. Each plausible scenario reveals a different relative weight for inequality and democratization in the observed progression of full coverage.

In the first one, increasing levels of full coverage would be first observed along the dimension of electoral competition, leaving income inequality fixed in high levels and moving from low to high levels of electoral competition. The movement

would then switching to those households living in places with low income inequality and moving again along the electoral dimension. Substantially, this would imply that the relative weight of inequality is higher than the relative weight of electoral competition in explaining the observed movements in the proportion of households with full coverage.

However, the proportion values reveal that the second plausible scenario is actually observed. The movements in Table 6.1 first happen along the inequality dimension. Leaving electoral competition fixed at low levels, the progression of coverage goes from .33 to .42, with a differential of $HL - LL = .09$. The next movement is done leaving electoral competition fixed at high levels and moving again along the inequality dimension with a differential of $HH - LH = .03$.

All levels of full coverage are higher at high levels of electoral competition, regardless of the levels of economic inequality observed. This suggests that, overall, households are better off living in places with high levels of electoral competition, regardless of the distribution of income in their municipalities.

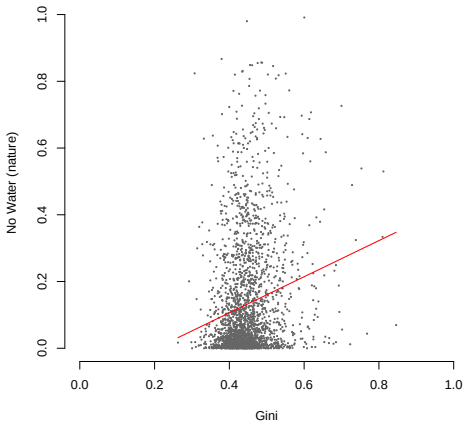
For households living in municipalities with high levels of income inequality, the data reveals a differential of $HH - HL = 0.14$ across levels of competition, whereas for households living in a context of low income inequality this observed difference is $LH - LL = 0.08$. The observed values $HH - HL > LH - LL$ suggest that increases in electoral competition have a stronger marginal effect in places with high income inequality, which in turn suggests there are diminishing marginal returns of increasing electoral competition conditional on the levels of income inequality.

In sum, Table 6.1 suggest that the expectations of both theories about public goods are consistent with the Mexican case. When taken independently of each other, households living under more competitive polities are more likely to enjoy full coverage of public goods, and households living under less unequal societies are

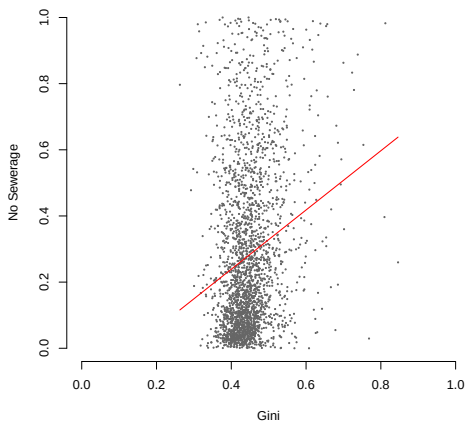
also better off in terms of access to public goods.

When we condition the proportion of full coverage on each dimension –thus discussing interaction between theories, which are mostly mute in two out of four possibilities– we see that households under more competitive regimes enjoy overall higher levels of full coverage, regardless of the existing levels of income inequality. Households living in a context of higher income inequality with high levels of electoral competition show a difference of 14% in full coverage compared with those living under less competitive regimes, and those living in municipalities with low income inequality but high competition show only an 8% differential compared to those living in municipalities where electoral competition is low, suggesting that the marginal effects of democratization are conditional on income inequality.

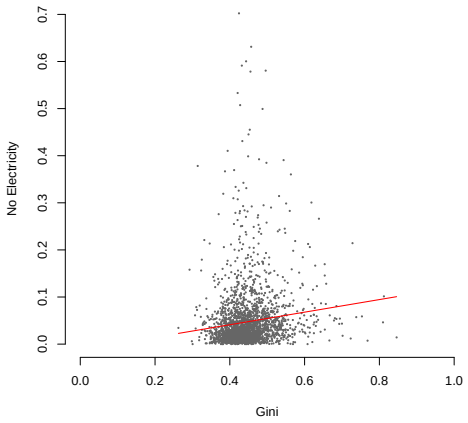
How do these variables look in bivariate relationships? Figure 6.1 the simple bivariate relationship between income inequality and the lack of water, sewerage and electricity. These measures were constructed as specified for Table 3.6 above. Each dot corresponds to the proportion of households in that municipality. Panel 6.1a shows the relationship between income inequality and the lack of any government provided service of water (households whose members need to, for example, walk for to a river or nearby creek to get their drinking water, sometimes for a more than two hours each way). Panel 6.1b shows the same information for households with no access to a government provided grid (whose members urinate and defecate in open air, or nearby caves or ditches). The final Panel 6.1c shows the proportion of households in each municipality that have no access to electricity (without distinguishing between formal and informal use for those households who do have electricity). In all three cases, municipalities are heavily clustered around the mean of the distribution (following the same general pattern shown above in panel 4.11a). This makes it difficult to see any clear pattern, but a naive regression line shows the



(a) Income inequality and lack of water.



(b) Income inequality and lack of sewerage.



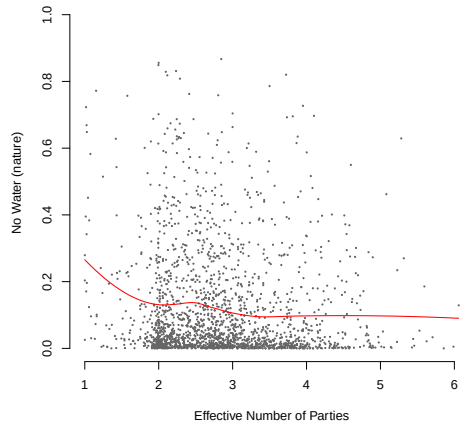
(c) Income inequality and lack of electricity.

Figure 6.1: Proportion of households without the specified infrastructure, against municipal income inequality. Each dot corresponds to one municipality (n=2,456). Naive bivariate loess lines are shown.

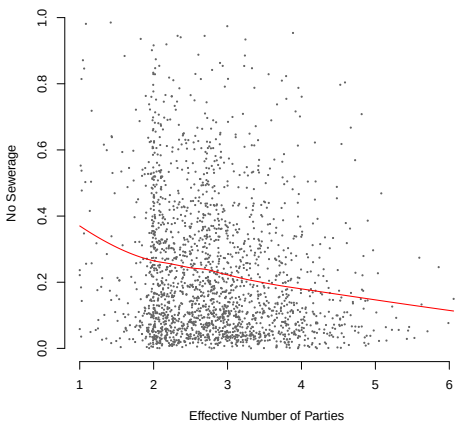
basic (albeit uncontrolled) structural relationship between the two variables. For all three variables, as inequality increases, so does the proportion of households with no access to each service.

Figures 6.2 and 6.3 show the bivariate relationships between the lack of access to basic infrastructure as a function of the effective number of parties, municipal and state respectively. Again, each dot corresponds to a municipality, and its location on the vertical axis corresponds to the proportion of households with no access. The horizontal axis corresponds to the effective number of parties (constructed as detailed in the previous chapter). At the descriptive level, electoral competition seems to be negatively correlated with the provision of all three goods. In all three panels of Figure 6.2, a higher number of effective parties is related to a lower proportion of households lacking infrastructure. There is however an apparent difference across public goods. First, the effects for sewerage seem to be much more pronounced that for the remaining two public goods. Second, for water and sewerage, the fastest decrease appears in the 1-2 range. Given Mexico's recent political history, this suggests that the fastest decrease of households lacking infrastructure happens where the previous hegemonic party (PRI) looses electoral power (that is in the transition from a dominant to a multiparty system).

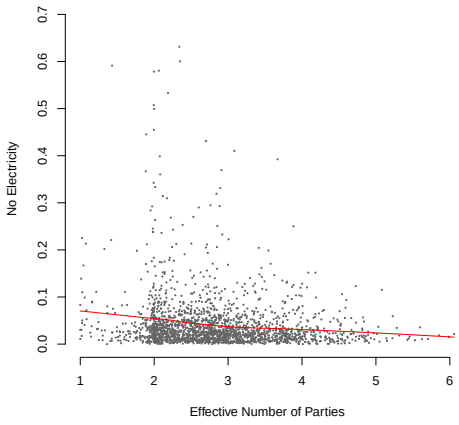
The pattern for state level competition seems somewhat different, as shown in Figure 6.3. Here, the relationship between a higher number of parties and basic infrastructure seems to disappear. Furthermore, the simple plotting of the data reveals a non-linear (quadratic or U-shaped) relationship. This non-linearity is graphically confirmed by the naive loess lines depicted in each panel. In sharp contrast to the loess curves in Figure 6.2, these show string non-linear movements that follow somewhat closely a U-shaped curve, suggesting that there is a threshold in the effective number of parties at the state level after which more electoral competition begins



(a) Electoral competition (M) and lack of water.

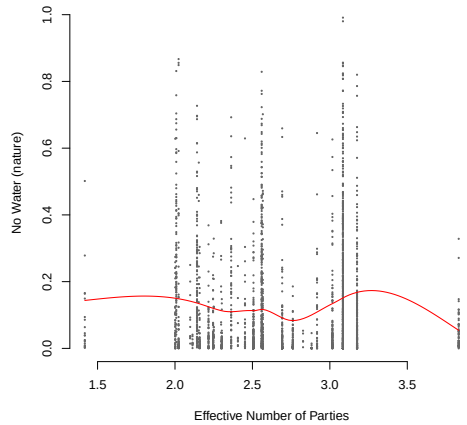


(b) Electoral competition (M) and lack of sewerage.

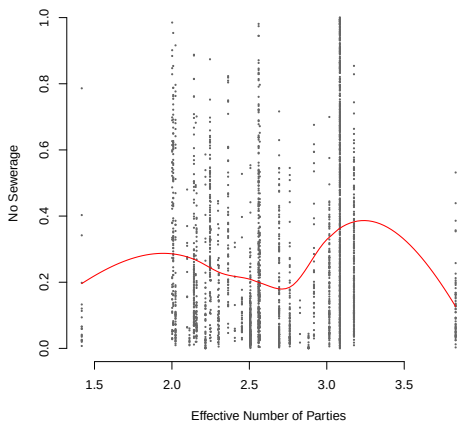


(c) Electoral competition (M) and lack of electricity.

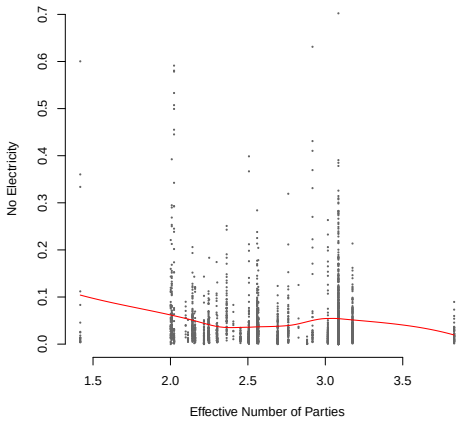
Figure 6.2: Proportion of households without the specified infrastructure, against the effective number of municipal parties. Each dot corresponds to one municipality (n=2,456). Naive bivariate loess lines are shown.



(a) Electoral competition (S) and lack of water.



(b) Electoral competition (S) and lack of sewerage.



(c) Electoral competition (S) and lack of electricity.

Figure 6.3: Proportion of households without the specified infrastructure, against the effective number of state parties. Each dot corresponds to one municipality (n=2,456). Naive bivariate loess lines are shown.

to be correlated with higher proportions of households that lack any of the basic services shown. This is an interesting departure from standard democratic theory. These different structural relationships might arise because of the differential value associated with office at the municipal (lower) versus state (higher) levels.

Of course this is not enough to make any inferences regarding the conditional correlations of full coverage with each one of these dimensions, let alone about causality. It is likely that these dimensions interact with each other in ways that reinforce or dampen their effects on full coverage. For example, the provision of public goods might be a tool with which politicians in places with high electoral competition diversify the risks of loosing seats with portfolios of public and private goods (Díaz-Cayeros et al., 2007; Kramon and Posner, 2013). Inequality changes the relative utility of ideology versus consumption (Dixit and Londregan, 1996),

The next section presents additional variables related to social heterogeneity, and the next section after that addresses identification concerns in a more systematic way and proposes three solutions.

6.2 Other Relevant Variables

In addition to both main independent variables (income inequality and electoral competition) I use a set of variables that allow me to control for variation in public goods along other dimensions. At the municipal level the variables used in the models are shown in Table 6.2. The logic for their inclusion will be detailed in-depth below.

Table 6.2: Control variables (municipal).

Variable	***Mean***	***Median***	***Range***	***n***
Poverty	0.67	0.70	0.09 - 0.97	2456
Population Disp.	0.49	0.41	0.15 - 1	2456
Pop. Seat	0.49	0.46	0.003 - 1	2456
Avg. Altitude	4490	5000	5 - 10500	2456
Alternation	0.90	1	0 - 1	2036
Alternation (S)	0.75	1	0 - 1	32
Electoral Risk	0.17	0.12	0 - 1	2036
Ling. Frac.	1.15	1.03	1 - 3.4	2456
Rel. Frac.	1.34	1.27	1 - 5.95	2456
Electoral Risk (S)	0.13	0.16	0 - 0.71	32
Pop. Dens.	279	51.95	0.14 - 17657	2456
ENP	2.83	2.73	1 - 6.06	2036
ENP (S)	2.68	2.57	1.42 - 3.83	32

6.3 Identification problems

There are two main identification problems that affect the quality of our inference about the relationship between the provision of public goods, democratization and income inequality: endogeneity and hierarchy.

The most important problem is the endogenous relation between public goods and inequality. Basic household infrastructure like running water, sewerage and electricity, and to the ability to read and write of people in the households are intimately linked to the notion of *capabilities* (Sen, 1999, 2006; Prendergast, 2005). The study of poverty and inequality has gradually been shifting from an income-based approach to a multidimensional approach that combines income with basic capabilities, focusing more on asset accumulation than solely income (Bourguignon, 2006).

The concept of capabilities seeks to shift attention from income, which is

a one-dimensional approach, to a set of conditions of human being which include being healthy, have access to education, function in a context of gender and political equality, and in general those situations that enhance human dignity and freedom[1] (Nussbaum, 2001, 2006).

Following these normative debates (and the ensuing measurement and conceptual discussion), long-term development requires that children survive, that they develop their cognitive abilities sufficiently to be able to learn properly in schools and accumulate the human capital which will eventually have positive returns on their income in the labor market once they become economically active. The survival of children and the proper development of cognitive abilities is directly linked to the average level of health conditions in their households, as well as their parents educational level (Breierova and Duflo, 2004). Overall levels of human capital of the workforce seem to increase the rate of return on individual human capital (Acemoglu, 1996), making overall levels of investment in education an important (albeit incomplete) tool for development.

Many of these dynamics are shaped by the quality of the household where humans spend their first years as children. Having running water is key to prevent infections that arise from water that might be polluted from rivers, wells and lakes. Being able to dispose human waste in a sewerage system instead of in a field near the household, the ocean or a nearby river should also have some effect on the overall health of children and the family in general. Without a proper basic household infrastructure, it is presumably more likely that children will be not healthy enough to accumulate the educational assets needed for increased levels of income in the

[1]The concept of development as freedom has its intellectual roots in the modern debate between *negative* and *positive* liberty (Berlin, 1969; Prendergast, 2005). Emphasis is made in the latter. Positive liberty is related to the capability of self-realization. Negative liberty is, in contrast, liberty in a sense of having no external opposition to an agent.

future labor markets.

Hence, there is an intimate relationship between the availability and quality of public goods and poverty and income inequality. Less public goods are related to higher levels of poverty and income inequality. A sensible development policy must include the improvement of household conditions. Note that the hypothesis in this dissertation runs in the opposite direction: I am trying to tease out how inequality affects the provision of public goods. There is, then, a clear endogeneity problem that needs to be addressed.

To be sure, there are other potential problems of endogeneity between some of the variables I will be using throughout the empirical chapters. The most obvious one is the potential endogeneity between poverty and the provision of public goods. Again, in the medium-run, it is likely that income is correlated with infrastructure to the extent that the latter is correlated with other elements that are likely to influence future income (e.g. schooling, access to credits, to capital, and so on).

Although relevant and potentially very interesting avenues of research, in this dissertation I take the simplistic approach of assuming away this potential problem because its resolution would distract from the main variables of interest, which are income inequality and the level of electoral competition. I focus therefore mainly in the endogenous relationship between income inequality and the provision of public goods.

To do so I instrument the levels of inequality in Mexico today with structural conditions of the labor market in 1910, which are intimately linked to the mobility and coerciveness of labor across *haciendas* during the pre-revolutionary administration of Porfirio Díaz (1829-1910). As I argue below, I use proxies that capture the labor coerciveness of *haciendas* as an instrument for inequality today. Although the exclusion restriction is not fully realized (because there was no random assign-

ment of labor coerciveness), our best explanations today (Engerman and Sokoloff, 2005; Acemoglu et al., 2002; Sokoloff and Engerman, 2000; Acemoglu et al., 2001; Acemoglu and Wolitzky, 2009) establish links between institutions and poverty and inequality, with the foundational element of geographic traits (e.g. climate appropriate for growing crops historically linked with the rise of coercive institutions, like cotton, tobacco or sisal), which are indeed randomly assigned.

The second problem I deal with is the hierarchical nature of the data. As detailed in section 2.5, the fiscal structure and the nature of development policy in Mexico is a complex interaction between levels of government. My unit of analysis is the municipality and the state because by constitutional mandate municipalities are in charge, in a substantive way, with many of the decisions that directly influence the provision of basic infrastructure[2] Nevertheless, I am looking at the probability that a household has full coverage, and so the unit of analysis for the dependent variable differs from the unit of analysis of the main independent variables: the latter is at the individual level (taking households as individual units) whereas the main variables of interest are at the municipal level. The explanatory variables are thus a combination of individual and aggregate levels.

Furthermore, households are embedded within municipalities, which are themselves embedded within states. The nested structure of my unites of analysis calls for a hierarchical (or multilevel) analysis that takes into account the nested structure of the errors in different levels of analysis. To address this second concern I will make use a three-level hierarchical model that separates the source of the error structure into household, municipal and state levels.

[2]Federal and state funds are specifically allocated by formulas to the municipalities to improve the conditions of infrastructure in the municipal seats and the localities, specifically roads, sewerage, water, markets, slaughterhouses, electricity, etc. Education is much more complex, but it is accurate to say that states have the bulk of funds and manpower needed to provide schooling in Mexico.

The next section explains in detail the logic of the weak instrumentation of income inequality used in this dissertation as an additional (but secondary) robustness check.

6.4 Instrumenting Inequality: Labor markets during the Porfiriato (1826-1910)

An instrument is a variable that is related to the outcome of interest solely by virtue of its relationship with treatment status (Angrist et al., 1996). Instruments z are ideally variables that allow us to create exogenous variation on an endogenous regressor x (in this case inequality in 2010). Variables x and y are said to be endogenous if there is a (usually unobserved) variable w that correlates with both simultaneously, so that changes in y are the product of changes in x and changes in w.

Since instruments are ideally uncorrelated to the outcome variable, they allow researchers to "shock" the endogenous regressor and generate variation that is uncorrelated with neither y or w, thus creating the proper conditions for identification and causal inference: any variation measured in x will be exogenous to both y and w, and thus the estimator for x in a linear model will not capture variation in y that arises from movements in w (and thus y itself).

Because instrumental variables are biased but consistent, large sample studies are particularly benign to reduce the bias of the estimators (Angrist and Krueger, 2001): as the sample size increases, the estimator converges to the population parameter, thus dampening the bias inherent to the use of instrumental variables.

For the reasons put forth in the previous section, income inequality and the provision or public goods are likely correlated, either directly or through a third

omitted variable. For example, it might be that average income (as measured by per capita GDP) influences both the provision of public goods through urbanization pressures associated with higher industrial development, and at the same time it also influences the level of inequality as in Kuznets (1955).

For this reason an instrumental variable approach is in place. If we simply perform an OLS estimation on the effect of inequality on the provision of public goods we should expect an upward bias in the estimator because an omitted variable is shifting both inequality and public goods, so their conditional correlation should move away from zero. A proper estimation of the conditional correlation between inequality and the provision of public goods should attempt to find a variable that satisfies, insofar as historically possible, the exclusion restriction.

I propose to use the nature of labor markets during the era immediately preceding the Mexican Revolution of 1910[3]. This historical period was characterized by massive expropriations of indigenous land sold in advantageous terms to non-indigenous landlords. The concentration of huge portions of land in a small percentage of the population is perhaps the most conspicuous economic and social characteristic of this time, and it would eventually set in motion the agrarian component of the 1910 Revolution[4].

The stylized argument runs as follows: labor markets in Mexico during 1871-1910 was characterized by massive concentration of land in a (proportionally) few owners, who relied on *coercion* to secure their supply of labor. The nature of this contractual agreement was not free in the sense that workers could not revise and renew their contracts with any employer.

Although slavery was formally prohibited in Mexico since the constitution

[3]I thank Alberto Díaz-Cayeros for the basic formulation of this instrument and data.

[4]There is a second component linked to the struggle among elites for the succession of power.

of 1857, the structure of labor markets during the pre-revolutionary era in Mexico resembles less a free-market than a plantation style structure. Landed elites developed physical and legal mechanisms of labor discipline, and did use them when necessary, but the main tool of labor discipline was achieved with *debt*.

Labor was coerced into an extractive economy with subsistence wages and no exit option, thus inhibiting savings and the accumulation of physical capital. Therefore my argument establishes a positive relationship between the level of coerciveness of labor markets in 1910 and the structure of inequality today[5].

The following paragraphs present an historical overview and tackle two issues: first, why we should expect a relationship between labor coerciveness in 1910 and inequality today; second, why labor markets in 1910 can be reasonably excluded from meaningful effects on the development of infrastructure (i.e. running water, sewerage, electricity and literacy) during the XX^{th} century. In a word, to what extent the exclusion restriction applies.

The liberal government of Benito Juárez (1867-1871) was instituted after the execution of Prince Maximilan of Habsburg, which *de facto* ended a turbulent period of direct foreign interventions and intestine conflict between liberals and conservatives fighting over the right to shape the constitution –particularly the terms of ecclesiastical property, as well as religious and educational freedom. The Juárez administration was characterized by the establishment of a more professional public administration and treasury. After his death in 1871, new struggles over the transfer of power generate violent clashes between liberals and conservatives, and a young general with widely known liberal credentials, Porfirio Díaz, seizes power in 1876 to prevent another liberal, Sebastián Lerdo de Tejada, from being reelected (León-

[5]Previous efforts with the same class of instruments include Acemoglu et al. (2002); Banerjee et al. (2005); Dell (2010).

Portilla, 1969).

The Porfirian era is widely regarded as the initial steps toward the modernization of Mexico. The first massive investment plans in railroads networks happen during this era, exports and foreign investment grew, and average income rose (mostly an elite-driven rise). Foreign firms and national elites had established vast networks of support within the federal government and were given disproportionate access to, and control of, resources. In particular, huge amounts of land called *haciendas*, were concentrated in a handful of owners: in 1910 there were around 8,431 haciendas and around 48,000 *ranchos* (smaller than *haciendas*) and 96.9% of rural household heads had no land property whatsoever (León-Portilla, 1969).

The excessive accumulation of land is traced back to the late colonial period. The international market for minerals –on which a substantial part of colonial revenue depended on– was contracting, inducing a shift in productive activities from mining to agriculture, which requires, in the absence of extensive capital use, more land. Indigenous arable land became increasingly more valuable and it became the target for legal and illegal acquisition by the *criollo* and upper *mestizo* elites (Florescano, 1971b,a).

A powerful group of large landowners is a necessary but insufficient condition for bondage in agriculture. Two additional requirements are a shortage of labor and a government that that officially refuses to implement bondage while tacitly tolerating it and acknowledging under a different name (Katz, 1974: 2).

The Porfirian era was struck by a shortage of labor as a consequence of the demographical collapse of indigenous population during the XVIIth and XVIIIth centuries in the aftermath of the Conquista due to disease, famine, destruction of productive assets and excessive labor (Gibson, 1964; Whitmore, 1991), which effectively declined the supply of labor. This in itself already speaks to the importance

of indigenous manpower, and their economic role.

Haciendas produced mainly agricultural and livestock commodities. The rise in the international prices of cotton, tobacco, rubber, coffee, sugar and henequen (Katz, 1974) further increased the demand for labor. In combination with their dependence on labor rather than capital (Van Young, 1983), and the demographic shortage, the relative value of labor increased[6].

In a market economy this would drive real wages up. But a lower supply of labor in a coercive economy differs substantially from a market economy. While the latter involves the free movement of labor across firms (driven in part by wages), in a coercive environment a relative increase in the demand for labor increases coercion: it encourages employers to exert more coercion to maximize effort, given that outside options for workers are too costly. If coercion is too costly in terms of relative output and exit options, markets develop; in the opposite case, coercive systems appear (Acemoglu and Wolitzky, 2009).

Thus it remains to show if the outside options for Mexican peons during the Porfirian era were costly or non-existent. Katz (1974) makes a convincing case why this was so. The labor conditions on haciendas during the Porfirian era were marked by coercive labor. The main mechanisms of labor discipline were debt (through the *tienda de raya*), a combination of tacit consent of the federal government of captive labor and local laws that stiffened labor markets, the political use of water and irrigation mechanisms as a form of labor discipline (specially in the south), and a system of private police in many haciendas (specially in the north).

Debt peonage was a generalized pattern of labor control in the *haciendas*. Workers, called *peones*, were mostly land deficient or did not posses any land at all.

[6]This makes the temperature of the latitudes where these plants grow also a valid instrument for the prediction of labor markets in 1910. This will be included in the final version of this dissertation.

Peons received a subsistence wage, which was then spent in the *tienda de raya*, a local store that belonged to the landowner, because local markets were underdeveloped to the point that most –if not all– commercial exchange was done through the *hacienda*. Workers could not access other venues of distribution because they didn't exist.

Weak local and national markets also allowed the *hacendados* to charge prices well above market price. In fact, the *tienda de raya* was an important part of revenue for the owners of *haciendas*. The combination of lack of access to more dynamic commodity markets, a subsistence wage, and a perverse circle of indebtedness with their employers were the hallmark of most *peones* during the Porfirian era. *Tiendas de raya* became a symbol of peasant oppression in the political and artistic narrative of the agrarian conflicts in Mexico during the early XX^{th} century.

They were, however, not the only form of labor discipline. Control over water and irrigation systems was a second mechanism by which landowners would coerce their workers into agreements that would not have been otherwise accepted given the effort/wage relationship. Most of the *peones* lived outside the *hacienda* and had low to null means of production. They depended on land and some capital from the hacienda, but they also depended on water.

The southern states of Mexico, specially Yucatán, Tabasco and Chiapas, experienced a disproportionate increase in labor demand because international prices of the products of the tropical lowlands increased substantially. Increases in the demand for products were met more labor: deportees and voluntary workers brought in from all around the country, members of indigenous tribes who had resisted the systematic confiscation of their lands (like the Yaquis in the northern state of Sonora), political dissenters, criminals an unemployed (Katz, 1974: 15-16)[7].

[7]This same author cites Turner (1910: 67): "The [Oaxacan] slave-holder has discovered that it is cheaper to buy a slave for 45 dollars and work and starve him to death in seven months and then spend 45 dollars for a fresh slave than it is to give the first slave better food, work him less

This was an active policy of southern *hacendados* that had an implicit consent from the Díaz government by way of omission. However, the federal government at times also actively contributed to the capture of labor. Portions of the federal army were at times used as a mechanism to capture peones who had escaped from the *hacienda*. In the northern state of Coahuila, *haciendas* had intricate systems of private police to track, detain and deport escapees. Local authorities and political bosses provided sometimes cheap labor from the communities under their control. In Yucatán, a law prohibited *hacendados* to accept *peones* who had escaped from their nearby masters.

The Porfirian administration put in place a very efficient method of maintaining captive labor "there are few, if any, reports of revolts or other social upheavals during most of the administration.

In sum, no access to land or other means of subsistence like water, no productive assets, subsistence wages, chronic debt, laws bias towards landowners, tacit consent from the federal government, informal policing systems and sometimes active persecution by state laws blurred the fine line between debt peonage and slavery during the Porfirian era. Katz is careful in providing a more nuanced account. There were regional differences in the degree of labor coerciveness, and there were different arrangements even across bordering *haciendas*.

Nevertheless, this state of affairs was on average accurate, and it would be the structural background against which the agrarian dimension of the Mexican revolution was fought[8]. Eventually the outside options became less costly relative to the *status quo*, and the incentives for the 1910 Revolution appeared.

The labor conditions during the Porfiriato can in fact also be taken as a proxy

sorely, and stretch out his life and his toling hours over a longer period of time".

[8]Emiliano Zapata's battle cry was *Tierra y libertad!* (land and freedom).

for longer term structural factors dating back to the colonial era. The technology, forms of production and productive social relationships in the late XIXth century in Mexico we already present in the late XVIIIth century (Van Young, 1983). In fact, patterns in the labor markets of the *colonia* have been traced back to the indigenous precolonial labor institutions that were exploited by the Spanish invaders (Arias and Girod, 2011).

We cannot directly observe labor markets in the sense described here. But coercive labor markets functioned layered upon structural characteristics of land tenure that are observable. My proxy for labor markets in 1910 is the effective number of haciendas per municipality in 1910. This proxy is meant to capture the extent of outside options of *peones*. More competition for labor in the Porfirian context would drive coerciveness up. Subsistence wages and quasi-slavery induce low levels of investment in human capital, and inhibit savings by workers. This is the main causal mechanisms proposed: higher labor coerciveness in 1910 is positively related to inequality today.

Table 6.3 shows a simple OLS estimation of inequality today with the effective number of haciendas per municipality in 1910, as well as with the percentage of people living in haciendas in that same year. The former is a Herfindahl index of the concentration of the population in haciendas, and the latter captures the percentage of the population living in haciendas. Three effective haciendas with 100% of the people living in them proxy a less coercive labor structure than three effective haciendas with 50% of the population living in them. These proxies were calculated using census data for 1910.

The instrumentation of inequality in 2010 shows that a higher number of haciendas per municipality in 1910 is correlated with higher inequality today, and that a lower percentage of people living in haciendas is again related to higher levels

Table 6.3: Instrumented inequality.

	DV: Gini 2010
(Intercept)	**0.436*** **
	(*0.0023*)
ENH 1910	**0.00195*** **
	(*0.00042*)
Pop. haciendas (%) 1910	**-0.0202*** **
	(*0.00763*)
n	1132
$Adj\text{-}R^2$	0.02

*Signif. codes: 0.01 '***' 0.05 '**' 0.1 '*'*
Standard errors in parentheses

of inequality in 2010. The expected value of this regression, which explains a mere 2% of variation of inequality today, is the instrument in the next section.

6.5 A Hierarchical Model of Municipal Coverage

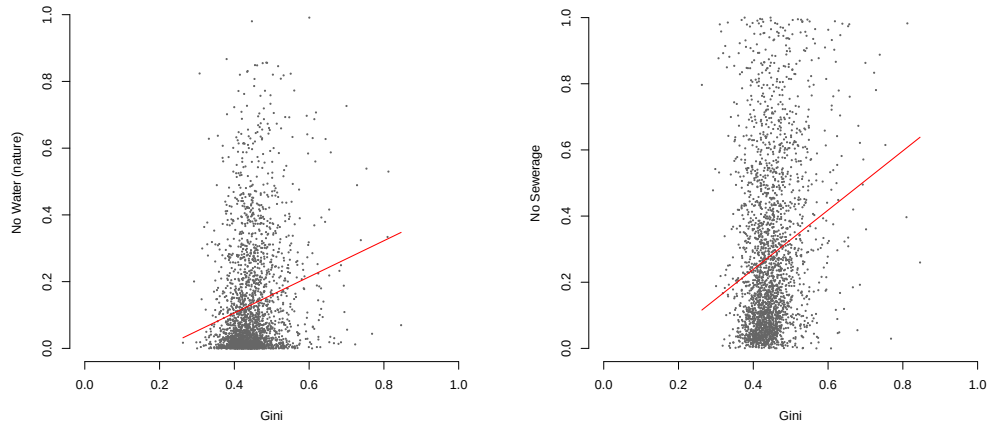
This section presents the first rounds of empirical tests. The goal is twofold: to test whether if at the municipal level there exists a positive relationship between income inequality and the provision of basic infrastructure, and to test whether there exists a positive relationship between electoral competition and the latter. It is important to test these hypothesis at multiple levels of disaggregation, and always taking into account the clustering of units in higher levels (municipalities within states in this case). The main testing method throughout the following two sections will be a series of mixed-effects (hierarchical) models of increasing complexity and interactivity of the variables. The unit of analysis is the municipality (n=2456), and the dependent variables will be the proportion of households in each municipality that have no access to infrastructure.

This dependent variable is a novel measure because it is built using the most disaggregated data made available by the Mexican census (shown in Table 3.3 in Section 3.3 above), which is a novel contribution of this dissertation. Using the census sample of 2010, the raw proportions of households with no governmental provision of infrastructure was constructed for each municipality. For water, this includes the households that get their water from rivers, creeks and lakes. For sewerage it includes those households whose members perform their bodily functions in rivers, lakes, oceans, ditches, or in the ground. Finally, for electricity, all households that have no electricity (formal or informal) all were included.

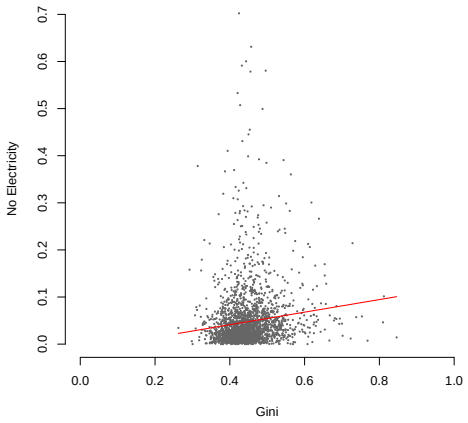
How do these proportions look when graphed in bivariate plots? Figures 6.4 and 6.5 show the bivariate relationships between the proportion of households that lack a public good, against inequality and electoral competition, respectively. The panels, starting with 6.4a and going clockwise, show the relationship between municipal Gini and water, sewerage and electricity, and the same logic follows Figure 6.5 but for electoral competition[9]. The plots also show in red the result of a simple loess regression. The results in both sets of figures show, at a simple descriptive level, the basic results of this dissertation at the municipal level –which will then be confirmed with more complex models. As inequality increases, the proportion of households with no access to the good increases, but as the effective number of parties increases, this proportion decreases.

This simple descriptive data at the municipal level suggests the following points. First, there is a non-null relationship between the structure of income (both levels and distribution) and the provision of infrastructure, and it follows roughly the pattern hypothesized in this dissertation.

[9]The number of observations is n=2,036 because there are 420 municipalities from Oaxaca missing because they abide by traditional indigenous law and have no municipal elections.

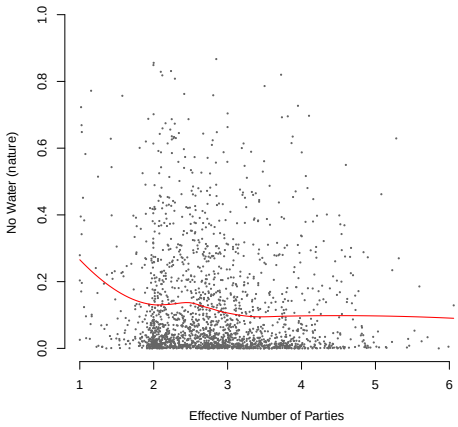


(a) Proportion of households with no water. (b) Proportion of households with no sewerage.

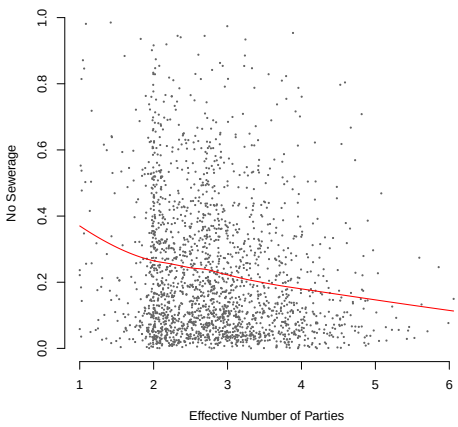


(c) Proportion of households with no electricity.

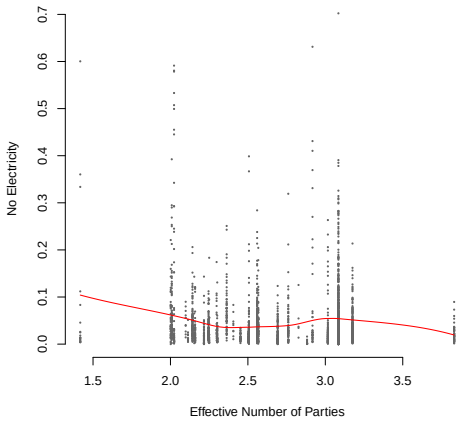
Figure 6.4: Income inequality and public goods. Each dot corresponds to a municipality (n=2,456). Vertical axis represents the proportion of households with no infrastructure. Horizontal axes show municipal Gini.



(a) Proportion of households with no water.



(b) Proportion of households with no sewerage.



(c) Proportion of households with no electricity.

Figure 6.5: Electoral competition and public goods. Each dot corresponds to a municipality (n=2,036). Vertical axis represents the proportion of households with no infrastructure. Horizontal axes show the municipal effective number of parties.

Second, consistent with previous work (Díaz-Cayeros, Estévez, and Magaloni, Díaz-Cayeros et al.; Barro, 1996; Plümper and Martin, 2003; Tavares and Wacziarg, 2001; Boix, 2003; Diamond, 1992), a more vibrant electoral landscape is positively associated with the provision of public goods (but see Ross (2006) for a critique).

Third, the structural relationships between these variables is heterogeneous across goods. The levels and distribution of income seem much more relevant to understand the lack of provision of sewerage than it is for water. Why this might be so was hinted during my field-work in the Southern states of Oaxaca and Chiapas (very poor and with a highly skewed distribution of income). Interviews with treasurers, geographers, engineers, public works officials, and the like, from multiple municipalities and political signs consistently pointed out the high technical and financial difficulty of providing sewerage vis-a-vis water. While the latter does require high levels of investments to connect households to a broader grid (itself very costly in terms of time and money), the former requires a substantially higher investment to procure a waste-management system that involves high setup costs and high recurring costs (since waste needs to be transported and treated on an ongoing basis). The theoretical framework presented in this dissertation is useful to understand this behavior: when confronted with the provision of a very costly and time-consuming infrastructure, elites who have captured the political process will disregard the provision of such a good given the high opportunity costs it represents, and will invest in other items closer to their needs (of which household infrastructure is not one of them by definition). These elite-driven preferences for investment will in turn exacerbate the short-term logic of political parties who need to invest in broader constituencies and would rather not invest heavily in infrastructure that will benefit marginal constituencies (which becomes even more problematic in the face of very high electoral uncertainty / competition). The cost structure of the

provision of infrastructure will therefore be determinant in the investment choice of parties and elites who control the political process.

These results need to be properly tested controlling for additional variables also related to the provision of public goods (as discussed in Section 6.2 above). The control variables encompass different theoretical backgrounds and can be categorized as heterogeneity, institutions and costs. The first category includes variables that capture heterogeneity along three main variables: economic heterogeneity (through income inequality, the main variable of interest), religious and linguistic fractionalization (as a proxy for ethnic fractionalization). The latter two are sources of heterogeneity not necessarily relevant for the Mexican case except for regional dynamics. For example, religious heterogeneity is not a politically active cleavage in most of the country, but in the Southern state of Chiapas it plays an important role for the political process –indeed so important that it induces a conflictive population sorting in communities along religious lines (e.g. Trejo, 2009).

The second set of variables are those that capture institutional aspects of municipal and state democratic life: the fragmentation of the party system and whether alternation has happened for the executive. A virtue of this study is that it does not posit an intrinsic weight to municipal and state levels of government in the definition of these dynamics. A set of variables from both levels of government are used, and the hierarchical models allow me in fact to determine which level of government contributes the highest variation to the probability of coverage.

The third set of variables are proxies for the cost of provision of infrastructure: population density, population dispersion, urbanization, and terrain conditions associated with costs (for example small localities in high places with very rugged terrains will have a higher cost of provision of the good than a more populated area with flat terrain conditions).

The model specification is the following:

$$y_{jk} = \beta_{0,jk} + \beta_1 x_{1,jk} + ... + \beta_{p+1} x_{p,jk} + e_{jk} \tag{6.1}$$

$$\beta_{a,k} = \gamma_{a0,k} + \gamma_{a1} z_{1k} + ... + \gamma_{a,q+1} z_{qk} + u_k \tag{6.2}$$

Eq. 6.1 corresponds to the municipal-level estimation. The term y_{jk} is the proportion of households with no infrastructure good for municipality j in state k. The 1 x *p+1* vector $\underline{\beta}$ is the vector of municipal-level parameters and the n_1 x p matrix $\boldsymbol{X}$ contains the variables for this level. Each municipality j has an error term e_{jk} with $\underline{e} \sim N_{n_j}(\underline{0}, \sigma_1^2 I_p)$. The parameter type $a, b \in \{0, 1, 2, ...\}$ denotes whether the parameter modeled is a random intercept ($a, b = 0$) or a random slope ($a, b > 0$). The 1 x $q+1$ vector $\underline{\gamma}$ is the vector of state-level parameters and the n_2 x q matrix $\boldsymbol{Z}$ corresponds to state level variables. Each state k has in turn an error term u_k with $\underline{u} \sim N_{n_k}(\underline{0}, \sigma_2^2 I_q)$. The number of observations for each level are $n_j = 2456$ and $n_k = 32$.

Table 6.4 shows the main regression results for a set of models where the dependent variable is the proportion of households with infrastructure. Three sequential models are shown for each public good. The first pair of models for each good consist of the linear mixed effects model with random coefficients (LMM/RI). The second set of models for each infrastructure correspond to an instrumental variable two-stage least squares estimation (2SLS), in which income inequality has been instrumented as detailed above.

Each LMM/RI model decomposes total variation into two normally distributed components, one for the state-level random intercepts σ_s and one for the municipal residual variation with σ_m. Total variation is the sum $\sigma_s + \sigma_m$. We can

Table 6.4: Municipal estimation. The dependent variable is the proportion of households with access to government provided water as detailed in Section 3.3. For each good, the first pair of models correspond to a mixed-effects estimation with random intercepts for municipalities and states, and the third corresponds to an two-stage least squares instrumenting inequality as detailed in section 6.4.

	WATER			SEWERAGE			ELECTRICITY		
	LMM/RI		2SLS	LMM/RI		2SLS	LMM/RI		2SLS
Income Structure									
Intercept	**1.1*** **	**1.22*** **	**2.68*** **	0.204	0.339	**0.73*** **	**0.964*** **	**1.05*** **	**0.727*** **
	(*0.103*)	(*0.16*)	(*0.231*)	(*0.202*)	(*0.264*)	(*0.255*)	(*0.033*)	(*0.052*)	(*0.058*)
Inequality	**-0.15** **	**-0.605** *		**-0.209** **	**-0.777** *		-0.004	**-0.319*** **	
	(*0.07*)	(*0.329*)		(*0.095*)	(*0.451*)		(*0.023*)	(*0.108*)	
Inequality (IV)			**-3.43*** **			**-1.67*** **			**0.398*** **
			(*0.504*)			(*0.556*)			(*0.126*)
Poverty	**-0.434*** **	**-0.822*** **	**-0.298*** **	**-0.639*** **	**-1.14*** **	**-0.64*** **	**-0.134*** **	**-0.396*** **	**-0.109*** **
	(*0.028*)	(*0.224*)	(*0.042*)	(*0.039*)	(*0.307*)	(*0.047*)	(*0.009*)	(*0.074*)	(*0.01*)
Electoral Dynamics									
Risk elec.(M)	0.002	0.003	-0.031	-0.041	-0.04	**0.153*** **	0	0	0.011
	(*0.024*)	(*0.024*)	(*0.034*)	(*0.032*)	(*0.032*)	(*0.038*)	(*0.008*)	(*0.008*)	(*0.008*)
Risk elec. (S)	0.005	0.01	-0.038	-0.052	-0.044	**-0.186*** **	0.051	**0.054** *	**-0.03** **
	(*0.105*)	(*0.106*)	(*0.047*)	(*0.221*)	(*0.222*)	(*0.052*)	(*0.034*)	(*0.032*)	(*0.012*)
ENP (M)	0.008	0.006	0	**0.016** **	**0.013** *	**0.034*** **	**0.005*** **	**0.004** **	**0.006*** **
	(*0.006*)	(*0.006*)	(*0.007*)	(*0.008*)	(*0.008*)	(*0.008*)	(*0.002*)	(*0.002*)	(*0.002*)
ENP (S)	-0.02	-0.022	**-0.025** **	0.089	0.087	**0.037*** **	0.001	0	**0.016*** **
	(*0.032*)	(*0.032*)	(*0.013*)	(*0.068*)	(*0.068*)	(*0.014*)	(*0.01*)	(*0.01*)	(*0.003*)
Alter (M)	**0.036*** **	**0.036*** **	**0.039** **	**0.044*** **	**0.043*** **	**0.065*** **	**0.008** **	**0.007** *	0.005
	(*0.011*)	(*0.011*)	(*0.016*)	(*0.015*)	(*0.016*)	(*0.018*)	(*0.004*)	(*0.004*)	(*0.004*)
Alter (S)	-0.005	-0.005	0.018	**0.113** *	**0.113** *	**0.076*** **	0.002	0.002	**0.008*** **
	(*0.029*)	(*0.029*)	(*0.012*)	(*0.061*)	(*0.061*)	(*0.013*)	(*0.009*)	(*0.009*)	(*0.003*)
Social Heterogeneity									
Rel. frac.	**-0.014** *	**-0.13*** **	**0.138*** **	-0.009	-.013	0.002	.003	0.001	-0.003
	(*0.007*)	(*0.008*)	(*0.035*)	(*0.033*)	(*0.023*)	(*0.038*)	(*0.008*)	(*0.008*)	(*0.009*)
Ling. frac	0.012	-.033	**0.114*** **	**-0.033*** **	**-0.031*** **	**-0.301*** **	**-0.025*** **	**-0.024*** **	**-0.067*** **
	(*0.017*)	(*0.025*)	(*0.035*)	(*0.016*)	(*0.016*)	(*0.039*)	(*0.008*)	(*0.004*)	(*0.009*)
Population Structure									
Pop. dens. (log)	-0.004	-0.001	-0.004	**0.067*** **	**0.071*** **	**0.053*** **	**0.002** *	**0.003*** **	**0.006*** **
	(*0.003*)	(*0.003*)	(*0.004*)	(*0.004*)	(*0.004*)	(*0.004*)	(*0.001*)	(*0.001*)	(*0.001*)
Pop. disp.	**0.094*** **	**0.101*** **	**0.16*** **	**0.126*** **	**0.135*** **	0.043	0.001	0.005	-0.01
	(*0.032*)	(*0.032*)	(*0.044*)	(*0.044*)	(*0.044*)	(*0.048*)	(*0.01*)	(*0.01*)	(*0.011*)
Orography									
Altitude	**.000*** **	**0*** **	**.000*** **	**.000** **	**0** **	**.000*** **	**.000*** **	**0*** **	.000
	(*.0000*)	(*0*)	(*.0000*)	(*.0000*)	(*0*)	(*.0000*)	(*.0000*)	(*0*)	(*.0000*)
Ruggedness	**-.000** *	-.000	-.000	-.000	-.000	**-.000*** **	**-.000*** **	**0*** **	**-.000*** **
	(*.0000*)	(*0*)	(*.000*)	(*.000*)	(*0*)	(*.0000*)	(*.0000*)	(*0*)	(*.0000*)
Interaction Effects									
Pov x Ineq x ENP		**.301*** **			.008			**.223*** **	
		(*0.686*)			(*0.154*)			(*0.037*)	
(Pov x Ineq x ENP)^2		**-.057*** **			-.008			**-.042*** **	
		(*.026*)			(*0.036*)			(*.009*)	
σ_s	.070	.070		.154	.155		.022	.021	
σ_m	.143	.143		.195	.194		.048	.047	
Wu-Hausman (t)			1.75			1.97			1.62
n_s	32	32	32	32	32	32	32	32	32
n_m	2030	2030	2030	2030	2030	2030	2030	2030	2030

Signif. codes: 0.01 '***' 0.05 '**' 0.1 '*'

Standard errors in parentheses

calculate the intra-class correlation for two random observations taken from the same state with $\frac{\sigma_s}{\sigma_s+\sigma_m}$, and the intra-class correlation for two randomly selected municipalities with $\frac{\sigma_m}{\sigma_s+\sigma_m}$. In other words, the models allow us to decompose total variability into between-group (state) variation and within-group (municipal) variation.

The bottom two rows in Table 6.4 show that each model has 2,030 municipalities distributed across 32 states. The table also shows the municipal and state level variation parameters σ_m and σ_s, respectively. About 67% of total variability in access to water comes from municipal (intra-class) variation, and about 33% comes from state (inter-class) variation. For sewerage, about 56% of variation comes from municipalities and about 44% from inter-state variation. Finally, for electricity about 69% comes from municipalities and about 31% from the states. On average, about twice as much variability comes from the municipal (intra-class) level compared to state (inter-class) variability.

One of the main variables of interest in these models is income inequality. This variable shows heterogeneous effects across public goods, with a negative one for water and sewerage and mixed results (positive and negative) for electricity. For all three model specifications for water and sewerage the coefficient estimate is consistently negative for the LMM/IR and 2SLS models, with the coefficient for the 2SLS estimation being considerably higher in both cases. These model specifications show an inverse relationship between income inequality and the proportion of households with the good. After controlling for an important number of institutional, societal and economic factors, a higher income Gini coefficient is correlated to a lower proportion of households with water and sewerage, but not electricity. Poverty is consistently negative across model specifications.

The next set of variables, also key for the argument of this dissertation, cap-

ture the role of electoral dynamics at both the municipal and state levels. These variables measure three different dimensions of electoral politics: transient and systematic risk (as explained in Chapter 5 above), and whether alternation has happened in the municipality. The variable *Risk elec.* captures the short-term electoral risk for the winner party measured as the differential in votes (as a percentage) between the incumbent and the second place in the election immediately previous to 2010, for booth state (S) and municipal (M) levels. This variable is not significant at neither the municipal nor the state level (except for the 2SLS models), indicating that these short-term dynamics have no consistent or robust association with the provision of infrastructure.

The next variable ENP captures the effective number of parties –the distribution of votes among different parties. This variable captures a different element of electoral pressures but on the medium run. At the municipal level (M), this variable is positive and significant in all models for sewerage and electricity, and not significant for water. This means that a more fragmented party system for municipal races is associated with a higher proportion of households with access to sewerage or electricity. At the state level there is no effect for state level competition (S) for water and electricity, but the results for sewerage are consistently positive, indicating that a higher dispersion of the vote is associated with higher proportions of this good.

The third and final element in this set of electoral variables is party alternation, which is significant and positive in all models at the municipal level for sewerage, but is only consistently significant for sewerage at the state level.

The next set of variables show the estimation results for two other sources of heterogeneity (religious and ethnic proxied with linguistic). The results for religious fractionalization are heterogeneous across model specifications for water, but the

results are consistent and significant for sewerage and electricity. In line with much research that looks at the effects of social heterogeneity on the provision of public goods, ethno-linguistic fractionalization is negatively associated with the provision of sewerage and electricity, but the results for water are not robust.

The structure of the population is also, as expected, significant but the two variables that capture this vary in their effects. Population density has no effect for water, but it does for sewerage and electricity. On the other hand, population dispersion shows a significant relationship with water and sewerage but not with electricity. The conjunction of these two variables confirm that dispersed, rural areas are *caeteris paribus* punished in the provision of basic household infrastructure, although the demographic structure has heterogeneous effects across public goods.

The variables average altitude and ruggedness capture the orographic profile of municipalities, and this is construed as a proxy for costs. The models indicate systematically that higher municipalities have a higher proportion of households with basic infrastructure, which captures the fact that big cities in Mexico are located at higher rather than lower altitudes[10]. Surprisingly, the ruggedness of the terrain shows no systematic effect, with most of the coefficient being not significant and the ones that achieve significance have no consistent results.

Finally, the second LMM/RI for each good in Table 6.4 shows the interaction effect for three key structural factors: income inequality, the proportion of households below the poverty line and electoral competition (at the municipal level). The models show a polynomial interaction of degree two because this is the relationship that appears with the simple descriptive data in Figure 6.4 above. This variable increases as inequality, poverty and electoral competition increase. The interaction

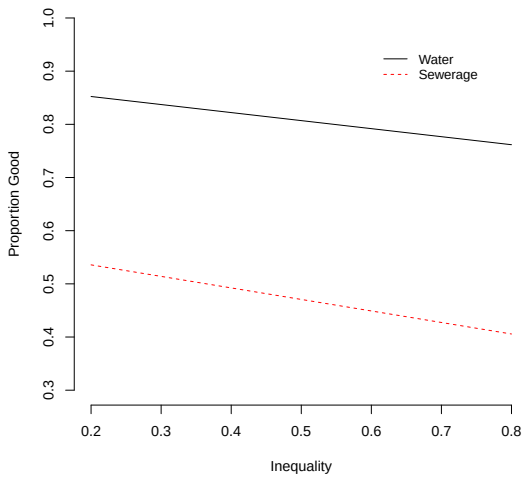
[10]For instance Mexico City is located at 2,240 meters (7,350 ft), Guadalajara at 1,590 meters (5,200 feet) and Monterrey at 537 m (1,762 ft).

is significant for water and electricity, but not for sewerage. The positive linear term and the negative quadratic one indicate that the relationship between the interaction of these characteristics and the provision of water and electricity follows an inverted-U shape.

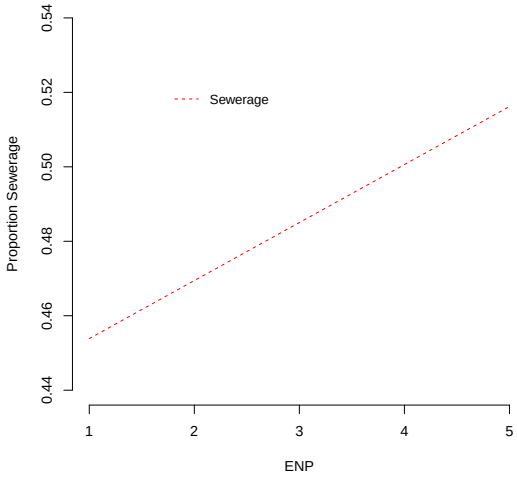
To better interpret these results, Figure 6.6 shows simulated results for inequality and the interaction term resulting from Table 6.4 above. The range of the horizontal axes corresponds to actual observed values in the data. The upper left Panel 6.6a shows the simulation for income inequality, displaying only the goods that had significant results (water and sewerage). The simulations show heterogeneous effects across goods, with water showing a less pronounced slope than sewerage. A municipality going from a low Gini value of 0.2 to a value of high Gini of 0.8 would experience a decrease of 9% in the proportion of households with access to water, while for sewerage it would experience a decrease of 13%.

The next two panels 6.6b and 6.6c show the simulated values for municipal level electoral competition (recall that this variable at the state level does not show any systematic and consistent effects across model specifications). Both panels show that increases in the effective number of parties are associated with an increase in the proportion of households with the respective good. *Cateris paribus*, a typical municipality going from a single-party (the PRI) to a highly fragmented electoral system experiences an increase of 6% of sewerage and 2% of electricity (which may seem a small increase but it is high given the almost universal coverage of this good in Mexico).

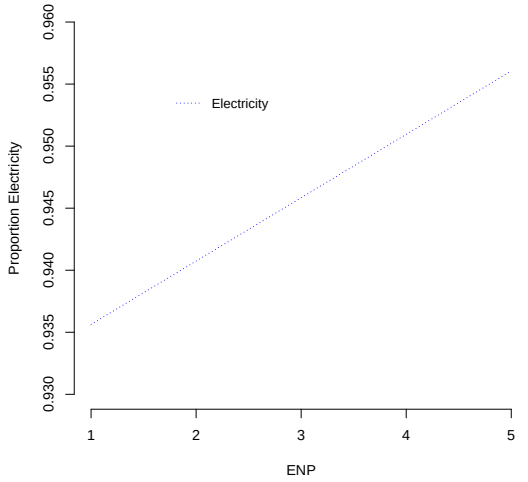
Finally, the lower right panel 6.6d shows the simulations for the interaction between income inequality, poverty and electoral competition. The negative effects of inequality and poverty diminish the overall expected value for public goods, and the non-linear term (introduced because of the non-linear relationship between



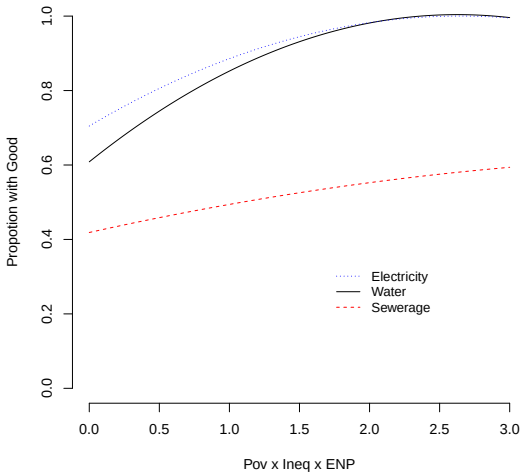
(a) Income inequality.



(b) Electoral competition (sewerage).



(c) Electoral competition (electricity).



(d) Interaction between inequality, poverty and competition.

Figure 6.6: Simulated values for income inequality and for the interaction effect between inequality, poverty and electoral competition. Values on the horizontal axis correspond to actual observed values of the variables.

poverty and public goods) establishes a curvature with interesting results. For water and electricity, this curvature means that as inequality, poverty and electoral competition increase the rate of change in the provision decreases, and for sewerage there is no curvature (the interaction coefficients are not significant but are plotted here for comparison), and this curvature is more pronounced for water than for sewerage.

This section has shown the first round of tests of the structural relationship between the lack of provision of a public good and economic, institutional, societal and orographic structures. The dependent variable was chosen as the proportion of households in a municipality that have access to the *government provided* grids, built with cleaner data than previous attempts as shown in Section 3.3 above. This section then provided simple 3-d plots showing the simple descriptive relationship between the provision, the structure of electoral competition and the structure of income (levels and distribution). These simple descriptives show there is a a non-null relationship between the structure of income (both levels and distribution) and the provision of infrastructure, and it follows roughly the pattern hypothesized in this dissertation.

The first key finding of the models suggest that higher levels of income inequality are associated with a lower proportion of households with water and sewerage, but not electricity (which has almost universal coverage). The second key finding of this section is that the effect of electoral competition is dependent on the variable used to measure it. If we use a variable that captures transient risk (such as the electoral safety of the executive) I find no results, but when using a more systematic source of party risk (the effective number of parties) there is a significant effect for sewerage and electricity. The main insight here is that for sewerage and electricity a more fragmented party system *at the municipal level* is correlated

with a higher proportion of households with this infrastructure, but water shows no effect. When interacting inequality, poverty and electoral competition, I find no effect for sewerage but there is a significant non-linear interactive effect for water and sewerage, with the curvature being more pronounced for sewerage than for water. As standard democratic theory predicts, alternation at the municipal level is associated with a higher provision of all public goods, but interestingly competition at the state level only matters for sewerage (the costliest good to provide).

6.6 A Hierarchical Model of Household Full Coverage

Despite the interesting results at the municipal, they still cannot allow us to make any inferences at the household level because they use aggregate data. This is unfortunate because we cannot model changes in the probability of household coverage to perform simulations under multiple structural conditions (social, economic and electoral structure) to measure differentials in these probabilities. Of particular interest here is to model changes in probabilities of coverage for a poor household under equal and unequal distributions of income. This section extends the municipal-level models in the previous one by estimating three-level hierarchical models of the probability of full coverage of households embedded in municipalities embedded in states.

Recall from Figure **??** and Table 3.1 above, that it is both theoretically and empirically useful to think about bundles of public goods, both at the aggregate (Figure **??**) and the household (Table 3.1) level. Of special relevance here is the fact that a household can fall in one of multiple categories that capture the specific combination of infrastructure it has (e.g. water and electricity but no sewerage,

sewerage and electricity but no water, none, all three, and so on. These bundles are the dependent variable in this section. The specification of the model follows closely the description in Section 6.5 above. The difference is that now I use a three-level estimation rather than a two-level, and the dependent variables changes from continuous (a proportion in Section 6.5) to a dichotomous indicator variable in this one, so the models are binomial.

I begin with the specification of the null hierarchical model with random slopes $y_{ijk} = \gamma_{00} + \epsilon_{ijk}$, where y_{ijk} is a $nx1$ binary vector that captures the probability (log odds) of household i in municipality j in state k of having full coverage in the sense of Table 3.1 above. The coefficient γ_{00} is a the global mean for all households, and ϵ_{ijk} is a vector of random deviations of each household from the global mean.

In binomial hierarchical model with three levels the error term is decomposed into a random deviation from the state mean, added to a random deviation from the municipal mean, that is $\epsilon_{ijk} = u_j + v_k$. In the usual OLS setting there is an additional error at the individual level, but this is meaningless in the context of a a logit model that is minimizing classification error rather than distance. Therefore a binomial hierarchical model will only yield estimations of the municipal and state level errors. The proportion of each one to total variation is the proportion of variation that occurs at each level.

A key element in hierarchical models is their flexibility to include random effects. In the standard null OLS model the constant parameter is fixed across all units and levels. In a multilevel model each unit in each level is allowed to have its distribution of level-specific coefficients, which are distributed normally with mean zero and unitary variance. The specific constant parameter of municipality 1 will be different than municipality 2, even if they are in the same state, and state A will have a different mean than state B.

Furthermore, a household in municipality 1 in state A will share the same state mean but will then have a separate municipal specific effect. Municipality 2 in state B will have two different starting values too. The means of the random variables for each unit in each level can be interpreted as the initial value shared by all households in that level. Levels are nested and so are the effects. A household will then have a probability of full coverage that is the sum, in the null model, of deviations from the overall mean, the mean initial probability of its state, and the mean initial probability of its municipality.

The results of the null model are shown in Table 6.5. The overall mean $\gamma_{00} = .45$ is the log odds of the intercept in the null model, which is equivalent to a change in probability of .61 significant at the 99% level. The total variation in the random effects is $.0436 + .0501 = .0937$. States effects account for $.0436/.0937 = .47$ of total variation, while municipal random effects account for $.0501/.0937 = .53$. Municipal differences account for about 13% more variation than states in the null model.

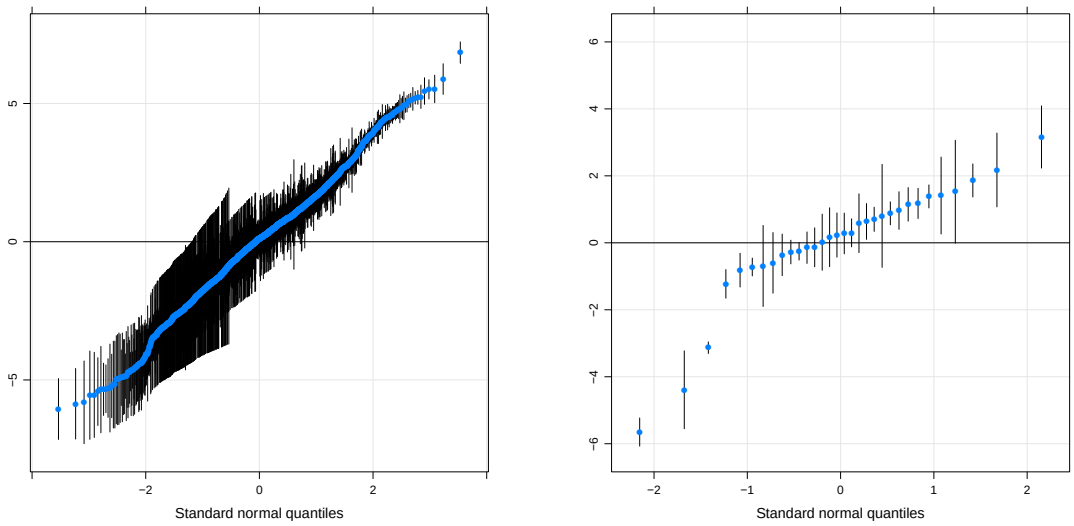
Figure 6.7 show the random effects of each municipal (n=2456) and and state (n=32) level random effects, ordered by quantiles of a standard normal distribution $N(0, 1)$. Each point corresponds to the posterior mean, and the lines show its 95% confidence intervals. Figure 6.7a in the left panel reveals a substantial variation in the starting values for households within each municipality.

The variation at the municipal level shows that a good number of municipalities have initial values different from zero (those where the 95% intervals do not overlap with the horizontal value of zero). The lowest values correspond to municipalities in the south-east of Mexico, particularly the states of Yucatán, Oaxaca and Chiapas, which are very poor and mostly indigenous. The highest values correspond to municipalities in the northern state of Nuevo León and of Mexico City.

Table 6.5: Mixed effects logistic regression - DV: Probability of full coverage in households.

	Null Model		Bivariate	
Fixed Effects	*Coef. (SE)*	*Odds ratio*	*Coef. (SE)*	*Odds ratio*
Intercept (γ_{00})	.45 (.04)	**.61** ***	1.051 (.46)	**.74** *
Gini (γ_{01})			-3.916 (.75)	**.019** ***
Random Effects	*Var.*	*S.d.*	*Var.*	*S.d.*
State (γ_{00})	.0436	.209	2.96	1.72
Municipal (γ_{00})	.0501	.224	3.88	1.97
Log-likelihood	-1,263,502		-878,950	
AIC	2,527,011		1,757,908	
BIC	2,527,063		1,757,958	
n	2,848,922		1,900,612	
Municipalities	2,456		2,456	
States	32		32	

$^{***}p < .01$ $^{**}p < .05$ $^{*}p < .1$



(a) Municipal random effects (n=2456). (b) State random effects (n=32).

Figure 6.7: Null model with random slopes. Mean and confidence intervals of municipal and state random effects for the probability of full coverage, plotted against the standard quantiles of the standard normal distribution.

The right panel 6.7b shows the random slopes (mean and confidence intervals) for states. There is also substantial variation in both directions from zero, and an important number of states have initial values different to zero. It is worth noting the three states that appear in the lower tail of the distribution of means. These states are again Yucatán, Oaxaca and Chiapas, respectively. These states have traditionally been the most indigenous and most marginalized states in the country. Two of them (Yucatán and Chiapas) concentrate the largest Maya populations in the country, while Oaxaca is home to mostly Zapotecos, Mixtecos and Triquis[11].

These means should be interpreted as the initial probability of full coverage from which households will randomly deviate. The null model captures the well-known fact that these states are particularly vulnerable in terms of coverage of

[11] Although the ethnic landscape in Oaxaca shows perhaps the richest variation in indigenous ethnicities.

infrastructure. It further reveals that there are reinforcing municipal and state effects related to the very low initial probability of having full coverage.

The fact that a substantial amount of municipalities have random slopes that differ from zero suggests first, that the choice of a hierarchical model is appropriate (in line with Table **??** above), and that the probability of households having full coverage is conditional on municipal and state effects.

The next step is the construction of a bivariate hierarchical model $y_{ijk} = \beta_{0jk} + \epsilon_{ijk}$ to test for the basic relationship between inequality and probabilities of full coverage. We again allow for random slopes but introduce the main independent variable as a covariate such that $\beta_{0jk} = \gamma_{00} + \gamma_{01}\, Gini_{jk}$, which gives a final model of the form $y_{ijk} = \gamma_{00} + \gamma_{0j}\, Gini_{jk} + u_j + v_k$. This allows for the initial values of households in each municipality to vary according to the random component (as in the null model) but also introducing a fixed effect for inequality γ_{01} at the municipal level. The results for this model are shown in Table 6.5, and they show a negative and significant coefficient for inequality of -3.92, in the direction expected in this dissertation.

The final step is to calculate a series of full models with different specifications and different control variables for each one of the dimensions covered in the previous sections. The summary statistic of the household level variables included are shown in Table 6.6. The results for the three-level hierarchical logit models are shown in Table 6.7.

The variable *income* captures the household income related to work, and *indigenous* captures the self-ascription of the head of household, as detailed in Chapters 2 and 3. *Linguistic minority* is an indicator variable that captures whether a household does not belong to the predominant linguistic group; this variable includes Spanish, Náhuatl, Maya, Zapoteco, Mixteco, Otomí and more than 20 other

Table 6.6: Control variables (household).

Variable	**Mean**	**Median**	**Range**	***n***
Income	$6,347	$4,000	0 - 1	2,310,471
Indigenous	0.32	0	0 - 1	2,890,503
Female head	0.49	0.50	0 - 1	2,903,246
Linguistic minority	0.078	0	0 - 1	2,903,640
Religious minority	0.17	0	0 - 1	2,903,640
Sector minority	0.46	0	0 - 1	2,903,640

less used indigenous languages, so it is a very refined measure of the degree of linguistic variation inside a municipality. *Religious minority* also measure with great degree of detail whether a household belongs to the minoritarian religious group because it includes Catholic and its variations, Christian and its many variations, Jewish, Muslim, Buddhist and more than 15 other small religions or sects. Finally for households, an indicator variable measures whether it belongs to the predominant economic sector or not; for this variable all economic activities were collapsed into their broader categories of agriculture/livestock, industry and services, so it is a coarser measure than the latter two.

At the municipal level there are three variables that capture the heterogeneity along the dimensions of language/ethnicity, religion and economic activity.

The four full models show results for variables at the household, municipal and state levels. As for the municipal models in Table 6.4, the variables are group according to the broad dimensions underlying the provision of public goods discussed: the structure of income includes aggregate variables like income inequality and the proportion of people living under the poverty line, but it also includes a household variable for income. The variables under population structure include different aspects of the demographic structure of municipalities, like the population (log), population density and the proportion of the population that lives in the mu-

Table 6.7: Household-level estimation. The dependent variable is an indicator variable that captures whether a households has or not access to the bundle of water, sewerage, electricity and literacy as detailed in Section 3.3. Each result models the log-odds of the probability of a households having full coverage using a three-level random intercepts model.

	Model 1	**Model 2**	**Model 3**	**Model 4**
Income Structure				
Intercept	**-1.431*****	**-4.41*****	**-5.64*****	**-4.06****
	(*0.20*)	(*0.21*)	(*1.55*)	(*1.69*)
Inequality	**-3.65*****	**-3.72*****	**-2.25*****	**-1.211*****
	(*0.1867*)	(*0.204*)	(*0.683*)	(*0.379*)
Poverty				**-3.60*****
				(*0.288*)
Income (log)	**0.188*****	**0.199*****	**0.17*****	**0.184*****
	(*0.001*)	(*0.001*)	(*0.001*)	(*0.001*)
Electoral Dynamics				
ENP (M)		**0.59*****	**0.231*****	**0.097****
		(*0.092*)	(*0.046*)	(*0.053*)
ENP (S)		**0.81***	0.096	0.871
		(*0.417*)	(*0.593*)	(*0.597*)
Risk (M)				0.311
				(*0.219*)
Risk (S)				1.39
				(*1.93*)
Alter (M)				0.13
				(*0.105*)
Alter (S)				0.709
				(*0.532*)
Population Structure				
Female head			**-0.044*****	
			(*0.005*)	
Population (log)		**0.37*****		
		(*0.009*)		
Pop. dens. (log)	**0.408*****		**0.53*****	**0.309*****
	(*0.007*)		(*0.030*)	(*0.029*)
Pop. conc..		**0.39*****		**0.604*****
		(*0.079*)		(*0.166*)
Pop. seat (% pop.)		**1.52*****		
		(*0.062*)		

Table 6.7: Household-level estimation. The dependent variable is an indicator variable that captures whether a households has or not access to the bundle of water, sewerage, electricity and literacy as detailed in Section 3.3. Each result models the log-odds of the probability of a households having full coverage using a three-level random intercepts model, Continued

	Model 1	**Model 2**	**Model 3**	**Model 4**
Orography				
Altitude				**0.000***
				(*0.000*)
Ruggedness		-0.000		**0.0001***
		(*0.0001*)		(*0.0003*)
Social Heterogeneity				
Indigenous			**-0.43*****	
			(*0.006*)	
Ling. frac.			**-1.11*****	-0.013
			(*0.252*)	(*0.11*)
Ling. minor.			**-0.26*****	
			(*0.008*)	
Rel. frac.			**-0.75****	-0.059
			(*0.257*)	(*0.068*)
Rel. minor.			**-0.031*****	
			(*0.005*)	
Sectorial frac.			0.316	
			(*0.398*)	
Sectorial min.			**0.31*****	
			(*0.004*)	
σ_m	0.36	0.46	1.73	1.29
σ_s	0.17	0.96	1.46	1.37
Log-likelihood	-935501	-969147	-953843	-925747
States	32	32	32	32
Municipalities	2036	2036	2036	2036
Households	2,092,235	2,270,710	2,265,552	2,084,349

$^{***}p < .01$ $^{**}p < .05$ $^{*}p < .1$

nicipal seat; it also includes a household level variable that captures whether the household head is a woman. Next, assorted variables capture different aspects of electoral competition, like the electoral risk for parties, the effective number of parties and an indicator variable that captures whether party alternation has occurred.

This set of variables are at both the municipal and state level. The following set of variables capture orographic characteristics of the municipalities, that I have linked above to the cost of provision of public goods. The last set of variables captures different dimensions of social heterogeneity, both at the aggregate and household levels: whether the households is indigenous, the linguistic, religious and sectorial[12] fragmentation, and two indicator variables that capture whether a household is in the local linguistic, religious or sectorial minority.

In the interest of thoroughness and robustness, I ran over one-hundred different models with different variable combinations and specifications (for example, using the Herfindahl of party competition or its inverse, multiple interactions and combinations of all relevant variables, and so on)[13]. The models presented here are emblematic of a series of modeling choices that I took in order to control for as many different variables as possible, and show results that where overwhelmingly consistent in all runs.

The first thing to notice is that, although the models are run with about a quarter of a million cases each, not all the variables in the models are significant –a common threat when using big data in which all coefficient results become significant simply due to the very high signal-to-noise ratio. This suggests that the models are, despite the high number of observations, useful in discriminating which statistical associations are stronger.

The second main finding in these models is that income inequality measured with a municipal Gini coefficient is systematically negative across all model specifications, regardless of the multiple combinations of variable types and specifications. A more variables are included (in models 2-4) the coefficient diminishes from -3.65

[12]Which proportion of the population works in the primary, secondary and third sectors.

[13]In terms of computational power, each model took about 24 hours running in the Super Computer Center at UC San Diego.

to -1.21 in the full model 4, but the significance remains very high. A higher income inequality at the municipal level is systematically and robustly associated with a lower probability of a household having full coverage of water, sewerage, electricity and literacy. As expected, higher aggregate poverty levels are also negatively associated with a lower provision of full coverage, while richer households have a higher one.

The variables that capture electoral dynamics show overwhelmingly three results. First, the positive effect of the structure of the party system (indicating that a more dispersed vote is correlated with a higher likelihood of full coverage) only appears at the municipal level. The effective number of parties at the state level is only marginally significant in model 2, and this result in fact disappears for the remaining specifications (a result which consistently also disappeared in the vast majority of models I ran but do not include here). Second, the marginal ex-ante risk captured by the margin of victory of the incumbent in the last election shows no effect at both the municipal and state levels. Finally, party alternation also shows no effect at neither the state and municipal levels (a result for the latter which did appear in the municipal models of the previous section).

I also tested for the interaction effects between income inequality and competition at multiple levels and specifications (not shown). These results were systematically not significant. Even when both inequality and competition are significant by themselves (including or excluding the interaction effects), the interaction effects are never significant. This is a good indication that income inequality and electoral competition are sufficient, but not necessary, conditions for variation in the provision of public goods. This is an important finding because it speaks of two different mechanisms that interact at seemingly different levels: competition (at the municipal level) eliciting monitoring and accountability dynamics associated with higher

public goods, and then a negative result for inequality through social heterogeneity and elite capture.

Population structure shows results that are expected (and consistent with the municipal models above). Using multiple measures of population concentration, the results show that households in more populated areas are more likely to have full coverage. This result appears when I use simply the population log, or when I adjust it for the area of the municipality (pop. density), or when I include a variable that captures the percentage of the total population that lives in the municipal seat. An interesting result is that households headed by a woman are less likely to have full coverage. This might be a result that reflects the (lack of) public authority of women in general, or their lack of embeddedness in broader political networks that can successfully bargain the provision of goods.

Surprisingly, the coefficients for municipal altitude and terrain ruggedness come out positive, indicating that households in higher municipalities in more mountainous places are more likely to achieve full coverage. As in the municipal models, I conjecture that this result is driven by the three mos populous cities in Mexico, with Mexico City (which spreads across more than 20 municipalities) being one of the highest megalopolis in the world.

Finally, the models show the results for a series of variables that capture other sources of social heterogeneity: linguistic (a proxy for ethnic), religious and sectorial fractionalization. It also shows results for household level variables which indicate whether a household belongs to a minority in any of these dimensions, or whether it identifies as indigenous. The results in model 3 are as expected: more heterogeneity is associated with a lower probability of full coverage, and a household being a minority further decreases the likelihood. However the results disappear in model 4, so this is not a robust result. It allows me to nevertheless control for other

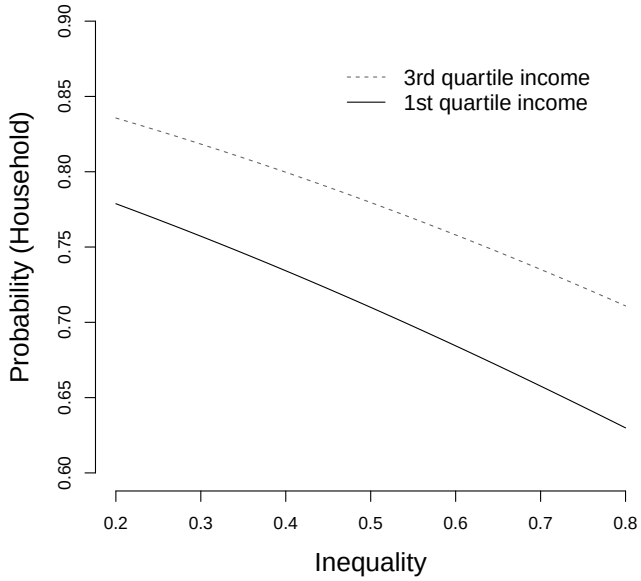
sources of social heterogeneity that have been important in the literature, making the result for inequality more robust.

As with the municipal estimation above, the models allow me to separate the total variation into state (σ_s) and municipal (σ_m) components. For the full model 4, the percentage of each is 49% for municipalities and 51% for states.

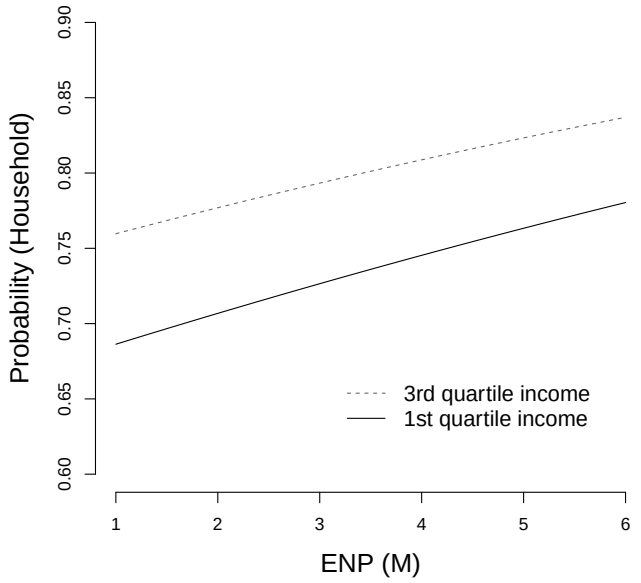
For purposes of visualization of how these probabilities change, Figure 6.8 shows simulated probabilities using the results in model 4, for households with incomes in the first and third quartile, where $p = \frac{e^{\beta_0 + \sum \beta_i x_i}}{1 + e^{\beta_0 + \sum \beta_i x_i}}$. The ranges for the horizontal variables correspond to actual empirical values.

The upper panel 6.8a shows how probabilities of full coverage decline with increases in inequality. A household with an income in the first quartile that transits from a low to high inequality setting reduces its probability of full coverage from 0.78 to 0.63, a negative change of almost 20%. In contrast, a household in the third quartile of the income distribution will reduce its probability from 0.84 to 0.71, a drop of about 16%. The lower panel 6.8b shows the same simulations for increases in the effective number of parties at the local level. Going from a completely hegemonic party system to a highly fragmented one will increase the probability of full coverage from 0.69 to 0.78, an increase of 13%, while a household in the third quartile of income will increase it from 0.76 to 0.84, or about 11%.

This chapter has shown two strategies to estimate the relationship between income inequality, electoral competition and the provision of public goods. It first presented results for a two-level estimation of municipal proportions, and then extended the analysis to the household level using household, municipal, and state level data with a hierarchical framework. The results show consistently that inequality is negatively associated with the provision of public goods, both looking at individual goods at the municipal level, and then looking at bundles for households.



(a) Expected probability of household full coverage with changes in inequality.



(b) Expected probability of household full coverage with changes in municipal electoral competition.

Figure 6.8: Simulated probabilities for inequality and electoral competition, for households at first and third quartiles of logged income.

Interestingly, the results show an important discrepancy in the effect of electoral variables. Party alternation is a very robust finding for individual goods at the municipal level, but almost completely disappears when looking at bundles at the household level. However, the result for municipal effective number of parties is robust across model specifications and units of analysis (except for a drop in significance for electricity in one model in Table 6.4). These results are robust to controlling for population structure, orographic profile and other sources of societal heterogeneity.

The next chapter discusses these findings in light of the hypotheses and theories presented in this dissertation, discusses potential pitfalls with the data and proposes avenues for future research.

Chapter 7

Discussion and Concluding Remarks

During one of my field trips to the city of Oaxaca (an important tourist destination in southern Mexico), a high-ranking municipal official told me a story that epitomizes the dilemmas dealt with in this dissertation. I was asking him about the provision of basic household infrastructure in Oaxaca, and he noted that in Oaxaca City, the population without these services were concentrated mostly in the outskirts of the city. When I asked him why the services had not been provided, his answer pointed out the lack of funds. As I questioned him about the high levels of tax revenue that the city obtained from tourism, he remarked, rather annoyed, that massive investments in the infrastructure necessary to provide these services to the poor would siphon out money needed to invest in the touristic center, and the owners of the touristic corridors would coalesce against them in the next election and support a party that was more friendly to their interests. The spending priorities of the city of Oaxaca were aligned with the economic interests of the local elites (whose wealth is directly related to tourism). The disciplining mechanism for this alignment

were electoral pressures, and the essential cleavage underlying the dilemma was the distinction between haves and have-nots.

This dissertation explores these dynamics in light of the strategic choices that parties and politicians make when faced with electoral uncertainty and a societal context of an unequal distribution of income. The theoretical framework developed to understand statements like the one above first explored the effect that an unequal distribution of income might have on these strategic choices. I argued that income inequality in Mexico is a politically active cleavage that structures politics in a meaningful way (as opposed to, for example, religious or ethnic affiliation). This powerful source of wealth heterogeneity fragments the preferences of voters and catalyzes collective action dilemmas with regards to spending and taxation. But income inequality also signals the presence of elites that have a disproportionate access to economic and political resources with which they can discipline incumbents. The asymmetry in resources available to mobilize political grace makes it more likely than not that policy will fall closer to the collective preferences of the haves, and the policy priorities of the poor will be left aside.

The evidence in the previous chapter shows the relationship between these variables and the probability of households of having full coverage of infrastructure basic for household welfare. The results show that the distribution of income is robustly negatively associated with the provision of a full bundle of basic household infrastructure, using both aggregate and household data. The results appear in simple bi-variate models and hold after controlling for population structure and geographic profile of the municipalities (both elements bound to affect the cost of providing infrastructure), as well as other sources of social heterogeneity, all under multiple specifications and combination of variables.

The negative relationship between income inequality and the probability of

household coverage suggests that the presence of local elites influences policy to the benefit of their interests. The results show that going from low to high levels of income inequality reduces the probability of full coverage for a poor household by 20%. This points out to the interesting fact that the provision of infrastructure for the poor (which requires high levels of investments) decreases as the distribution of income becomes more unequal. In more unequal settings the elite becomes smaller compared to the non-elite, and the results suggest that elite capture is stronger in places where the elites are smaller and where poverty exists.

In the framing of this dissertation, the electoral margin of victory and the effective number of parties capture two types of electoral risk for parties: transient for the former, and systematic for the latter. The results show that the political and electoral dynamics at the municipal level are relevant, but not to the same extent. The margin of victory of the incumbent party in the previous election shows no significant result under robustly for all except one model specification, and both the municipal margin of victory for the municipal president, as well as the margin of victory for governor at the state level show systematically no result. However, for household probabilities, the effective number of parties shows systematically a significant and positive result, but party alternation does not.

However, party competition in the context of poverty and low levels of institutionalization (two recurrent characteristics of new democracies) is likely to elicit vote- and turnout-buying incentives for political parties. If there is indeed a trade-off between the provision of private and public goods (as the scant evidence suggests), offering ephemeral hand-outs instead of long-lasting public goods to the poor will be associated with a lower provision of public goods. This is a conjecture that opens up possibilities to explore these issues further in future research.

Despite these cautions, a key finding here is that, at the municipal level,

higher levels of electoral competition are linked to a higher provision of public goods, which is consistent with findings from other scholars (D íaz-Cayeros et al., *forthcoming*, Faguet 2012, Gerring et al., 2012; Deacon and Saha, 2005; Zhang et al., 2004). When political parties face stark competition, short-term electoral constraints become a powerful drive behind the allocation decision of politicians. Because public goods require massive investments and take a long time to be completed and consumed by voters, it will be difficult for present politicians to claim credit for public works if they become available after their period in office ends, which plays into the levels of structural risk they face during elections.

A related important finding is that the effects of electoral competition for the provision of public goods are heterogeneous across government levels. The results show that the strongest effects appear at the municipal level, and the state shows little to no overall effect. A virtue of the models used in this dissertation is that they are inherently agnostic as to which level of government should be expected to have more weight in the provision of public goods. Although this is in part determined by law (see Appendix B), in practice the investments in basic infrastructure are the result of complex negotiations between parties and factions within parties across levels of government, so the expectation cannot be derived exclusively from the regulatory framework.

The fact that states show no relationship under almost all model specifications seems to be yet another indication of the corrupt and self-serving nature of governors in Mexico. Democratization at the federal level has by far exceeded democratization (in the broad sense) at the state level. The lack of any effect at the state level for the probabilities of households having full coverage suggests that electoral risk (transient or structural) by itself is not a complete predictor of the beneficial dynamics that democracy supposedly brings. From the evidence presented

here it seems that the devolution of powers to states and municipalities during the last two decades has had contrasting effects for each level, perhaps due to preexisting political conditions that affect the quality of the devolution of powers to local governments (Faguet, 2012).

For the specific case of Mexico, the lack of results at the state level is not surprising because governors have become very visible and powerful political actors in the new era of democratic consolidation. They coalesce and articulate shared positions vis-à-vis the federation in powerful formal and informal mechanisms of coordination, and have been able to circumvent many of the democratic regulations already implemented at the federal level (freedom of information laws, anti-corruption measures and so on). In a tragicomic resemblance with the previous authoritarian regime, states in Mexico are corrupt fiefdoms where governors have extraordinary discretion to allocate budget and define political careers, and basically remain out of reach from the auditing and corrective tools available to the federation.

Besides electoral pressures, politicians also make cost-benefit analysis to determine where to spend in infrastructure. A recurrent topic during my interviews was that benefits are calculated by the number of people benefited with a public work, and the costs of providing these goods were directly tied to the amount of machinery and labor required. A such, the number of people and their relative concentration in a specific geographic area will interact with structural variables such as the remoteness of the locality or the difficulty of supplying the machinery and labor due to the orographic profile of the place.

Field interviews with geographers and engineers revealed a consensus about the costs of providing each of the public goods under study. The least expensive one to provide is electricity because –given an already installed capacity of high tension production by the federation– in a sense providing electricity consists of merely pro-

viding high-to-low tension transformers, cable and electricity posts. Next in costs is the provision of water, which requires high investments in machinery, material and labor to extend the existing network of running water to new regions of the country. The provision of sewerage is more expensive by an order of magnitude because, in addition to expenses it shares with the provision of water, the management of household waste requires a secondary, separate grid to transport waste into a processing plant, which is very expensive to build and represents very high ongoing costs for local governments. Finally, the provision of primary education represents the costliest good to provide, not only in financial terms (buildings, material, administrative and teacher wages) but is also a highly politicized area in Mexico. The (fixed and ongoing) costs of the primary education system in Mexico exceed the costs required to provide sewerage to households.

In this context, the trade-off ratio between private and public goods is likely to affect the calculus of politicians. Why would a party seeking reelection devote massive investments to provide, say, sewerage to a remote and isolated locality, when it can offer them sacks of cement during election time and use the remaining financial resources to invest in other areas of higher electoral return? The conjecture in this dissertation is that they don't. Private hand-outs are a winning strategy for parties who want to invest resources efficiently to win votes, and are also a winning-strategy for elites who can benefit of policy closer to their own preferences in detriment of the poorer segments of society. The key elements that give rise to these dynamics are the finite amount of financial resources at the disposal of governments, the short-term electoral pressures of elections and the lack of institutionalization endemic to new democracies. When social preferences are fragmented along income, and when one groups has disproportionate access to policy tools, it is likely that elites will capture the political process to their benefit. A limited budget and recurring elections elicit

the dynamics explored in this dissertation.

The negative link between income inequality, electoral competition and public goods challenges core assumptions of the scholarly debate. On the one hand, the debate over the redistributive properties of democracies needs to be qualified along multiple lines. Distribution to whom? To the poor? The middle-class? Distribution of what? Household infrastructure? Transfers and other government programs? Inter-temporal substitution among cohorts of age? The question over democracy and redistribution is vast, and local levels of government have different relationships to each one of these questions. On the other hand, my results should also help other scholars rethink the preponderance of poverty in the analysis of failure in political markets. As argued above, poverty is a characteristic of individuals, so we cannot gain a full understanding of political failures looking exclusively at this. It is likely that electoral strategies are also linked to aggregate conditions such as asymmetries in the distribution of resources, which are in turn likely to affect incentives of politicians to behave like we would expect them in democracy.

The standard understanding that democracies provide more public goods is challenged by the literature on vote- and turnout-buying. Yes, public goods might seem as efficient tools to cater to broader constituencies under universal suffrage, but public goods are in fact inefficient tools from the perverse standpoint of politicians who want to selectively reward and punish political support (Hicken, 2011; Stokes, 2005; Díaz-Cayeros et al., *forthcoming*). These incentives appear initially where there are poor voters who are more willingly to exchange their votes for hand-outs, but inequality aligns the incentives of parties and broader elites to provide hand-outs: to win elections more efficiently for the former, and to contain potential violence in the context of systematic exclusion for the latter.

In a context of poverty and high inequality, the threat of political violence

from the poor is a latent risk that elites need to address. Redistribution through public goods is one available mechanism, but the provision of targeted, excludable goods is also an option. If elites only marginally increase the consumption of the poor they reduce the risk of violence and maximize the rents at their disposal. Clientelism should therefore be understood in the broader context of the persistence of a social order which relies on the strategic allocation of rents to groups who can potentially unleash violence and dissipate elite rents. Excludable material rewards to the poor are one such tool, but it is available for party machines, not for elites. Parties use material rewards as efficient tools to mobilize support and demobilize opposition, but need in turn the organizational assets of the elites to broker the clientelistic exchange. Clientelism thus aligns the incentives of party machines and local elites to cooperate in the provision of excludable goods. However, the result here suggest that political parties are willing to invest in public goods when short-term electoral constraints are not powerful –such as in the context of low electoral competition– which makes inequality and the presence of elites irrelevant.

These conjectures merit further exploration. The theoretical framework I have developed here is complex, and the empirical treatment, although consistent with the expectations, shows only a reduced form analysis that black-boxes the intermediate processes by which inequality leads to a lower provision of public goods. The models I have presented test the theory on short-form, but a more pertinent treatment would be to test empirical implications at different stages of the causal process, a method known as "causal process observation" (Haggard and Kaufman, 2012; Collier et al., 2004; Brady and Collier, 2010).

Further research must also explore how the results change with different measures of inequality. Different measures capture different conceptual elements of redistribution. Recent research shows that, in a cross-national analysis of a sample of

countries, it is not so much the *level* of inequality but its *structure* what matters for distributive policy (Lupu and Pontusson, 2011). The results here will be robust when using other typical measures of inequality[1], but more attention must be devoted to systematically test different elements of income inequality.

The results here also have implications for the broader debate over democracy and redistribution. There is important evidence suggesting that democracies do not increase the welfare of the poor any different than autocracies, when taking into account a systematic bias in the availability of data for authoritarian regimes which perform good (Ross, 2006), or when looking at short-term effects (Gerring et al., 2012). The lack of growth is particularly prevalent in new democracies with high level of income inequality at lower levels of development (Bourguignon, 2009; Barro, 2008; Bourguignon and Verdier, 2000; Banerjee and Duflo, 2003; Guerrero et al., 2009).

It is likely that the political dynamics linked to inequality explored in this dissertation are the core of these broader results. Further research must explore the role of failures in political markets in the negative relationship between income inequality and the provision of public goods, but must also address the theoretical void to link causally inequality with clientelism and the provision of public goods. My dissertation provides an answer to a very constricted set of relationships: between Gini, the effective number of parties and the provision of basic infrastructure for households. Whether these results are extensible to a broader class of variables (for example, redistribution via transfers, or redistribution to the middle-classes instead of the poor), and whether we can then find patterns across types of redistribution to conclude anything meaningful generalizations about the relationship

[1]For example, the correlation coefficient between my Gini measures and an Atkinson index constructed with the same data, is of 0.99.

between democracy, poverty and inequality remains an open empirical debate.

The pervasive presence of wealth inequality and poverty along history and across countries today makes it imperative for concerned observers to refine our available theoretical links and empirical measures to provide a fuller description of these pressing matters. These are far from being idle scholarly debates, as the quality of life of millions of people depend on the careful design of political incentives to guarantee that elites are properly constrained under democracy.

Appendix A

Measures of Inequality and Poverty

A.1 A Basic Welfare Framework

Most measures of poverty and inequality share the same underlying mechanism to map income into something valuable for individuals. A general property of the class of income-based measures analyzed here is that they rely on a *social welfare* framework. The following three subsections with an account of the evolution of measures of poverty and inequality follow closely –but expand– the discussion in Deaton (1997: 133-148).

In its simplest form, the value of a social welfare W is given as a non-decreasing function of a vector $\underline{x}$ in the population such that

$$W = V(x_1, x_2, ..., x_N) \tag{A.1}$$

where N is the population size and the vector $\underline{x}$ captures *individual welfare*. What

exactly to consider welfare is at the center of a debate I will outline throughout the following sections.

The function V is construed with a number of properties that are useful in gauging social welfare. First, it is designed to be unresponsive (non-increasing) to changes among the non-poor. This is a property desirable from a normative standpoint when evaluating policy or social justice more in general, because if V were strictly increasing in each of its elements x_i then an increase in any individual, regardless of its relative income and provided it affects this individual only, will increase W. Making this function increasing over $\underline{x}$ is consistent with the *Pareto condition* that social welfare is greater whenever any individual is made better-off without making any individual worse-off. This approach would be flawed to explore inequality because social welfare would increase whenever any individual (for example, a rich person) becomes better-off. Thus, it is useful to weaken the Pareto condition with the provision that V be *non-decreasing* in each of its arguments.

A second property that V shares with most social welfare functions is that it satisfies the *anonymity* or *symmetry* property, and so social W depends only on the overall vector $\underline{x}$, and not on the individual ordering of the elements x_i, that is, W will be the same for any permutation of the elements of $\underline{x}$.

Third, there is a normative element embedded in V such that equal distributions are preferred to unequal ones. This is done by imposing a structure similar to standard utility functions which is marginal diminishing utility of income for each individual element x_i. This guarantees two things. First, that any increase of income in a poorer individual will have a larger effect on W than an increase by the same amount of a richer individual. Second, it imposes the restriction that W will increase only insofar that a transfer from a richer individual to a poorer is not sufficiently large so as to reverse their relative positions –the so-called *principle of*

transfers (Dalton, 1920).

Finally, it is useful to construct social welfare functions that shift welfare proportionally to proportional changes in all of the elements of vector $\underline{x}$. This occurs when V is an homogeneous function of degree one. In general, a homogeneous function f of degree k satisfies the property $f(\alpha\underline{x}) = \alpha^k f(\underline{x}),\ \forall\, \alpha \neq 0$. For the welfare function analyzed here $k = 1$. If V indeed satisfies this requirement then we can rewrite Eq. 1 as

$$W = \mu\, V(\frac{x_1}{\mu}, ..., \frac{x_N}{\mu})$$

where μ is the mean of $\underline{x}$. We can then choose measurement units such that $V(1, 1, ..., 1) = 1$ with $x_i = \mu\ \forall\ i$. This is a state of perfect equality in which each individual has the mean level of welfare. This provides the benchmark to compare the existing levels of inequality because, by the principle of transfers, no other distribution of income will yield higher social welfare than perfect equality, that is $V(\cdot) \leq \mu$. This provides a basic framework to measure inequality:

$$\begin{aligned} W &= \mu\, [V(1, 1, ..., 1) - V(x_1, x_2, ..., x_N)] \\ &= \mu\, (1 - I) \end{aligned} \tag{A.2}$$

This measure of inequality separates social welfare into two components: the average income and deviations from perfect equality. This is important because it incorporates into a single measure not only the central tendency of incomes (for example, GDP per capita) but also a measure of relative income.

Also, because of the properties of the function V outlined above, this measure is by construction insensitive to increases in wealth among the non-poor. It avoids

the trap of making inferences on welfare from measures of inequality –or average income– alone. Furthermore, if inequality rises but average incomes also rises[1] then decreases in welfare due to increases in inequality might be offset by a greater proportional increase of mean income –or viceversa.

This concludes the exposition of a basic framework for the study of welfare, poverty and inequality. It has three analytically distinct elements in the calculation of social welfare: a function, average income and the internal distribution of incomes across individuals.

First, the function maps average income and inequality to welfare. This function does not capture changes of welfare among the non-poor, but is sensitive enough to capture Pareto improvements if the losses due to inequality are offset by the gains in average income. This function is required to be quasi-concave and be homogeneous of degree one.

Second, it involves the average level of income across all individuals in a given society. Because the function is homogeneous of degree one, we can include the average income in the function as a multiplier, provided that we divide all elements of vector $\underline{x}$ by this same multiplier, leaving social welfare unchanged.

Finally, we can construct a benchmark of perfect equality by transforming the units appropriately (e.g. normalizing to one) so that the value of the welfare function is 1 when every individual has the exact same income. Inequality is then the difference between the benchmark (i.e. one) and the observed distribution of income: I. With this basic framework, we can generate measures of inequality by specifying W and solving for I (Deaton, 1997: 138).

[1]For example, increases in average income driven by increases in marginal productivity for high-skilled vis-à-vis low-skilled workers also increase inequality, albeit temporarily (Kuznets, 1955).

A.2 Measures of Inequality

Atkinson (1970) measures income inequality using social welfare functions as outlined above. He starts from the following additive social welfare function:

$$W = \begin{cases} \dfrac{1}{N}\displaystyle\sum_{i=1}^{N} \dfrac{x_i^{1-\epsilon}}{1-\epsilon} & \text{if } \epsilon \neq 1 \\ \\ \dfrac{1}{N}\displaystyle\sum_{i=1}^{N} \ln x_i & \text{if } \epsilon = 1 \end{cases} \tag{A.3}$$

where the parameter $\epsilon \geq 0$ captures the degree of "inequality aversion", or the trade-off in social welfare between the average welfare and inequality.

With the particular definition of W in Eq. 3, we see that for any ϵ, $\partial W/\partial x_i = \frac{1}{N}\, x_i^{-\epsilon}$ which implies that

$$\frac{\partial W/\partial x_i}{\partial W/\partial x_j} = (x_j/x_i)^{\epsilon}. \tag{A.4}$$

This expression gives a ratio of the marginal social utilities between two individuals. Eq. 4 shows that the specification of W in Eq. 3 is useful for analyzing the effects on welfare of redistributional policy. To fix ideas, suppose that $\epsilon = 2$ and that individual i is twice as better off as individual j [2]. Then Eq. 4 has a value of 1/4, which is the reciprocal of the social marginal utility of transferring income to individual j. This gives a relative measure of the marginal utility of income. As ϵ tends to infinity, it is the marginal social utility of the poorest that predominates over social welfare, and policy trying to maximize W thus aims at maximizing the minimum level of welfare (Rawls, 1971).

[2] Exclusively in an ordinal sense.

The welfare function as defined in Eq. 3 is not homogeneous of degree one[3]. Raising W to the power of $1/(1-\epsilon)$ converts it to a homogeneous function of degree one. The inequality measures with Eq. 3 are thus the following:

$$I = \begin{cases} 1 - \left(\frac{1}{N} \sum_{i=1}^{N} (x_i/\mu)^{1-\epsilon} \right)^{1/(1-\epsilon)} & \text{if } \epsilon \neq 1 \\ \\ 1 - \prod_{i=1}^{N} (x_i/\mu)^{1/N} & \text{if } \epsilon = 1 \end{cases} \tag{A.5}$$

The inequality "aversion" parameter regulates how sensitive welfare is to inequality. It is thought of as inequality aversion and not inequality in itself because if $\epsilon = 0$ then no matter how unequal the distribution actually is, then $W = \mu$ (Deaton, 1997: 139). It does not capture a real state of inequality but a perceived state of inequality, that is actually independent of the true inequality of the distribution of $\underline{x}$. Atkinson's measure of inequality satisfies decomposability and the principle of transfers.

A second measure that also satisfies the latter principle (but not decomposability) is the *Gini* coefficient. This coefficient can be constructed in a number of ways. The usual way of thinking about this indicator if inequality is as the ratio of a Lorenz curve to the total area of the triangle formed with a 45° angle that serves as a benchmark of complete equality. Sorting the population from lowest to highest (in percentiles, for example), and then graphing the amount of income that each individual (or subpopulation) has yields the cumulative distribution of income as a function of the cumulative distribution if income –the Lorenz curve.

[3]To see why this is so, consider the following example. Imagine a two people society with an aversion parameter $\epsilon = .5$, and values $x_i = 1$ and $x_j = 3$, so that $\mu = 2$. Social welfare in this case would be $W = \frac{1}{2}(\frac{1^{.5}+3^{.5}}{.5}) \approx 2.73$. If we substitute each x_i by $x_i^* = x_i/\mu$ we get $W = 2\frac{1}{2}(\frac{\frac{1}{2}^{.5}+\frac{3}{2}^{.5}}{.5}) \approx 3.86$. Since both numbers are not the same, we know that W is not homogeneous of degree one.

Lorenz curves are graphical tools to characterize inequality, and are useful because dominance has a graphical representation: any curve which is highest at all values of the x-axis will depict a society that is unambiguously more egalitarian. Multiplying income allocation by a scalar (as for example, the mean) does not shift the Lorenz curve at all, and so this measure is not useful for understanding mean income.

Generalized Lorenz curves (Shorrocks 1983, in Deaton 1997) solve this problem by substituting the cumulative income of the population in the y-axis for the cumulative income in the population times the mean income. Because mean income is a scalar, it only involves shifting the data on the vertical axis, without changing the shape of the curves. It allows to compare inequality across groups or countries with different mean incomes, thus ordering the inequality curves that would otherwise all fall within the same scale. *Transformed* Lorenz curves graph the distance from the generalized Lorenz curve to the 45° line.

The Gini coefficient can also be represented in equation form as the following:

$$\gamma = \frac{N+1}{N-1} - \frac{2}{N(N-1)} \sum_{i=1}^{N} \rho_i x_i \tag{A.6}$$

where ρ_i is the rank of individual i in the x-distribution where the richest has rank 1.

Sen (1976b) advocated the use of the Gini coefficient as a measure of inequality in the determination of W, yielding

$$W = \mu \left(1 - \gamma\right) \tag{A.7}$$

which was then generalized by (Graaff, 1977) to incorporate the distinction between economic equity and efficiency by including a new parameter $\sigma \in [0, 1]$ that

captures this trade-off, such that

$$W = \mu\,(1-\gamma)^{\sigma}. \tag{A.8}$$

Another major measure of inequality is *Theil's Generalized Entropy Measure*, given by

$$I_T = \frac{1}{N}\sum_{i=1}^{N}\frac{x_i}{\mu}\,ln\left(\frac{x_i}{\mu}\right) \tag{A.9}$$

where $I_T \in [0, lnN]$ when either all x's are identical or the richest person has all income, respectively. This measure is used because it satisfies decomposability and allows for the ordering and ranking of distributions to test for dominance.

A.3 Measures of Poverty

The defining element in the measurement of poverty is the establishment of a *poverty line*. In its simplest form, poverty lines are arbitrary cut-off points of what level of income, consumption or calories defines an individual as poor. Poverty lines are controversial because their arbitrariness assumes a discontinuity in the distribution welfare among the population.

Nevertheless, they are widely used in policy development and are the standard measure for international organizations. The World Bank established in 1990 that $1 dollar a day was the appropriate cut-off point to determine poverty, but has recently adjusted the measure to $1.25 dollars at purchasing power parity, or *ppp* (Ravallion et al., 2008) .

To guarantee comparability across countries, and given the vicissitudes of international financial and exchange rate markets, a standardized measure of pur-

chasing power –*ppp*– is used. This measure determines equivalence by comparing the cost of a basket of basic goods as a benchmark to determine the purchasing power of money in a country, independently of exchange rates.

One of the most basic measures of poverty is the *headcount ratio*, which is simply the fraction of the population that lives below the poverty line:

$$P_0 = \frac{1}{N}\sum_{i=1}^{N} 1\left(x_i \leq z\right) \tag{A.10}$$

where z denotes the poverty line, and the indicator function $1\left(x_i \leq z\right)$ becomes *1* if the statement is true, and *0* otherwise.

Poverty measures of this sort have a fundamental, and potentially perverse, flaw that the headcount ratio clearly exemplifies. Because they measure poverty as the fraction of the population below a poverty line, then attrition (i.e. death by extreme poverty) actually decreases the measure P_0 (Grusky and Kanbur, 2006; Bourguignon, 2006). Thus, in the extreme case of a government allowing its poorest citizens to die due to ineffective action (or inaction), this measure would capture a decrease in poverty.

The headcount ratio does not satisfy the principle of transfers because it is sensitive to policies that would extract resources from the very poor and transfer them to the poor but at the margin of the poverty line. Doing so would decrease the amount of people below the poverty line, but would leave the very poor worse-off. This measure is thus not sensitive to who is benefited below the poverty line. From the reverse perspective, it does not take into account the degree of poverty of those below the poverty line.

A solution to this insensitivity incorporates the distance of a person from the poverty line, and assigns a higher weight to those further from it, i.e. to those

poorer. This is called the *poverty gap* measure, and it extends the headcount ratio to include relative distance in the following way:

$$P_1 = \frac{1}{N}\sum_{i=1}^{N} 1\left(x_i \leq z\right)\left(1 - \frac{x_i}{z}\right) \tag{A.11}$$

Notice that it has the same form as Eq. 10 but it has an additional term which captures the distance from the poverty line: $1 - \frac{x_i}{z}$. When an individual is exactly on the poverty line, then $x_i = z$ and thus the whole term collapses to *0*. In the extreme case where an individual has no income whatsoever, then $1 - \frac{x_i}{z} = 1$ and the individual is given full weight in the summation. In other words, it satisfies the principle of transfers: individuals closer to the poverty line will have less weight than those far away, and if transfers from the poor to the less poor whereby the latter become non-poor will also be registered.

Nevertheless, a disadvantage of such a poverty measure is that it is insensitive to transfers among only the poor. If transfers are made within this group, but no individual escapes the poverty line with such a measure, then the index P_1 remains unchanged. Sen (1976a) suggests to include a measure of inequality among the poor such that

$$P_S = \frac{1}{N}\sum_{i=1}^{N} 1\left(x_i \leq z\right)\left(1 - \frac{\left(1 - \gamma^p\right)\mu^p}{z}\right) \tag{A.12}$$

This measurement of poverty expands Eq. 11 by substituting the level of welfare of individual i by an aggregate measurement that is analogous to Eq. 2 above: the term $\left(1 - \gamma^p\right)\mu^p$ decomposes the welfare of the poor into average welfare and distribution of welfare. The information of individual welfare remains captured by the first term (which it shares with the headcount ratio) but the second term expands the poverty gap measure by adjusting in a way that captures the internal

distribution of welfare among the poor.

The term γ^p is the Gini index for the poor as calculated in Eq. 6 above. When there is no inequality among the poor then $\gamma^p = 0$ and Eq. 12 reduces to the poverty gap in Eq. 11 [4]. When there is total equality among the poor, then $\gamma^p = 1$ and Eq. 12 reduces to the headcount ratio in Eq. 10.

Sen's measure uses the Gini coefficient which, as stated above, is not decomposable, so it is not possible to track changes in poverty across groups, which is an important feature of a poverty measure that is to be used for policy design and evaluation. To deal with this shortcoming, Foster, Greer, and Thorbecke (1984) generalize the poverty gap measure into a class of decomposable measures of the following form

$$P_\alpha = \frac{1}{N}\sum_{i=1}^{N} 1\left(x_i \leq z\right)\left(1 - \frac{x_i}{z}\right)^\alpha$$

where the original poverty gap and the headcount ratio are special cases of this measure, when $\alpha = 1$ and $\alpha = 0$, respectively.

Decomposability follows from the additive structure of the measure, where the total variance in poverty is the sum of every possible partition into any sector S of the population, such that

$$\begin{aligned} P_\alpha &= \frac{1}{N}\sum_{s=1}^{\mathrm{S}}\sum_{j\in S} 1\left(x_j \leq z\right)\left(1 - \frac{x_j}{z}\right)^\alpha \\ &= \sum_{j\in S}\left(n_s \,/\, N\right) P_\alpha^s \end{aligned} \tag{A.13}$$

[4] Because $x_i = \mu_i$

The poverty and inequality measures described in the previous three subsections are all specified in terms of individual welfare levels x_i. The specific way to measure welfare is subject to a debate that I will only touch upon here. There are three main distinctions in the debate (Deaton, 1997: 148-149). First, what should we use as a practical measure of welfare? Second, which time-frame should we use? Third, at which level should we observe this measure of welfare?

Regarding the first question, the preferred answer has been to focus on either income or consumption. Other approaches focus on caloric intake but these are noisy measures that depend on relative prices and might be endogenous to poverty or development, i.e. individuals in more affluent societies might have different caloric intake on average than in poorer countries, even in the absence of malnutrition.

The choice of income poses its own problems. In rural places people might not receive a determined or fixed income for their production, and it may well be that most of their labor is devoted to self-consumption activities or that their income depends on the commercialization of a vegetable that only grows in certain times of the year, thus accumulating the bulk of income in one or two months. Using income in these settings will bias the relative welfare of urban populations against rural. But this argument extends also to those in situations of poverty in general. Nevertheless, the choice of consumption over income is not void of traps. For example, when converting nominal measures of consumption to real ones, price indexes must be available. Inflationary pressures distort these measures and seriously hinder comparability across regions or population subgroups. Smoothing income questions with annual income requires individuals to recall past events, which influences the quality of the available data.

Regarding the time-frame, theoretical questions arise as to the time span that we should measure consumption or income, and the proper unit of time to be

used in determining that someone is indeed poor, or conversely, that she has indeed sopped being poor. The choice of a reference period is conditional on the choice of unit of analysis. Consumption and income have different time-related dynamics, with consumption being usually shorter and more volatile than income. The time-frame also depends on what type of consumption goods we observe, or what type of income we are analyzing: credit markets function at a different speed than family networks.

The third problem is the unit of analysis. While it is easier to obtain information at the household level, a proper conceptualization of welfare requires that surveys distinguish within the household on at least two dimensions: age and gender. The needs of adults differ from those of children Deaton (1997), and thus focusing on the household as a unit is likely to bias the estimations of welfare for some of its members, potentially children who are a key target of development policies.

But even in the absence of children, it is widely recognized that there are authority structures within the household that cut-across gender lines, in which the distribution of assets and resources between men and women are unequal and directly affect the possibilities of development and female empowerment. Emphasis has shifted from unitary to collective models of the household (Alderman et al., 1995), in which there is no intrinsic agreement on how resources should be allocated to produce and consume commodities. Within the household, lack of agreement is expressed in power relationships across gender lines (Sen, 1989; Kabeer, 1999; Okin, 1999; Nussbaum, 2006; UN, 2009).

Taking the household as a unit of measure masks these internal asymmetries in the allocation of power and resources with two effects. First, they bias the measurement of welfare by blurring any intra-household difference. Second, and most importantly, this bias will affect the way in which policy is created and evaluated,

and will thus prove non-beneficial for women. A proper understanding of development requires distinguishing resources, assets and opportunities (in a word, welfare) within the household.

This line of thought echoes a broader problem in the selection of the measurement of welfare. Income, consumption, savings and similar measures all pertain to the space of income (Sen, 2006). While it is useful and practical to focus on these elements of welfare, social justice theories have elaborated a critique serious enough that uni-dimensional measures of poverty are slowly falling in disuse. The problem is, of course, to find alternative measures.

Appendix B

Regulatory Framework for the Provision of Public Goods

A key element to understand the provision of public services in Table 3.1 is the legal framework that imposes a specific set of obligations to different levels of government. Mexico's fiscal system is characterized by a strong dependence on transfers from the central government to states and municipalities who collect minimal amounts of own revenue. The federal arrangement in Mexico imposes a great deal of the financial burden on the higher levels of government. Municipalities depend heavily on state and federal transfers for their income, while states receive a substantial amount of their income from federal transfers (Díaz-Cayeros and Silva Castañeda, 2004). Historically, this was an initial agreement by the post-revolutionary elites in the process of stabilizing political life (Wilson, 1950; Lajous, 1981).

Besides the constitution,there are three main categories of laws that are relevant for understanding the constraints and obligations of the three levels of government in Mexico. The first category relates to the fiscal arrangements between

federation and states, federation and municipalities, and state and municipalities. The second category relates to the concrete mandate in terms of development. Finally, the third category relates to the specific regulation for each one of the public services in Table 3.1.

The current constitution of Mexico was established in 1917 in the aftermath of the Revolution of 1910, and abrogated the previous constitution of 1857. The three levels of government have specific sets of obligations in policy areas that are relevant for the provision of basic infrastructure and in general development.

Centralized education was a central element of the post-revolutionary regime. The Ministry of Education was created in 1921 –under a proposal by then provost of the National University José Vasconcelos– to centralize at the federal level education policy, which were previously dispersed both within public administration and territorially. The growth in the number of teachers, combined with the social sindicalist movements of the early XX^{th} century and the progressive corporatization of Mexican politics in the middle of the century, concluded with the creation of the *Sindicato Nacional de Trabajadores de la Educación* (National Union of Teachers, SNTE). It is currently regarded, along with the union of the state-owned oil giant PEMEX, as the most powerful union in Mexico.

The constitution establishes in its Art. 3 that the federation is in charge of curricula.

B.0.1 Fiscal coordination among federation, states and municipalities.

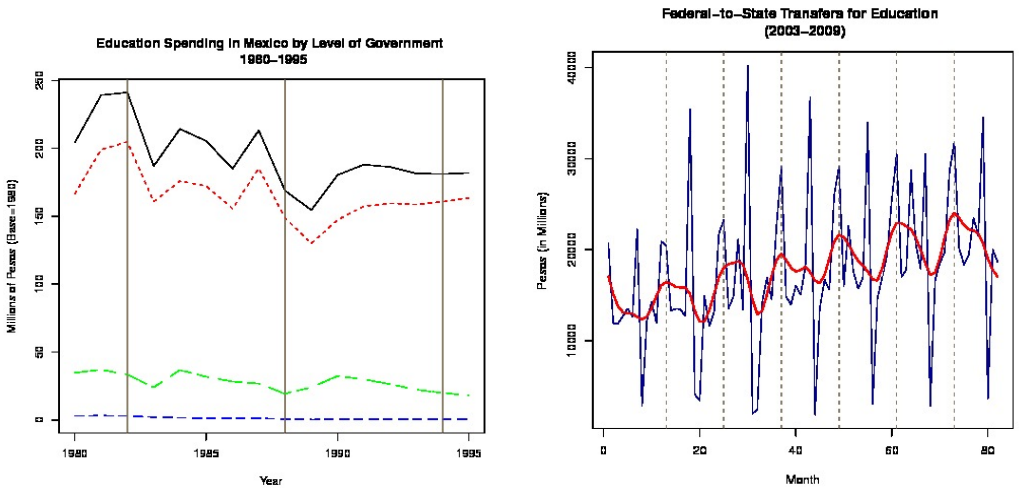
The main relevant law here is the Law of Fiscal Coordination (*Ley de Coordinación Fiscal*) which regulates the system of revenue sharing between levels of

government.

Chapter V of the law analyzed in this section is relevant for the topic in this dissertation.

For education, the federal pact was revised in 1992 through the *National Agreement for the Modernization of Elementary Education* (AMNEB in Spanish) among federation and states. This agreement transferred to the states 700,000 employees, educational services for 1.8 million children in kindergarten, 9.2 million in elementary school, 2.4 million of middle school, 100 thousand real estate properties and 22 million movables (Latapí and Ulloa, 2000).

The Fund for the Support of Basic Education (FAEB in Spanish) is the fiscal instrument with which the federation funds education. Funds flow from the federation to the states, and then the governors decide how to spend. The following figures show the evolution of funding for education by federal, state, and municipal level (left) and the evolution of federal transfers to states (right):



(a) Spending by level of government (1980-1995)

(b) FAEB transfers (2003 -2009)

Figure B.1: Education spending and transfers in Mexico

The data on the left panel shows the aggregate level of spending. The uppermost line is overall spending, which follows closely the federal expenditure right below it. The middle line reflects state spending, and the lower line the meager municipal spending.

Spending peaks in 1982, the first De La Madrid year. After the debt crisis, there is a sharp decline in allocated funds for 1983 and unstable allocation until after 1988, when the PRI[1] focuses budget on the poor as a strategy to revert massive allegations of fraud. Nevertheless, the previous graph suggests that the share of federal funds increased after the implementation of AMNEB, although with the current data I am unable to determine whether this was a sustained phenomenon or only transitory. The panel on the right shows that there has been increasing tendency in the funding for education during the same period.

It is important not to misunderstand the data. This graph shows the *origin* of financing in education by level of government. Nevertheless, the decentralization of education policy that started in 1992 gives states the bulk of authority over spending. Municipalities are the locus of spending by the governors.

B.0.2 Development policy.

The eradication of poverty, guaranteeing that all of the population has a minimal level of income and basic infrastructure, and the status of indigenous peoples (in a word, *social policy*) in this effort have been a central part of the historical narrative of the Mexican state. Once Mexico officially gained independence from Spain in 1821, both liberal and conservative governments in the XIX^{th} century took upon the task of reflecting a progressive view of development, at the time –much as it is now– mostly wrapped in a narrative of the indigenous question (Krauze, 2005).

[1] Salinas.

The post-revolutionary governments in the early XX^{th} century, which would eventually lead to the formation of the *Partido Nacional Revolucionario* (PNR) in 1929 by Calles and then the *Partido Revolucionario Institutional* (PRI) in the early 1930's with Cárdenas, also made a central part of their mandate the notion of social rights (basic infrastructure, health and education), both in continuation of the historical tendencies and in reaction to the main demands of the revolutionary movement of 1910 (Lajous, 1981; Meyer et al., 1978).

The main contemporary instrument of the Mexican state for development is the Law of Social Development (*Ley General de Desarrollo Social*, LGD), in effect only since January of 2004. This law condenses in a single legal instrument various dispositions that were scattered in multiple ordinances, which creates in paper a more systematic and unified framework for social policy in Mexico. This law also creates the *Consejo Nacional de Evaluación de la Política de Desarrollo Social* (CONEVAL) which is the organ of the federal administration in charge of defining and applying the methodologies for the scientific measurement of poverty in Mexico. It is widely recognized as a non-partisan organization that attracts top professionals.

At the federal executive level there is a six year national plan that sets the broad policy goals, criteria and principles for the entering administration. At the state level, some but not all, governors define their development priorities in six year plans.

The stated goals of LGD are to delimit specific obligations for each level of government for development policy, as well as to create the legal and organizational instruments for the coordination among these three levels. The ultimate goal (art. 1.I) is to "guarantee the full exercise of those social rights consecrated in the Constitution (...) to ensure that all population has access to social development". This

main goal is relevant because it adds an historical dimension to social development in Mexico by stating explicitly the commitment of the Mexican state to social policy, much in the same vein as the Indian government (Banerjee et al., 2005).

Appendix C

Coding Household Income

The household income variable comes from the sample of the 2010 Mexican census, which is divided into 3 data sources: individuals, households and migration. There are on average 4.4 members in each household and the total number of households in the sample is almost 2.9 million. The expansion factors of the sample generate data that represents 28,696,180 households.

The sample is stratified to guarantee acceptable margins of error at the municipal level or for localities with a population over 50,000 people. Localities with less population are included but are all clustered within a single locality identifier, so no specific data for these localities is available from the sample.

The census asks each member of the family to specify the amount in Mexican pesos that they receive on average per month for work, which is then summed up across all members of the household to generate an item for total income for work per household. Individuals (and then households) who report an income of zero are reported in the census as having income *0*. There are household which report blank, but the census documentation does not specify properly what this means. The range of income values goes from *0* to *999998*, and a category *999999* labeled

as "unspecified".

These values are treated as missing throughout this dissertation, which yields a grand total of 118,662 (4.1%) missing values. for this variable. The household income variable and the ethnic affiliation are the only two variables in this dissertation that present missing values.

To guarantee that a log transformation of zero household income does not bias my results I substituted all those values of *0* for *1* previous to the log transform. Their final value after the transform is still *0*. This prevents all income values of $log(0) = -\infty$ to be treated as missing values and thus excluded from the analysis, which would bias my estimations because these households are the poorest, and usually have no full coverage of basic infrastructure and literacy.

Two words of caution are important. First, the variation in the reported income is extreme. It is common to find municipalities where the average income is, say, 5,000 pesos, where we also find one or two households that reported incomes greater than 500,000. This substantively affects the variation in the calculation of the Gini index. Whether this is a real-world phenomena, related for example to the accumulation of massive fortunes in poor areas due to drug-trafficking, remains to be tested. At any rate, for this dissertation I decided to smooth out the values of income found in each municipality by eliminating those incomes that exceeded 20 standard deviations upward from the mean (inclusive of the outlier).

Second, the description of the census variables is not detailed enough to know what exactly reporting an income of 0 means. It is also mute on whether the goal of the income item is to gauge specifically those individuals who receive income for wages, although the way it is phrased suggests so. I contacted the Mexican Census Bureau (*INEGI* in Spanish) to attempt to understand this better, but I received no satisfactory explanation. I was able to reconstruct the official levels of inequality for

the whole country for 3 points in time, but only leaving incomes of zero outside of the calculation. For the sake of consistency with official data I excluded income of *0* from the calculation of the Gini index at the municipal level.

Appendix D

Coding Elections

The main construct to measure electoral competition is an inverse Herfindahl index of the votes obtained by each party Laakso and Taagepera (1979), which is strictly non-negative. Mexican elections at the subnational level present a wide degree of variation, both in their scope and in the nature of the alliances that occur. The state level elections are characterized by a higher degree of coalition-building, while the municipal and state level elections present a much more dispersed electoral framework.

To capture this variation I develop a simple criterion that divides political parties into three tiers. The upper tier is made up of the PRI and those political parties that have been historically challengers for the PRI: the PRD and the PAN. These are the most rooted and more politically relevant parties in Mexican political life; they alone control a substantial amount of legislative processes, as well as state and municipal executives.

The second tier is composed by those parties that are minor but still capture such amount of votes that have systematically surpassed the 2% threshold that Mexican electoral law sets to parties to maintain their registry. Parties in the

second tier are the Partido Verde (Green party) Convergencia and the Partido del Trabajo (labor party). These second tier parties are serious in the sense that they have been present in municipal, state and federal elections for at least a decade, and even though small, have become a consistent part of Mexican politics. These parties run in coalitions most of the time at the state level, but they do run by themselves in municipal elections, and actually win sometimes.

The third and last tier is composed by the new, small parties, that are not rooted among the electorate. These parties run in coalitions most of the time at all levels and have little campaign finance (which is tied to electoral results). Local and regional parties are also cataloged here.

D.1 Coalitions and common candidacies

Coding conflicts arise when a coalition, either for governor or municipal president, is built by two or more parties of the same tier. In this case, the total votes for the coalition were equally distributed among all parties belonging to the highest tier.

In 2010 in Oaxaca, for example, the PRD and the PAN set aside their historical (and mostly federal) conlict to compete against the PRI, who had never lost. In this example, all the votes for the coalition were divided equally between PRD and PAN. If any lower tier parties were part of the coalition, zero votes were assigned under the argument that most of the votes are (presumably) attracted by the major parties. The same logic applies for elections for municipal president.

For state elections, I defined four categories that I claim capture the complexity of state elections in Mexico. These categories are PRI, PAN, PRD and others. This establishes a lower bound to the fragmentation of the electoral market of .25

(or $1/.25 = 4$ effective parties). No party in the second tier or below has ever won a state governorship, and they seldomly run by themselves, from which we infer that the stakes are too high for them to risk being left outside of a coalition with the big parties.

Municipal elections in Mexico are a different story. Perhaps because there is less at stake, smaller parties do run by themselves often for municipal presidencies. Therefore the classification criteria must be relaxed to distinguish municipal elections where smaller parties run alone. Smaller parties do win sometimes (but not very often) municipal elections, like for example the municipality of Briseñas in the state of Michoacan in 2007, where Convergencia won (but then ost again in 2011). To capture this I expanded the classification scheme from four to seven categories: PRI, PAN, PRD, PVEM (Green party), PT (Labor party), Convergencia and others. Therefore the lower bound for the effective number if parties with this scheme is .1428 (or $1/.14 = 7$ effective parties).

In general, most of the coalitions built at the subnational involve a mixture of tiers. The criterion in this case was the same as for less complicated coalitions: when a coalition was found, votes were assigned to the most dominant party (i.e. highest tier) or divided equally between all parties of the highest tier. For example, if a PT-Convergencia coalition was found, votes were divided equally among these two parties; in the case of a PRI-PT-Convergencia coalition, all votes were assigned to the PRI. In Baja California Sur in 2011 Convergencia allied with the smaller Partido Acción Social, and all votes were coded as corresponding to Convergencia, a second tier party.

Regarding common candidacies (in which separate parties present the same candidate on the ballot), the same criterion above was applied. For example, in 2005, the PAN went on a common candidacy with the local party Unidad Democrática de

Coahuila, and all votes were coded for the PAN.

D.2 Extraordinary elections

Some minor changes had to be made to account for extraordinary elections. Elections, mostly at the municpal level, are sometimes repeated or differed to comply with rulings of the state or federal electoral courts on (pre or post) electoral conflict. In these cases, I took the simple criterion of coding the year of extraordinary as ordinary elections, because usually extraordinary elections are conducted in the forthcoming year, so for purposes of estimating the effective number of parties I believe it introduces only a neglegible amount of error.

The municipality of Ciudad Juárez had an extraordinary election in 2002, which was coded as occurred in 2001 like the rest of the municipalities of Chihuahua. The municipalities of Ixtenco and Zacatelco in the state of Tlaxcala also had extraordinary elections in 2002 that were coded as occurring in 2001.

D.3 Traditional indigenous communities in Oaxaca

Since 1995 Oaxaca allows its indigenous municipalities to choose whether they want to continue being ruled at the municipal level by political parties (the default), or if they want to revert to a set of traditional indigenous laws called Usos y costumbres. Out of 570 municipalities, 418 are now governed by these traditional laws. Because there are effectively no political parties, and to maintain the full sample of municipalities in the empirical analysis, I coded these municipalities as having 0 effective number of parties.

This not only corresponds with the choices that the communities have taken to expel political parties from the municipal government, it is also a useful way to not drop 418 municipalities that are critical to this work because they are usually extremely poor, indigenous places. Leaving these municipalities out of the analysis would bias my estimations, and I also find no substantive reason why such municipalities should not be coded as having 0 political parties, which they do.

The local constitutions of two other very indigenous states (the predominantly Maya states of Chiapas or Campeche) do not allow their municipalities to switch to traditional rules. This is a situation that applies exclusively for Oaxaca.

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