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INVESTMENT: INSTITUTIONS AND POLITICS MATTER*

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**THE DETERMINANTS OF CENTRAL vs. LOCAL GOVERNMENT
INVESTMENT: INSTITUTIONS AND POLITICS MATTER¹**

Jean-Paul Faguet²
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Abstract

This paper uses econometric models of public investment to investigate the institutional and political determinants of central vs. local government decision-making. I use a remarkable database from Bolivia's recent, radical decentralization program. I find that local government policy decisions are progressive both economically and in terms of need, and largely determined by a competitive interest group dynamic which provides poorer citizens, as well as private sector firms and civic institutions, with political voice. This ensures that accountability is binding for elected officials. By contrast centralized investment – more insulated from grass-roots pressures – is regressive in both dimensions. The results suggest a healthy picture of local democracy in which voters are able to influence local government through both their civil institutions and the electoral mechanism. Where local government works well citizens have voice, providing an effective counterweight to the power of private firms and government's own politico-bureaucratic interests.

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1. Introduction

Over the past few decades decentralization has become one of the most debated policy issues throughout both developing and developed worlds. It is seen as central to the development efforts of countries as far afield as Chile, China, Guatemala and Nepal. And in the multiple guises of subsidiarity, devolution and federalism it is also squarely in the foreground of policy discourse in the US, UK and EU. But surprisingly, there is little agreement concerning the effects of decentralization in the empirical literature. Advocates (*e.g.* Ostrom *et.al.* 1993, Putnam 1993, World Bank 1994a, UNDP 1993) argue that decentralization can make government more responsive to the governed by “tailoring levels of consumption to the preferences of smaller, more homogeneous groups” (Wallis and Oates 1988, 5). Opponents (*e.g.* Crook and Sverrisson 1999, Samoff 1990, Smith 1985) dispute this, arguing that local governments are too susceptible to elite capture, and too lacking in technical, human and financial resources, to produce a heterogeneous range of public services that are both reasonably efficient and responsive to local demand. But neither side is able to substantiate its arguments convincingly with empirical evidence.

The broadest surveys of decentralization experiences point to why. In their wide-ranging 1983 survey, Rondinelli, Cheema and Nellis note that decentralization has seldom, if ever, lived up to expectations. Most developing countries implementing decentralization experienced serious administrative problems. Although few comprehensive evaluations of the benefits and costs of decentralization efforts have been conducted, those that were attempted indicate limited success in some countries but not others. A decade and a half later, surveys by Piriou-Sall (1998), Manor (1999) and Smoke (2001) come to cautiously positive conclusions, but with caveats about the strength of the evidence in decentralization’s favor. Manor ends his study with the judgment that “while decentralization ... is no panacea, it has many virtues and is worth pursuing”, after noting that the evidence, though extensive, is still incomplete. Smoke asks whether there is empirical justification for pursuing decentralization and finds the evidence is mixed and anecdotal.

The inconclusiveness of this literature is less surprising when we examine it more carefully. Empirical work on decentralization can be divided into two broad groups: Qualitative (small sample) work, and Quantitative (large sample) work. The former focus usually on a single country, or develop comparisons between a small set of countries, relying primarily on descriptive and qualitative evidence. Although the

level of analysis is often careful, nuanced and deep, such studies tend to suffer from a low level of generality, an excess of variables over observations – which in turn leads to a failure to control adequately for external factors, and in the worst case a conflation of causes and effects. Examples of large sample studies include de Mello (2000), Estache and Sinha (1995), Fisman and Gatti (2000), Galasso and Ravallion (2000), Humplick and Moini-Araghi (1996), Huther and Shah (1998), and Zax (1989). Quantitative studies, on the other hand, tend to benefit from the high degree of generality, consistency and empirical transparency that statistical approaches provide. But they also suffer significant problems with the measurement of often abstract concepts, data comparability across diverse countries (or regions), and the possibility of omitted variables. Examples of small sample studies include Blanchard and Shleifer (2000), Parker (1995), Slater (1989), Treisman (1999), Weingast (1995), and World Bank (1995).

Perhaps as a result of these methodological difficulties, neither side of the decentralization debate has been able to specify a complete model of how government – central or local – works. The effects they posit operate at the hazy margins of a governmental black box, and as a result competing claims from each side pass each other in the fog, failing to engage or move the conversation forward. Without a clear model of central or local government, both sides have difficulty analyzing the effects of switching from one to the other. And as a result, neither side can triumph over the other. An exception to this inconclusiveness is Faguet (2001), who also examines the case of Bolivia and shows that decentralization *did* make government more responsive to real local needs. After decentralization, municipalities invested more in education, water & sanitation, water management and agriculture where illiteracy rates are higher, water and sewerage connection rates lower, and malnutrition a greater risk respectively. These changes were driven by Bolivia's smallest, poorest, mostly rural municipalities investing newly devolved funds in their highest-priority projects.

Knowing that these things happened is important. But in order to comprehend decentralization and fully learn its lessons, we must also understand *why* they happened. We must unlock the black boxes of central and local government operation in order to unravel the workings of each, and how they differ. We need a micro-level approach that allows for complexity and nuance, examining policy outputs through the interplay of institutions, electoral competition and lobbying activity that produces them. This paper builds on Faguet's work in an attempt to do that empirically for the remarkable case of Bolivia. It employs

econometric models of public investment that include a broader range of variables than have been used before to examine the policy choices of central and local government in significant detail. By modeling policy decisions under each regime separately, I am able to probe deeper into the political economy mechanisms that govern outcomes in each. Ultimately the social processes in question may be so complex and nuanced in nature as to require qualitative characterization of actors and the relationships between them in order to be fully understood. The interesting, even provocative insights that emerge from the quantitative approach employed here will hopefully help to spur such research.

Bolivia is a particularly interesting case for study because reform there consisted of a large change in policy at a discrete point in time. The data available are of surprising scope and quality for a country of its socio-economic characteristics, and include information on the political, social and civic, economic, institutional, and administrative characteristics of all of Bolivia's municipalities. These data beg to be exploited. Furthermore, focusing on one country but with a data-intensive approach allows me to benefit from the rigor and generality of econometric methodology while avoiding problems of data comparability and controlling for external shocks, political regime, institutions, and other exogenous factors.

I define decentralization as the devolution by central (i.e. national) government of specific functions, with all of the administrative, political and economic attributes that these entail, to democratic local (i.e. municipal) governments which are independent of the center within a legally delimited geographic and functional domain. The rest of the paper is organized as follows. Section 2 quickly reviews Bolivia's decentralization program, focusing on the changes in national resource flows that resulted. Section 3 discusses the empirical methodology, and then tests models of central and local government investment separately, focusing on the power of political and institutional variables, as well as indicators of training and capacity-building, to explain investment behavior under each regime. Section 4 concludes.

2. The Bolivian Decentralization Program

2.1 Popular Participation and the Decentralization Reform

On the eve of revolution, Bolivia was a poor, backward country with extreme levels of inequality, presided over by a "typical racist state in which the non-Spanish speaking indigenous peasantry was controlled by a small, Spanish speaking white elite, [their power] based ultimately on violence more than consensus or any social pact" (Klein 1993, 237; my translation). The nationalist revolution of 1952, which

expropriated the “commanding heights” of the economy, land and mines, launched Bolivia on the road to one of the most centralized state structures in the region. The government embarked upon a state-led modernization strategy in which public corporations and regional governments initiated a concerted drive to break down provincial fiefdoms, transform existing social relations, and create a modern, industrial, more egalitarian society (Dunkerley 1984). To this end the President directly appointed Prefects, who in turn designated entire regional governments and associated dependencies, forming a national chain of cascading authority emanating from the capital.

Successive governments through the 1950s promoted the unionization of miners, laborers, peasants, public servants and professionals into a hierarchical “peak association”, whose representatives negotiated national policies directly with their similars from the private sector and government (Dunkerley 1984, 43). Together these three planned the exploitation of Bolivia’s natural resources, the development of new industries, and sectoral and regional policy in a bid to orchestrate a rapid development process from the heights of La Paz. The intellectual trends of the 1950s-1970s – *Dependencia* theory, Import Substitution Industrialization, and Developmentalism – only contributed to this tendency, as did the military governments which overthrew elected administrations with increasing frequency from the 1960s on (Klein 1993). With political power so little dispersed, there was little point in establishing the legal and political instruments of local governance. As a result beyond the nine regional capitals (including La Paz) and an additional 25-30 cities, local government existed in Bolivia at best in name, as an honorary and ceremonial institution devoid of administrative capability and starved for funds. And in most of the country it did not exist at all.

Against this background, the Bolivian decentralization reform was announced in 1994. The Law of Popular Participation, developed almost in secret by a small number of technocrats (Tuchschneider 1997), was announced to the nation to general surprise, followed by ridicule, followed by determined opposition of large parts of society.³ First made public in January of that year, the law was promulgated by Congress in

³ “Injertos Tramposos en ‘Participación Popular’”, *Hoy*, 19 January 1994; “La Declaratoria de Guerra del Primer Mandatario”, *La Razon*, 27 January 1994; and “Arrogancia Insultante”, *Presencia*, 27 February 1994 are only three of the many articles which appeared in the Bolivian press documenting popular reaction to the “Damned Law”. These are documented in Unidad de Comunicación (1995).

April and implemented from July. The scale of the change in resource flows and political power that it brought about were enormous. The core of the law consists of four points (Secretaría Nacional de Participación Popular, 1994):

1. **Resource Allocation.** Funds devolved to municipalities doubled to 20 percent of all national tax revenue. More importantly, allocation amongst municipalities switched from unsystematic, highly political criteria to a strict per capita basis.
2. **Responsibility for Public Services.** Ownership of local infrastructure in education, health, irrigation, roads, sports and culture was given to municipalities, with the concomitant responsibility to maintain, equip and administer these facilities, and invest in new ones.
3. **Oversight Committees** (*Comités de Vigilancia*) were established to provide an alternative channel for representing popular demand in the policy-making process. Composed of representatives from local, grass-roots groups, these bodies propose projects and oversee municipal expenditure. Their ability to have disbursements of Popular Participation funds suspended if they find funds are being misused or stolen can paralyze local government, and gives them real power.
4. **Municipalization.** Existing municipalities were expanded to include suburbs and surrounding rural areas, and 198 new municipalities (out of 311 in all) were created.

The change in local affairs that these measures catalyzed is immense. Before reform local government was absent throughout the vast majority of Bolivian territory, and the broader state present at most in the form of a military garrison, schoolhouse or health post, each reporting to its respective ministry. After reform elected local governments accountable to local voters sprang into being throughout the land.

2.2 Descriptive Statistics

The scale of the changes caused by decentralization can be appreciated by examining the changes in resource flows that followed. Total resources devolved from central to local governments increased by 72%. More impressive are changes in the distribution of funds. Figure 1 shows revenue-sharing between central and local governments for 1993, the last year prior to decentralization, and 1995, the first full year it was in effect, for the capital and second city of each of the country's nine departments. Before decentralization the nine departmental capitals shared 93% of all funds devolved from the center, leaving 7% for Bolivia's other 302 municipalities. After decentralization their shares were 38% and 62% respectively. Within-department

allocations also shifted from extreme skewing of resources (five of nine departmental capitals received 94% or more of total departmental revenue-sharing) to greater equality. The per capita criterion resulted in a massive shift of resources in favor of the smaller, poorer municipalities in Bolivia.

More important are changes to the composition of investment. Figure 2 shows the investment patterns of central and local government before and after decentralization. The front row corresponds to central government investment during 1991-3, and the rear row to local government investments during 1994-6. The differences are significant. In the years leading up to 1994 central government invested the largest sums in transport, followed by hydrocarbons, multisectoral and energy. Together these four sectors account for 73% of total public investment during 1991-3. But after decentralization local governments invest most heavily in education, urban development, and water & sanitation, together accounting for 79% of municipal investment during this period. Of the sectors accounting for roughly three-quarters of investment in each case, central and local government have not even one in common.

With a very different allocation of resources across space and different uses of investment funds, the evidence implies strongly that local and central government behave in fundamentally different ways. What explains these differences?

Figure 1: Central-Local Revenue Sharing (Bs'000)

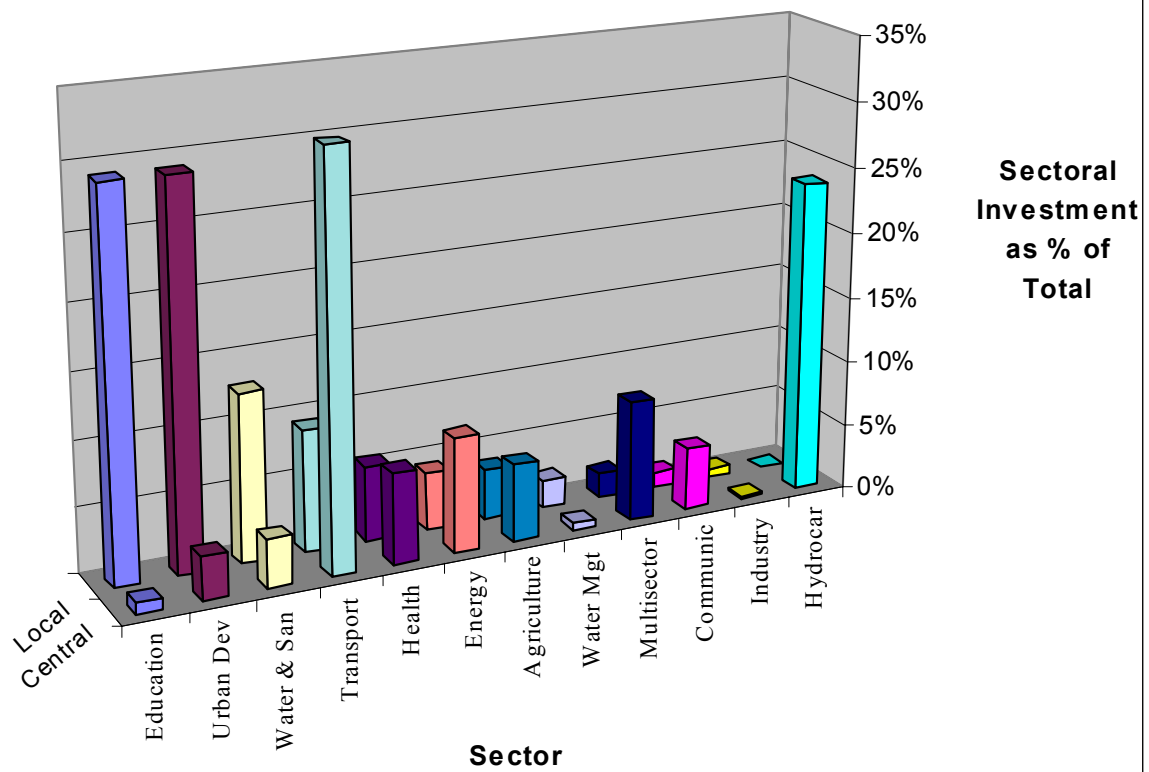
City	1993	1995	% Change
La Paz	114,292	61,976	-46%
El Alto	5,362	46,326	764%
ROD	1,120	76,170	6704%
<i>total</i>	<i>120,774</i>	<i>184,472</i>	<i>53%</i>
Santa Cruz*	51,278	63,076	23%
Montero	1,106	5,306	380%
ROD	1,774	56,012	3058%
<i>total</i>	<i>54,157</i>	<i>124,394</i>	<i>130%</i>
Cochabamba*	25,856	38,442	49%
Quillacoto	1,315	2,471	88%
ROD	2,108	73,688	3396%
<i>total</i>	<i>29,279</i>	<i>114,601</i>	<i>291%</i>
Oruro	6,969	15,925	129%
Challapata	29	1,090	3687%
ROD	74	11,198	15022%
<i>total</i>	<i>7,072</i>	<i>28,213</i>	<i>299%</i>
Potosi	1,208	13,990	1058%
Villazon	233	3,543	1420%
ROD	394	39,813	10009%
<i>total</i>	<i>1,835</i>	<i>57,346</i>	<i>3026%</i>
Sucre	4,581	21,202	363%
Camargo	244	2,214	809%
ROD	56	24,374	43540%
<i>total</i>	<i>4,881</i>	<i>47,790</i>	<i>879%</i>
Tarija	3,219	10,063	213%
Yacuiba	648	4,743	632%
ROD	841	13,893	1552%
<i>total</i>	<i>4,708</i>	<i>28,699</i>	<i>510%</i>
Trinidad	480	4,892	920%
Riberalta	87	6,599	7501%
ROD	154	10,393	6645%
<i>total</i>	<i>721</i>	<i>21,884</i>	<i>2937%</i>
Cobija	99	502	408%
ROD	1	379	63067%
<i>total</i>	<i>99</i>	<i>881</i>	<i>787%</i>
Total	223,525	608,280	172%

sources : Min. of Finance, Min. of Social Communication

* 1995 totals estimated due to incomplete reporting.

ROD = Rest of Department

Figure 2: Local v. Central Government Investment



3. The Determinants of Central vs. Local Government Investment

The object is to investigate the institutional, socio-political and administrative determinants of investment decisions by both central and local government. Specific questions include: Which local political forces are important in determining policy? How do voting and lobbying affect investment? How do the institutions of government shape policy choices? I wish to estimate the effects of these factors on public decisions under both central and local government, taking into account previous findings (Faguet 2001) that local investment responds strongly to measures of need. The nature of the data allows me to probe more deeply into the institutional and administrative characteristics of local government than one can for the center. Data on factors such as the planning procedures, training and capacity building, and information systems implemented by municipalities allows me to decompose their investment decisions to a surprising degree. For obvious reasons, central government data offers no cross-sectional variation of this nature, and hence less opportunity to pry open the black box of decision-making. The weight of analysis is accordingly biased in favor of the periphery.

3.1 Empirical Approach

The economic literature on local government includes a strong strain on the demand for local public goods and services. In a seminal contribution, Bergstrom and Goodman (1973) develop a method for estimating individuals' demand functions for municipal public services. They find positive income elasticities and negative price elasticities for different types of municipal expenditures using a technique which takes explicit account of population heterogeneity. Rubinfeld, Shapiro and Roberts (1987) build on this to propose a maximum-likelihood estimation technique that incorporates the sorting of individuals among communities on the basis of quality and quantity of local goods provided. They find price and income elasticities considerably smaller than those of Bergstrom and Goodman and others. Pommerehne and Schneider (1978) allow for differences in democratic institutions, dividing their sample of Swiss districts into direct democracies, and representative democracies with and without referenda, and find that the median voter model works best for direct democracies. This literature establishes a method for estimating demand for local public services which I follow below.

Ideally public goods would be measured in quality-adjusted units of output, separated by type. But such information is unavailable for Bolivia, and instead I measure investment inputs in the form of resources

expended on public investment projects. This approach has the advantage of using natural, non-controversial units, and of facilitating comparisons across different sectors. I separate these flows by sector, and for each sector estimate the model

$$G_m = \zeta S_m + \eta Z_m + \varepsilon_m, \quad (1)$$

where G_m is aggregate investment per capita in the public good subscribed by municipality, S_m is a scalar or vector of the existing stock of public goods of that type (variously defined) at an initial period, and Z is a vector of socio-economic, demographic, regional, political, institutional, administrative and procedural variables which might affect investment decisions. My use of the Z term follows Bergstrom and Goodman, and Rubinfeld, Shapiro and Roberts within the context of the available data. In particular, no income data is available at the municipal level in Bolivia, so I substitute several alternative indicators of income and wealth, including for example housing size, quality and related characteristics, and type of cooking fuel. But in comparison with previous authors I expand the scope of the Z vector to include measures of political regime type, municipal decision-making processes, and civic institutions and organizations, allowing me to investigate the micropolitical basis of local government decision-making.

In order to compare like with like, and smooth natural discontinuities in investment decisions,⁴ I adopt a simple cross-sectional approach where investment flows are summed over the years 1992-93⁵ for central investment, and 1994-96 for local investment. I assume that the variables in S , the stock of public services, as well as those in Z , are constant over the five-year period in question. I reduce the large number of potential Z variables to a manageable and conceptually coherent set through principal component analysis. This produces ten dimensions of Z containing thirteen principal component variables, which are summarized in figure 3 and explained in detail in Annex 2. Equation (1) can thus be written as

$$G_m = \zeta S_m + \eta_1 Z_{1m} + \dots + \eta_{13} Z_{13m} + \varepsilon_m, \quad (2)$$

where subscripts 1 to 13 denote the PCVs below.

⁴ Sectoral parameters often lead to investment being concentrated in time. For example, a municipality that builds a hospital may have no need for additional health investments for some time thereafter.

⁵ I reduce the sample to the period 1992-93 in order to be able to use census data as initial values of S_m without incurring endogeneity. Extending the sample to 1991-93 does not change the results.

Figure 3: Interpretation of PCVs

PCV Group	PCV No.	Interpretation - Variable increases in... listed in order of importance, where applicable (see Annex 1 for details)
1 Demographic	1	Protestants, atheists (i.e. non-Catholics) and rural dwellers
2	2	Native-language speakers and rural dwellers
3 Economic	1	Wealth and income
4	3	Family size and poverty
5 Civil Institutions	1	Strength of local civil institutions and organizations
6 Private Sector	1	Dynamism of the local private sector
7 Political Disaffection/Protest	1	Electoral abstention, null and anti-government votes
8 Training & Capacity-Building	1	Intensity of the local capacity-building efforts undertaken by/for local government
9 Information Technology	1	IT systems - hardware and software
10 Central Government Auditing	1	Audits by, reports to, and information system shared with central government
11 Municipal Administration	1	Robust administrative guidelines and operating procedures, and a strong executive
12	2	Strong, activist municipal council and weak mayor
13 Project Planning	1	Informed project planning which follows consensual and open procedures

Following the notation of equation (2) above, I use coefficient ζ to characterize central and local investment patterns according to need, where “need” is defined as the marginal utility arising from a particular type of public service, $N=U'(g)$. This is based on an assumption of the decreasing marginal utility of a public service as the level of provision of that service increases. Hence need falls as the stock of g rises, and vice versa. I rely on two types of information as indicators public service stocks: (1) the penetration rates of public services in the local population, and (2) the initial per capita stock of infrastructure (before decentralization). Examples include: (1) the literacy rate and the share of population without water or sewerage; and (2) the number of sports facilities per capita. I consider type 1 variables truer indicators of need, as they better capture the idea of people’s benefit from public services; type 2 variables indicate existence more than exploitation by the local population. I use type 2 variables only when type 1 variables are not available.

In theoretical terms, the main coefficients of interest are η_5 - η_{13} , corresponding to the social, political, institutional and procedural factors that underpin local governance. To a significant degree this vector of variables represents competing hypotheses about how government works, and thus we do not expect all to be significant for any given sector. Each sector also includes an interacted need-municipal training variable, to test the theory that even where training and capacity building have no independent effect on investment, they may affect investment indirectly via local government’s ability to perceive need.

Before moving to the results I briefly discuss two considerations which could affect the interpretation of the results in important ways. The first is the possibility that central government investment between 1992-3 was externally constrained, and thus its correlates reflect not central government preferences but rather the structure of these constraints. The second is that municipal investment between 1994-6 was externally constrained, and thus these patterns similarly reveal little about local-government preferences and dynamics. If neither possibility holds, we may take investment decisions between 1992-3 and 1994-6 to reflect central and local priorities subject to budget constraints. Otherwise we must account for additional external constraints, and include them in our models. I take each consideration in turn.

(i) Central Government Discretion: As section 2 shows, any external constraints binding on central government before decentralization would be of a sort that forced it to skew investment dramatically towards

a few, large municipalities and away from the smaller half, as well as favor transport and hydrocarbons over health, education and water & sanitation. In Bolivia's case such constraints would most likely come from the multilateral agencies and bilateral and other donors on which the country depends for scarce investment resources, and which impose numerous policy conditions as the price of aid. But careful consideration of Bolivia's international context during 1992-3 reveals no such pressures. Indeed, if anything international pressures would seem to have pointed in opposite directions from those Bolivia took. By 1992 Bolivia had ended its second structural adjustment program (ESAF) with the IMF, and begun its second Structural Adjustment Credit (SAC) with the World Bank. The conditions upon which these were based include a number of provisions designed to redirect public investment away from productive activities (mining and hydrocarbons especially) and toward the social sectors (i.e. education, health and water & sanitation) (World Bank 1991). Furthermore, a number of prominent projects undertaken by the Bolivian government at the time, including the Emergency Social Fund (World Bank 1987), Social Investment Fund (World Bank 1993b), Education Reform Project (World Bank 1993a) and the incipient Integrated Child Development Project (World Bank 1994b), co-financed in various combinations by the World Bank, Inter-American Development Bank, USAID, WHO/PAHO, GTZ, KfW, the Dutch, Swiss, Swedish, Belgian and several other governments – that is to say, as far as Bolivia is concerned, the entire international community – sought explicitly to redistribute investment flows toward poorer, rural areas and away from Bolivia's cities. But according to the data above, on neither criterion did international pressures have any effect. The fact that investment outcomes were the exact opposite of those the international community supported forces us to conclude that central government in Bolivia faced no binding constraints on its investment decisions during this period. The implication for relevant donors' aid policy, of course, is that collectively at least their conditionality was entirely ineffectual.

(ii) *Constraints on Local Government:* The question of external constraints on municipal governments between 1994-6 is only somewhat more subtle. Legal constraints certainly did exist – after the Popular Participation Law itself, central government passed Executive Decree 24182 which directed municipalities to dedicate at least 25% of their resources to productive investment, 30% to social investment, and no more than 15% to operating costs. The center sought to reward municipalities that did so through additional investment via the Social Investment Fund, Campesino Development Fund, National Environmental Fund, and the

Regional Development Fund. Were this binding, changes in national investment patterns between the two periods would be the result of changed priorities in La Paz and not the action of local governments. But the evidence demonstrates the opposite – the center proved too institutionally weak to enforce this decree. No sanctions were taken against offending municipal governments, and the system of matching grants fell apart as the Funds (all of them executive agencies) ignored requirements and continued working with municipalities regardless of their compliance (Lea Plaza 1997). An examination of the limit on operating costs reveals that 203 municipalities exceeded 15% in 1994, 157 did so in 1995, and 147 more in 1996. Indeed, departmental capitals were amongst the biggest violators, and received correspondingly broad media coverage of their finances. Smaller municipalities took notice. As for central government, we must conclude that local governments faced no binding constraints on their investment decisions during this period.

3.2 Results

I examine central and local investment in health, water & sanitation, education, urban development, water management and agriculture, where results from the models below are strongest.⁶ We shall see that central government coefficients are generally larger by an order of magnitude or more than local government coefficients. This should be interpreted bearing in mind that even after decentralization the center manages over seven times the resources that local government manages, and that it concentrated investment in a relatively small number of municipalities. Larger coefficients should thus not be interpreted as greater sensitivity to the factors that interest us, but rather as by-products of budgetary scale and concentration.⁷

Health

Figure 2 shows that of the eight indicators of need used in three models of central government investment, only one – the percentage of households using NGO or church-run health facilities – is significant. Its positive sign indicates that investment increased where private (*i.e.* non-public⁸) medical

⁶ Results from the remaining four sectors are insignificant, as one might expect.

⁷ This effect is magnified for the case of civil institutions, which sprouted by the hundreds throughout Bolivia after 1994.

⁸ The majority of private health facilities in Bolivia are NGO or church-operated.

facilities already exist, which in Bolivia is where public facilities are also in abundance.⁹ This implies an increasing geographic concentration of infrastructure. The insignificance of the other seven indicators implies central government investment was insensitive to need, or at most weakly regressive.

The coefficients on *Civil Institution* are positive and significant in all three models, implying that strong civil institutions are associated with increasing investment in health. As this data pre-dates both central and local investment, the direction of causality must be from civil society to investment outputs. This implies that civil institutions were able to successfully lobby central government to increase investment in health. The *Private Sector* variable is similarly significant in all three models, but negative. I interpret to mean that where the private sector is strong it successfully lobbied the center to reduce investment in health in favor of other sectors which interest it more, as we shall see below. The *Information Technology* PCV is also significant and positive in the three models, but because these IT investments only began with the decentralization program, I discount them as spurious correlations. Such results may imply that these variables proxy for deeper characteristics of municipalities before decentralization, but data constraints do not allow us to explore this possibility here.

Investment under local government shows several important differences from that under central government. First, need variables are significant in all three models. Investment rises with indicators of need, although in the neediest municipalities there appears to be a poverty trap. Thus, investment increases with the malnourishment rate,¹⁰ and is also higher where public facilities and those run by public insurers are used intensively. But investment is lower where the proportion of the population that receives no health care

⁹ The Municipal Census (Secretaría Nacional de Inversión Pública y Financiamiento Externo 1997) shows that private health facilities are mostly concentrated in municipalities that also benefit from public facilities of the same type. In the municipalities where all 46 private health posts are located, there are 436 public facilities. Of the 145 private centers nationwide, 107 are located in just two municipalities. Far from complementing the state health network and making up for its deficiencies, these facilities operate in parallel to the public system and compete with it for patients.

¹⁰ Associated in Bolivia much more with nutritional balance than caloric intake, and hence susceptible to simple medical interventions.

Figure 4

Ind. Var	Model*					
	Central Government			Local Government		
	I	II	III	I	II	III
<i>Demographic & Regional Controls?</i>	YES	YES	YES	YES	YES	YES
Economic PCV1	0.11361 (2.237)	0.12081 (2.420)	0.13094 (2.441)	-0.0016 (-2.940)	-0.0014 (-2.698)	-0.0012 (-2.309)
Economic PCV3	0.12182 (1.648)	0.12324 (1.628)	0.12294 (1.695)	0.0022 (2.020)	0.00224 (2.022)	0.00189 (1.793)
Political Protest Vote PCV1	-0.211 (-1.455)	-0.2187 (-1.508)	-0.2397 (-1.620)	-0.0008 (-0.801)	-0.0015 (-1.390)	-0.0008 (-0.798)
Civil Institutions PCV1	0.12452 (2.401)	0.1203 (2.399)	0.1199 (2.336)	0.00161 (2.488)	0.00159 (2.401)	0.00152 (2.380)
Private Sector PCV1	-0.0727 (-1.866)	-0.0767 (-1.912)	-0.0756 (-1.868)	-0.0018 (-2.022)	-0.0021 (-2.363)	-0.0015 (-1.807)
Training & Capacity Building PCV1	0.06995 (0.733)	-0.1389 (-0.917)	0.09059 (0.965)	0.00156 (1.041)	-0.0016 (-1.008)	0.0016 (1.079)
Information Technology PCV1	0.12397 (1.700)	0.12628 (1.750)	0.13478 (1.825)	0.00187 (2.135)	0.00172 (2.016)	0.00167 (1.961)
Central Gov Auditing PCV1	-0.0353 (-0.501)	-0.0315 (-0.461)	-0.0369 (-0.533)	-0.0012 (-1.636)	-0.0014 (-1.867)	-0.0012 (-1.692)
Municipal Administration PCV1 (Robust Guidelines)	0.1012 (1.350)	0.10708 (1.335)	0.11265 (1.486)	-0.0006 (-0.648)	-0.0007 (-0.686)	-0.0006 (-0.636)
Municipal Administration PCV2 (Strong Municipal Council)	0.0637 (0.866)	0.06782 (0.928)	0.04703 (0.633)	0.00167 (2.203)	0.00183 (2.188)	0.00141 (1.971)
Project Planning PCV1	0.03738 (0.473)	0.03858 (0.490)	0.04565 (0.603)	0.00083 (1.083)	0.00082 (1.046)	0.00098 (1.258)
Health Care, Min. Health %	-0.0019 (-0.219)		-0.0004 (-0.048)	0.00018 (2.513)		0.00014 (1.991)
Health Care, Public Insurance %	0.01408 (0.725)	0.01883 (1.051)		0.00045 (2.272)	0.00033 (1.807)	
Health Care, None %	0.01665 (1.293)	0.0184 (1.558)	0.01593 (1.138)	-0.0003 (-1.673)	-0.0003 (-1.935)	-0.0003 (-1.847)
Health Care, NGO & Church %			0.03638 (1.860)			-0.0003 (-1.549)
Malnutrition Rate (Low)	0.01761 (1.273)	0.01808 (1.285)	0.01531 (1.068)	0.00038 (1.881)	0.00039 (1.850)	0.00041 (1.951)
Local Health Authority	-0.373 (-0.975)	-0.416 (-1.083)		-0.0019 (-0.527)	-0.0021 (-0.557)	
Needs-Training Interacted 1	-0.0045 (-0.709)		-0.0055 (-0.839)	-0.0001 (-1.323)		-0.0001 (-1.304)
Needs-Training Interacted 2		0.00433 (1.219)			5.8E-05 (1.067)	
constant	-1.6044 (-2.147)	-1.6839 (-2.667)	-2.0193 (-3.020)	-0.0008 (-0.107)	0.00731 (1.312)	0.00132 (0.208)
sigma	0.8949 (5.038)	0.88729 (5.016)	0.87899 (5.080)	0.01652 (4.482)	0.01674 (4.561)	0.01662 (4.512)
χ^2	42.05	43.32	43.23	60.84	53.17	57.99
Prob> χ^2	0.0041	0.0019	0.0019	0.0000	0.0001	0.0000
N	265	265	265	259	259	259

* Tobit estimation with robust standard errors

z-stats in parentheses; PCVn = nth principal component variable

is high. I interpret this to mean that local government responds to demand for local health services, as well as to indicators of poor public health. But where very few health care services exist, people may be ignorant about their benefits and not demand health investment, leading local government to invest less. Second, and interestingly, investment is progressive in *Economic* terms according to both PCVs in all three models; health investment increases as wealth and income fall, and as family size and poverty measures rise. This is the opposite of the usual, expected pattern, where investment is higher in wealthier municipalities.

Civil institution and private sector PCVs are also significant in these models, with the same signs as for central government. This indicates that both civic groups and private sector firms are successful in lobbying local government to increase/decrease investment as they prefer. Municipalities which acquire IT systems invest more in health, perhaps because IT helps them to execute complex health projects, though as we shall see this result is not repeated in any other sector. Municipalities subjected to *Central Government Auditing* and similar external pressures invest less in health, and municipalities where the local council is strong and active and the mayor relatively weak invest more. Note that the interacted *Needs-Training* variables are insignificant in all three models, reinforcing the conclusion that training has no effect on investment. Curiously, the presence of a *Local Health Authority* also has no effect on investment, either before and after decentralization.

Water & Sanitation

Figure 3 shows few determinants for central government investment in water & sanitation.

Investment increased with the number and strength of civil institutions, indicating – as in health – their success in lobbying the center for resources. But no other variables in the four models are significant. In particular, central government does not seem to have responded to any of our five measures of local need.

Decentralized investment in water is quite different. All indicators of need are significant. Investment rises as *% Population Without Sewerage* rises, and falls with the square of this term. The trend holds across different measures of population without sewerage. This implies investment that increases in need up to a high level of deprivation,¹¹ beyond which it falls again, signaling the existence of a poverty trap where existing levels of provision are extremely low. Investment also rises with *Public Urinals Per Capita*,

¹¹ The implied inflection point is about 92% of the population without sewerage.

the lowest level of public sewerage available in poor communities. It is likely that the presence of urinals in such communities helps to build grass-roots support for further investment by showing people the benefits of sewerage. Investment decreases with the percentage of people who already have private sewerage, additional evidence that investment is concentrated where need is greatest. The models are robust to alternative specifications.

Of the main variables of interest, both *Municipal Administration* and central auditing are consistently significant across our models. Investment rises where districts have a strong municipal council, whereas the PCV for robust municipal rules and procedures is not significant. Central auditing and budgeting systems that operate in the municipality are also associated with rising investment. None of the other institutional or procedural variables seems to affect local government investment, nor does the interacted needs-training term.

Figure 5

Independent Var	Model*							
	Central Government				Local Government			
	I	II	III	IV	I	II	III	IV
<i>Demographic & Regional Controls?</i>	YES	YES	YES	YES	YES	YES	YES	YES
Economic PCV1	0.00512 (0.780)	0.00281 (0.472)	0.00311 (0.504)	0.00524 (0.804)	0.00348 (3.313)	0.00292 (2.949)	0.00286 (2.843)	0.00371 (3.384)
Economic PCV3	-0.0115 (-0.944)	-0.0103 (-0.913)	-0.0104 (-0.844)	-0.0112 (-0.898)	-0.0029 (-2.320)	-0.0023 (-1.909)	-0.0025 (-2.004)	-0.003 (-2.314)
Political Protest Vote PCV1	-0.0131 (-0.776)	-0.0139 (-0.837)	-0.0135 (-0.801)	-0.0131 (-0.770)	0.00133 (0.918)	0.00162 (1.117)	0.00142 (0.958)	0.00114 (0.761)
Civil Institutions PCV1	0.01931 (2.857)	0.01897 (2.830)	0.01911 (2.819)	0.01878 (2.797)	-0.0002 (-0.233)	-0.0003 (-0.265)	-0.0002 (-0.216)	-0.0003 (-0.292)
Private Sector PCV1	0.00177 (0.213)	0.00132 (0.186)	0.00162 (0.241)	0.0018 (0.211)	-0.0019 (-0.819)	-0.0032 (-1.429)	-0.0025 (-1.131)	-0.0021 (-0.952)
Training & Capacity Building PCV1	0.00993 (1.114)	0.00979 (1.094)	0.00979 (0.405)	0.01226 (0.503)	0.00109 (1.055)	0.00094 (0.909)	0.00016 (0.050)	0.00208 (0.709)
Information Technology PCV1	-0.0142 (-1.393)	-0.0151 (-1.449)	-0.015 (-1.430)	-0.0128 (-1.263)	-0.0004 (-0.303)	-0.0006 (-0.449)	-0.0006 (-0.464)	-0.0001 (-0.074)
Central Gov Auditing PCV1	0.01542 (1.353)	0.01606 (1.450)	0.01602 (1.451)	0.01484 (1.281)	0.0039 (2.029)	0.00398 (2.165)	0.00419 (2.246)	0.00418 (2.125)
Municipal Administration PCV1 (Robust Guidelines)	0.01125 (1.055)	0.01084 (1.023)	0.01087 (1.032)	0.01181 (1.092)	-0.0022 (-1.432)	-0.002 (-1.345)	-0.0019 (-1.290)	-0.0021 (-1.353)
Municipal Administration PCV2 (Strong Municipal Council)	-0.0114 (-1.151)	-0.0112 (-1.192)	-0.0111 (-1.147)	-0.0108 (-1.082)	0.00176 (1.549)	0.00207 (1.817)	0.0019 (1.662)	0.00201 (1.691)
Project Planning PCV1	0.00519 (0.629)	0.00553 (0.638)	0.00529 (0.624)	0.00481 (0.595)	0.00116 (0.892)	0.00084 (0.650)	0.0011 (0.854)	0.00092 (0.687)
% Pop. w/out Sewerage 1	0.00141 (0.298)			0.00164 (0.338)	0.00145 (2.408)			0.00153 (2.480)
% Pop. w/out Sewerage 1, Square of	-4E-06 (-0.110)			-6E-06 (-0.148)	-8E-06 (-1.850)			-8E-06 (-1.920)
% Pop. w/Private Sewerage**		-4E-05 (-0.022)				-0.0004 (-2.888)		
% Pop. w/out Sewerage 2,			0.00025 (0.187)				0.00028 (2.045)	
Public Urinals per capita				1.0385 (0.045)				4.69693 (3.057)
Needs-training interacted			1.3E-06 (0.003)	-3E-05 (-0.088)			1.3E-05 (0.308)	-2E-05 (-0.458)
constant	-0.3197 (-1.758)	-0.2358 (-3.338)	-0.2558 (-2.432)	-0.3246 (-1.783)	-0.0417 (-1.843)	0.02773 (6.270)	-0.0007 (-0.062)	-0.0447 (-1.938)
sigma	0.16295 (4.612)	0.16327 (4.617)	0.16319 (4.585)	0.1628 (4.623)	0.02775 (11.48)	0.02788 (11.58)	0.02799 (11.77)	0.0277 (11.18)
χ^2	51.13	50.76	50.81	49.16	35.97	33.67	31.37	37.95
Prob> χ^2	0.0000	0.0000	0.0000	0.0002	0.0046	0.0060	0.0180	0.0060
N	276	276	276	268	269	269	269	261

* Tobit estimation with robust standard errors

z-stats in parentheses; PCVn = nth principal component variable

** Includes septic tanks, outhouses, etc.

Education

Figure 6

Ind. Var	Model*							
	Central Government				Local Government			
	I	II	III	IV	I	II	III	IV
<i>Demographic & Regional Controls?</i>	YES	YES	YES	YES	YES	YES	YES	YES
Economic PCV1	0.00462 (1.489)	0.00415 (1.360)	0.00484 (1.522)	0.00471 (1.415)	-0.0017 (-1.695)	-0.0016 (-1.652)	-0.0017 (-1.718)	-0.0013 (-1.420)
Economic PCV3	-0.0007 (-0.184)	-0.0002 (-0.054)	-0.0007 (-0.203)	-0.0015 (-0.417)	0.00161 (0.997)	0.00172 (1.086)	0.00173 (1.105)	0.00174 (1.046)
Political Protest Vote PCV1	-0.0185 (-2.198)	-0.0183 (-2.198)	-0.0189 (-2.231)	-0.0167 (-2.171)	-0.0003 (-0.142)	-0.0004 (-0.176)	-0.0004 (-0.193)	-0.0012 (-0.566)
Civil Institutions PCV1	0.00865 (2.459)	0.00885 (2.507)	0.00875 (2.489)	0.00875 (2.520)	0.00338 (1.986)	0.00347 (2.078)	0.00344 (2.033)	0.00307 (1.923)
Private Sector PCV1	0.00024 (0.144)	0.00033 (0.204)	0.00033 (0.206)	0.00116 (0.786)	-0.0054 (-2.012)	-0.0055 (-2.037)	-0.0054 (-1.995)	-0.0065 (-1.883)
Training & Capacity Building PCV1	-0.0004 (-0.061)	0.00213 (0.682)	0.00226 (0.725)	0.00381 (0.483)	0.00161 (0.533)	0.00218 (1.615)	0.00221 (1.639)	0.00185 (0.593)
Information Technology PCV1	-0.0055 (-1.220)	-0.0054 (-1.203)	-0.0055 (-1.206)	-0.0059 (-1.263)	-0.0021 (-1.312)	-0.002 (-1.268)	-0.002 (-1.311)	-0.0014 (-0.896)
Central Gov Auditing PCV1	0.01288 (2.899)	0.01317 (2.912)	0.01235 (2.720)	0.01029 (2.345)	-0.0019 (-0.967)	-0.002 (-1.056)	-0.0021 (-1.076)	-0.0023 (-1.084)
Municipal Administration PCV1 (Robust Guidelines)	-0.0057 (-1.205)	-0.0056 (-1.190)	-0.0059 (-1.250)	-0.0067 (-1.313)	0.00117 (0.819)	0.00127 (0.896)	0.00119 (0.838)	0.00161 (1.092)
Municipal Administration PCV2 (Strong Municipal Council)	0.00679 (1.682)	0.00669 (1.649)	0.00719 (1.750)	0.0064 (1.711)	-0.0008 (-0.532)	-0.0008 (-0.539)	-0.0008 (-0.510)	-0.0004 (-0.308)
Project Planning PCV1	0.00243 (0.568)	0.00241 (0.568)	0.0022 (0.518)	0.00084 (0.181)	-0.0001 (-0.095)	-0.0002 (-0.153)	-0.0003 (-0.184)	0.00021 (0.146)
Illiteracy Rate (Adult)	0.0003 (0.462)				0.00058 (1.958)			
Illiteracy Rate (Over-6s)		1.8E-06 (0.002)				0.00065 (1.822)		
Illiteracy Rate (Over-15s)			0.00059 (0.788)				0.0006 (1.766)	
Educational Attainment, Low (0-3 years)				0.00125 (1.552)				0.00082 (2.476)
Educational Attainment, University				0.00114 (0.537)				0.00252 (1.093)
Local Education Authority	-0.027 (-1.803)	-0.0265 (-1.764)	-0.0268 (-1.785)		0.0089 (1.810)	0.0084 (1.726)	0.00867 (1.777)	
Needs-Training Interacted 1	8.2E-05 (0.409)				1.7E-05 (0.197)			
Needs-Training Interacted 2				-6E-05 (-0.213)				-4E-06 (-0.038)
constant	-0.086 (-2.452)	-0.077 (-2.268)	-0.0954 (-2.483)	-0.1737 (-2.437)	0.02294 (1.978)	0.02377 (2.065)	0.02208 (1.705)	-0.0107 (-0.443)
sigma	0.05658 (4.674)	0.05672 (4.661)	0.05656 (4.716)	0.05782 (4.510)	0.03645 (13.13)	0.03649 (13.08)	0.03647 (13.20)	0.03647 (13.09)
χ^2	32.20	31.94	32.39	30.91	34.74	34.20	34.47	35.08
Prob> χ^2	0.0208	0.0153	0.0134	0.0295	0.0102	0.0079	0.0073	0.0092
N	276	276	276	275	269	269	269	269

* Tobit estimation with robust standard errors

z-stats in parentheses; PCVn = nth principal component variable

Central investment in education showed no discernible relation to need. I use a variety of indicators of *Illiteracy* and *Educational Attainment*, but none is significant. Interestingly, the presence of a *Local Educational Authority* caused investment to fall under central government. This implies that the center went out of its way to deprive of resources those districts where sectoral authorities were in operation, a perverse result. As with health and water, investment increased with the strength of local civil institutions, implying that the grass roots were able to lobby the center successfully for investment in education. I discount the central auditing, municipal administration and *Political Protest Vote* coefficients as spurious correlations. Note that unlike health, the private sector PCV is not significant anywhere.

Decentralized investment patterns, once again, are very different. Investment rises with indicators of need across all models, including various measures of illiteracy and educational attainment. The presence of local health authorities is also significant here, but now positive as we would expect. It is also notable that investment rises as wealth and income fall, making local education investment economically progressive. As in health, investment rises in all three sectors where civil institutions are stronger, and falls in measures of the private sector. This signals the existence of a healthy local political economy, where groups lobby for the sorts of investment that interest them most.

Urban Development

Very few municipalities received any investment in urban projects before 1994, with only 24 non-zero observations for central government investment. Hence I reduce the number of explanatory variables in each model by dividing the Z vector into two subvectors, Z^1 and Z^2 ,¹² and estimate

$$G_m = \zeta S_m + \eta^1 Z_m^1 + \varepsilon_m \quad \text{and} \quad (2')$$

$$G_m = \zeta S_m + \eta^2 Z_m^2 + \varepsilon_m \quad (2'')$$

separately using the same needs variables, as well as economic, demographic and regional controls in each model.

¹² Where, using the notation of equation (2), $Z^1 = Z_1 - Z_7$ and $Z^2 = Z_1 - Z_3 \ \& \ Z_8 - Z_{11}$.

Figure 7

Independent Var	Model*					
	Central Government				Local Government	
	I	II	III	IV	I	II
<i>Demographic & Regional Controls?</i>	YES	YES	YES	YES	YES	YES
Economic PCV1	-0.0043 (-0.099)	-0.0232 (-0.361)	-0.0229 (-0.536)	-0.0763 (-1.262)	0.003124 (2.759)	0.003575 (3.061)
Economic PCV3	-0.0954 (-0.965)	0.11492 (0.879)	-0.1006 (-1.117)	0.06418 (0.570)	-0.00477 (-2.777)	-0.00449 (-2.561)
Political Protest Vote PCV1		-0.4303 (-2.114)		-0.3555 (-1.867)	-0.00542 (-2.022)	-0.00575 (-2.319)
Civil Institutions PCV1		0.11442 (1.839)		0.13407 (2.096)	0.002936 (1.000)	0.002915 (0.910)
Private Sector PCV1		-0.0704 (-0.958)		-0.0325 (-0.671)	0.013894 (2.080)	0.013566 (2.011)
Training & Capacity Building PCV1		0.07368 (1.145)		0.0798 (1.201)	-7.2E-05 (-0.050)	0.000118 (0.085)
Information Technology PCV1	0.0923 (1.488)		0.13464 (2.050)		0.000428 (0.294)	0.000988 (0.704)
Central Gov Auditing PCV1	0.15289 (1.481)		0.19215 (1.450)		0.001128 (0.631)	0.000324 (0.168)
Municipal Administration PCV1 (Robust Guidelines)	-0.048 (-0.575)		-0.0737 (-0.706)		0.000886 (0.527)	0.000806 (0.494)
Municipal Administration PCV2 (Strong Municipal Council)	-0.2028 (-2.327)		-0.1886 (-2.230)		0.000206 (0.148)	0.000578 (0.424)
Project Planning PCV1	-0.0056 (-0.059)		0.03371 (0.319)		-0.00033 (-0.239)	-0.00069 (-0.504)
Sports Facilities per capita** (1994)	-1989.9 (-0.841)	-1240.5 (-0.327)			9.555442 (3.473)	
Solid Waste Disposal sites (Landfills) per capita (1994)	-1620.1 (-0.464)	-32251 (-1.744)			135.2504 (2.002)	
Museums per capita (1994)	-376.88 (-0.378)	-2326.5 (-0.705)			40.59828 (1.869)	
Markets per capita (1994)	-41.835 (-1.033)	-647.89 (-1.119)			0.186157 (2.517)	
Commercial & Recreational Infra. (aggregate, per cap 1994)			-3.5377 (-0.804)	-19.14 (-0.919)		0.19468 (1.920)
Needs-training interacted		118.697 (0.074)			17.92777 (2.158)	
constant	-1.6378 (-3.341)	-1.783 (-2.704)	-1.7413 (-3.102)	-1.7514 (-2.571)	0.048671 (9.671)	0.048174 (8.904)
sigma	0.72378 (4.185)	0.65308 (2.802)	0.75333 (4.170)	0.71266 (2.721)	0.034031 (11.265)	0.033904 (11.225)
χ^2	56.89	54.63	51.15	43.76	92.31	83.09
Prob> χ^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N	273	257	269	255	245	244

* Tobit estimation with robust standard errors

z-stats in parentheses; PCVn = nth principal component variable

** Defined as other than football fields, multi-use courts and coliseums

Urban development is the only sector where central government seems to have invested progressively in terms of need. Of the five indicators of need employed, one – *Solid Waste Disposal (Landfills)* – is significant in one of the models. Its negative sign implies that the center invested more where such facilities were more scarce, and hence where need was greater. But no other needs indicator is significant, and landfills is insignificant in model 1. Evidence for progressiveness is thus weak. Civil institutions seem to have increased central investment where they are abundant, but the private sector variable, surprisingly, is insignificant.

Investment under decentralization shows a very different pattern. All five variables of need are significant and positive, implying that local government invests more where existing infrastructure is in abundance, and investment is regressive in terms of need. These results are supported by the economic variables, which are significant and strongly regressive; investment rises as wealth and income rise, and falls where poverty is greater. As we would expect, investment rises with the number and dynamism of private sector firms, which I ascribe to firms lobbying for the type of projects (*i.e.* contracts) from which they stand to gain. It is notable that the variable for political disaffection and protest is significant and negative. Given the pattern of local investment we observe, I interpret this as an indication that voters are successful in at least partially reducing resource flows to a sector in which investment is generally regressive and largely benefits firms. This describes a local political economy with a healthy dynamic in which different interests compete for resources, and – crucially – voters and non-business interests can affect policy decisions. Given the number of municipalities that invest in this sector and the scale of resources involved, this is an important result.

Of the remaining coefficients only the interacted need-training variable is significant. Like pure indicators of need above, it is also regressive. Although training seems to have no direct effect on investment, to the extent that it makes local government more aware of need it may make investment more regressive.

Water Management

Figure 8

Ind. Var	Model*								
	Central Government						Local Government		
	I	II	III	IV	V	VI	I	II	III
<i>Demographic & Regional Controls?</i>	YES	YES	YES	YES	YES	YES	YES	YES	YES
Economic PCV1	-0.0161 (-1.366)	-0.0184 (-1.226)	-0.0126 (-0.992)	-0.0094 (-0.622)	1.3E-06	-0.0069 (-0.618)	0.0013 (1.956)	0.00114 (1.405)	0.00078 (1.259)
Economic PCV3	-0.0167 (-1.130)	-0.0385 (-2.684)	-0.0175 (-0.995)	-0.0569 (-2.529)	-0.0423 (-2.167)	-0.0427 (-2.436)	-0.0029 (-3.050)	-0.003 (-2.762)	-0.0019 (-2.174)
Political Protest Vote PCV1		-0.0784 (-1.752)		-0.1176 (-2.161)		-0.0808 (-1.822)	-0.0023 (-1.855)	-0.0021 (-1.675)	-0.0024 (-1.887)
Civil Institutions PCV1		-0.0094 (-0.913)		-0.0199 (-1.238)		-0.0087 (-0.661)	0.0012 (1.732)	0.00088 (1.352)	0.00149 (1.868)
Private Sector PCV1		0.00553 (0.867)		-0.0113 (-0.251)		0.00671 (0.825)	0.0004 (0.517)	0.00538 (1.395)	-0.0002 (-0.276)
Training & Capacity Building PCV1		-0.1254 (-1.962)		-0.1075 (-1.381)		0.00046 (0.020)	0.00237 (0.964)	0.00499 (1.593)	0.0004 (0.505)
Information Technology PCV1	0.01334 (0.769)		0.01093 (0.565)		0.01512 (0.772)		-0.0004 (-0.448)	-0.0007 (-0.799)	-0.0006 (-0.640)
Central Gov Auditing PCV1	0.00603 (0.305)		0.0116 (0.510)		8.9E-05 (0.005)		-0.0016 (-1.596)	-0.0011 (-1.157)	-0.0009 (-0.981)
Municipal Administration PCV1 (Robust Guidelines)	-0.0233 (-1.375)		-0.0315 (-1.843)		-0.0224 (-1.391)		0.00079 (0.911)	0.00116 (1.306)	0.00106 (1.264)
Municipal Administration PCV2 (Strong Municipal Council)	0.04589 (1.904)		0.04313 (1.725)		0.03772 (1.691)		0.00072 (0.853)	0.00105 (1.146)	0.00105 (1.244)
Project Planning PCV1	0.00562 (0.260)		-0.0028 (-0.132)		-0.0045 (-0.219)		-0.0003 (-0.387)	-0.0007 (-0.718)	-0.0008 (-0.790)
Local Health Authority	0.63796 (3.313)	0.85599 (2.776)	0.65894 (3.111)	1.10805 (2.916)	0.68496 (3.235)	0.89958 (2.863)	0.00297 (0.470)	0.00503 (0.707)	0.0019 (0.287)
% Pop. w/out Sewerage 1	-0.0179 (-2.739)	-0.0055 (-0.828)	-0.0057 (-1.492)	-0.0049 (-1.281)			0.00178 (3.106)	0.00026 (1.753)	
% Pop. w/out Sewerage 1, Square of	0.0001 (2.658)	1.5E-05 (0.243)					-1E-05 (-2.816)		
% Pop. w/out Sewerage 2					-0.0047 (-1.486)	-0.0039 (-1.324)			0.00023 (2.045)
% Pop. w/out Water 1			0.00316 (0.645)	0.01223 (1.197)				0.00188 (4.215)	
% Pop. w/out Water 1, Square of			-3E-05 (-0.798)	-9E-05 (-1.085)				-1E-05 (-4.068)	
% Pop. w/out Water 2	0.001 (0.799)	0.00088 (0.773)					-0.0001 (-1.468)		
% Pop. w/Water (Internal Plumbing)					-0.0029 (-0.965)	-0.0034 (-1.043)			4.9E-07 (0.003)
% Pop. w/Private Standpipe					0.00026 (0.153)	-0.0005 (-0.275)			0.00032 (1.639)
% Pop. w/Public Standpipe					-0.0148 (-2.676)	-0.01 (-1.773)			0.00042 (2.114)
Storm Drainage per capita (1994)			-298.46 (-1.049)	-297.96 (-0.563)				-16.668 (-0.857)	
Needs-Training Interacted 1		0.00182 (1.834)					-3E-05 (-0.849)		
Needs-Training Interacted 2				0.00152 (1.335)				-6E-05 (-1.440)	

Ind. Var	Model*						Local Government		
	I	II	III	IV	V	VI	I	II	III
constant	-0.2879 (-1.633)	-0.9658 (-2.189)	-0.6264 (-2.743)	-1.5882 (-2.674)	-0.5857 (-3.408)	-0.8976 (-3.194)	-0.0669 (-2.832)	-0.084 (-3.680)	-0.0321 (-2.234)
sigma	0.16573 (2.978)	0.17072 (2.809)	0.17567 (3.096)	0.19856 (3.015)	0.16219 (2.936)	0.17232 (2.762)	0.0173 (6.649)	0.01738 (6.793)	0.01751 (6.936)
χ^2	30.85	29.83	25.51	21.32	32.36	27.53	79.86	84.40	72.99
Prob> χ^2	0.0092	0.0125	0.0613	0.1664	0.0090	0.0247	0.0000	0.0000	0.0000
N	300	282	294	275	300	282	269	263	269

* Tobit estimation with robust standard errors

z-stats in parentheses; PCVn = nth principal component variable

The water management sector is related to water & sanitation, but is broader in scope. It includes such projects as reservoirs and wastewater treatment lagoons, which are components of municipal (potable) water systems, as well as levees and storm drainage works, which are not. In general the degree of overlap between the two sectors is high, and I use similar indicators of need for both. As for urban projects, central government invested in water management in very few municipalities prior to 1994, and so again I estimate equations (2') and (2'').

The striking result in models I-VI is that those needs variables that are significant are negative, and hence regressive in terms of need. As more people had no water in their homes (*i.e.* rely on public standpipes) and as the proportion of people without sewerage grew, central government invested less in water. This trend is marked, with three indicators significant at the 1% level and one more at the 10% level. This finding is confirmed by the second economic indicator, which shows that investment fell as measures of poverty increased. Interestingly, the presence of a local health authority served to increase investment in all six models. The fact that this term is insignificant in the decentralization models implies that local health authority lines of communication and influence are sectoral more than geographic. That is, they were better able to lobby central government – presumably through their ministerial representatives in the capital – than their own, local representatives. The fact that local health authorities are generally composed of chief physicians and hospital managers who are often devolved ministerial staff, and hence “foreign” to the locality, may explain this pattern. Indicators of municipal government, *Training & Capacity Building*, and the political protest vote are also significant, but I dismiss these as spurious correlations.

Once again, the results for decentralized government are completely different. Local government invested greater sums in municipalities where people lacked running water and sewerage. The models are robust to the several measures of water and sewerage provision used. A series of indicators in increasing quality of service (model III) reveals a progressive pattern of investment that increases where households receive water from public or private standpipes and then falls to zero where the proportion of households with internal plumbing is high. But significant squared terms of population without water and sewerage point to a poverty trap for the neediest localities.¹³ I interpret these results to indicate a virtuous cycle where knowledge of the benefits of water and sanitation spreads through a population via a demonstration effect. But where existing infrastructure is below some critical threshold, voters remain ignorant and do not pressure their local government for investment.

This interpretation is supported by the coefficients for civil institutions, which imply that strong local organizations succeed in pressing local government to invest more in water projects. As we found for urban projects, the indicator of electoral protest is negative and significant, implying that local governments without a strong electoral base are unable to undertake the expensive and complicated projects of the water sector. No other institutional or procedural variables are significant.

Agriculture

The models of central investment in agriculture are significant at the 10% and 30% levels respectively, and hence I discount the second and interpret the results of the first with extra care. The evidence is that central government invested regressively in terms of need, with *Malnutrition Rate, Female* negative and just significant, and *Malnutrition Rate, Male* approaching significance. The data thus weakly suggest that central government invested less where levels of malnutrition were higher. On the other hand, civil institutions were able to increase investment where they are abundant and well organized. Unsurprisingly the indicator of the private sector, which excludes private farming of all types, is not significant, nor are economic variables.

¹³ Implied inflection points are around 65% of the population without access to water and 80% without access to sewerage.

Figure 9

Independent Var	Model*			
	Central Gvt.		Local Gvt.	
	I	II	I	II
<i>Demographic & Regional Controls?</i>	YES	YES	YES	YES
Economic PCV1	0.00983 (0.773)	0.0080 (0.611)	-0.0007 (-1.690)	-0.0005 (-0.919)
Economic PCV3	-0.0048 (-0.190)	-0.0112 (-0.457)	0.00015 (0.286)	-0.0009 (-0.752)
Political Protest Vote PCV1	-0.0091 (-0.270)	-0.0262 (-0.847)	-0.0001 (-0.156)	-0.0026 (-1.139)
Civil Institutions PCV1	0.02137 (1.703)	0.02504 (1.942)	0.00023 (0.528)	0.00043 (0.818)
Private Sector PCV1	0.00973 (0.922)	0.0072 (0.664)	-0.0012 (-1.896)	-0.0016 (-1.748)
Training & Capacity Building PCV1	0.11584 (2.238)	0.02446 (1.208)	-0.0007 (-0.311)	0.00076 (1.093)
Information Technology PCV1	-0.0243 (-1.053)	-0.0304 (-1.234)	0.00083 (1.219)	0.00081 (0.919)
Central Gov Auditing PCV1	0.03112 (1.291)	0.03264 (1.313)	4.2E-06 (0.007)	0.0002 (0.247)
Municipal Administration PCV1 (Robust Guidelines)	-0.0029 (-0.160)	-0.0003 (-0.017)	0.00042 (0.756)	-0.0007 (-0.720)
Municipal Administration PCV2 (Strong Municipal Council)	-0.0095 (-0.399)	-0.0085 (-0.362)	1E-05 (0.021)	-0.0006 (-0.693)
Project Planning PCV1	0.01359 (0.720)	0.0104 (0.504)	0.00036 (0.723)	-4E-05 (-0.061)
Malnutrition Rate, Males	-0.0092 (-1.410)		0.00034 (1.963)	
Malnutrition Rate, Females	-0.0084 (-1.639)		-9E-05 (-0.776)	
Slaughterhouses per capita (1994)	-60.953 (-1.120)	-63.316 (-1.055)	-1.4784 (-2.047)	-2.2122 (-2.014)
Municipal Nurseries per capita (i.e. Plants - 1994)		-391.03 (-1.007)		-25.21 (-1.978)
Needs-training interacted	-0.0039 (-1.677)		4.2E-05 (0.407)	
constant	0.05426 (0.420)	-0.3183 (-4.189)	0.00129 (0.313)	0.00589 (1.779)
sigma	0.34342 (6.301)	0.36165 (6.520)	0.01203 (6.564)	0.01848 (4.911)
χ^2	27.78	19.61	36.06	31.79
Prob> χ^2	0.0878	0.2946	0.0104	0.0160
N	263	274	257	267

* Tobit estimation with robust standard errors

z-stats in parentheses

PCVn = nth principal component variable

By contrast, local government invests more where more males are malnourished,¹⁴ where there are fewer municipal *Slaughterhouses*, and where *Municipal Nurseries* are scarce. Local investment is thus progressive in terms of need. These results are weakly supported by the first economic variable, which suggests in one of the two models that investment falls as wealth and income increase. Investment falls with measures of private sector activity in both models, which is not surprising as explained above, and points to a healthy local political economy where competing interests lobby for the types of investments they most prefer.

3.3 Results – Summary

Detailed econometric models of investment across six sectors show how public investment decisions changed with decentralization, and provide insight into the social and institutional mechanisms by which these changes took place. Decentralization changed the policy regime from one where central government invested less where need was greater to one where local government invests more. Whereas the center invested regressively in terms of need in three sectors: health, water management and agriculture, local government invests progressively in terms of need in five of these six: health, water & sanitation, education, water management and agriculture. Indeed, local investment is regressive only for urban development. The fact that local investment was *economically* progressive in health, education and agriculture increases confidence in these findings.

So far the results confirm those of Faguet (2001), albeit in greater detail. But the models also allow us to probe much more deeply into the decision-making processes which led to this change, giving us insight into the political and institutional dynamics of local government and their effects on policy. Variables for civil institutions and the private sector are significant across a number of sectors and imply that each is successful in pressing local government to increase investment in those areas of greatest interest to it. Thus, local firms successfully lobby for lower investment in health, education and agriculture in districts with a vigorous private sector in order that more resources may be devoted to urban development, a sector which

¹⁴ Interestingly, female malnourishment seems to have no significant effect.

offers them many more lucrative contracts than training farmers or refurbishing schools.¹⁵ And civil organizations, representing civil society via neighborhood organizations, rural syndicates and other grass roots groups, succeed in getting local government to increase investment in health, education and water, their areas of highest priority. The fact that the variable for political disaffection and protest enters negatively in our model of urban development, where investment is strongly regressive both economically and in terms of need, suggests a healthy picture of local democracy in which voters are able to influence local government through both their civil institutions and the electoral mechanism. Where local government works well, even the poorest citizens have voice and may participate in the policy debate, providing an effective counterweight to the power of private firms and government's own politico-bureaucratic interests.

It is thus not surprising that local government is sensitive to local need. The competitive interplay of local political forces ensures that the local administration will be well informed about voters' preferences. And binding mechanisms exist to ensure accountability.

The type of municipal administration, though less important than the interplay of political forces, does seem to affect local investment in interesting ways. A strong, activist municipal council is associated with increasing investment in health and water, two sectors where investment is progressive in terms of need and which civil organizations favor. This combination of results suggests that a strong council serves the governance process by effectively transmitting demand from the grass-roots up to the level of decision-making, resulting in investment more closely aligned with people's preferences. This argues against the common claim that robust oversight mechanisms obstruct government action, whereas a strong executive

¹⁵ It may at first glance seem perverse that local business would be associated with decreasing levels of educational investment, implying a less skilled workforce. But the time inconsistency between local firms facing a high failure rate (in Bolivia as elsewhere), and social projects whose full benefits may lag by a generation or more, leads firms to prefer investment in urban development, where the benefits are large and immediate. Businessmen may rationally prefer useless urban projects that ensure them a few years', or even months', survival over projects with a much higher social return but where the contracts are less generous.

promotes agile government. Indeed the first municipal administration PCV, representing a strong executive and clear operating procedures, is not significant in any of the main sectors of interest.

The results for IT, training and capacity building, *Project Planning*, and central government auditing are mostly insignificant, with the few coefficients that are significant and not self-contradictory scattered unsystematically amongst the various sectors.¹⁶ This is interesting precisely because it is counter-intuitive – indeed, I expected the opposite. In the case of IT, it could be that the types of investments undertaken by the majority of Bolivian municipalities are insufficiently complex to take full advantage of the technology, and thus it will take some time for its full potential to be realized. Given high rates of obsolescence, the necessary implication is that a significant part of the investment undertaken in IT systems to date was at best premature. In the case of training and capacity-building, I have at my disposal 29 indicators of training programs undertaken and requested. If the models have failed to detect a significant effect in any sector, it is likely that there is none to be detected, at least with current data. The same is true for project planning techniques.

Lastly I return to my models of central government, where civil institutions increased investment in health, water, education, urban development and agriculture, and the private sector decreased investment in health. I interpret this as evidence that a political-economy dynamic was also at work there, with municipal forces competing for influence over central government resources. But the fact that central investment was regressive both economically and in terms of need, as well as concentrated in a minority of municipalities, indicates that the center was much less sensitive to local political forces and local priorities than decentralized government. Although a local political dynamic did operate under the former, and managed to influence policy, it did so with much lower efficacy and a correspondingly smaller effect on government outputs. But this begs the question of decentralization: If the center attempts to take account of local politics in its provision of public services but does so ineffectively, then why not decentralize? Why run a system

¹⁶ Project planning is not significant in any of the main sectors of interest, training approaches significance in one, IT achieves it only in health, and central auditing seems to increase investment in water but decrease it in health.

where government's response to local priorities is muted by distance, incentives, and (geographically) extraneous political considerations?

4. Conclusions

This paper differs from the standard literature on decentralization in its use of empirical models of investment to peer into the black box of local government decision-making and unpack its institutional dynamic. As a rule the existing literature, both theoretical and empirical, pays very little attention to how local government operates, with most authors assuming (implicitly or explicitly) that bringing government "closer" to the governed somehow increases the weighting on local preferences in policy selection. Through six sectoral models of local government investment I seek to shed light on the social forces that compete for power locally, the political dynamic to which this competition gives rise, and the characteristics of the institutions through which these forces shape policy-making at the local level. I seek to provide systematic and generalizable evidence of the micro-political foundations of local government decision-making.

What conclusions can we draw from the results? Decentralization in Bolivia was largely a process in which the center empowered municipal governments, which it then could not control. Given the center's performance during the years leading up to decentralization, it is not surprising that the reform worked best in the smaller, poorer, more distant communities, as these are precisely those where the central state was most weakly represented, when it existed at all. As smaller districts are the ones which disproportionately drive the changes documented above, understanding local government dynamics there is equivalent to understanding why decentralization works. My results provide a good point of entry. Strong civil institutions cause municipalities to raise investment in the social sectors, whereas strong private sector firms decrease investment in the social sectors and increase it in urban development. Far from contradictory, this should be taken as a sign that the local political economy is developing along healthy lines in Bolivia's towns, with interests groups competing to obtain the outcomes each prefers. A local administrative regime characterized by a strong, activist municipal council working with a relatively weak mayor is also associated with more investment in social projects. And political disaffection and protest decreases investment in sectors where projects are very expensive and where investment tends to be regressive. These results paint a picture of a robust local political economy in which accountability operates through both the electoral

mechanism and interest group lobbies. And the free interplay of these political forces in a context of strong local institutions, especially a representative council transmitting grass-roots demands, is at the heart of successful local government.

It is instructive to contrast the importance of civil institutions and the private sector with the irrelevance of IT, training and capacity building, project planning, and central government auditing. The technocratic approach to institution building and good governance is often to deploy systems and procedural “software” in the place of building the institutions and the legal-political “hardware” necessary to the functioning of a democratic system. This tendency is at least partly due to the difficulty of the latter, and the fact that the former fits well with many donors’ project orientation. We see here direct evidence of the irrelevance of this approach, and of the importance of the interplay between civil and economic forces in the local political regime. This points to a way in which aid priorities can be reordered. Instead of spending on IT, training, and government processes more generally, resources could be invested in measures to secure the foundations of an open political system. This would include improving transparency and strengthening the legal and institutional framework to the point where it can successfully contain the societal pressures which clash therein, and is not torn apart by them. In the absence of such elements, installing information systems and training local officials is unlikely to succeed, and may actually hinder good governance by empowering self-interested agents in a dysfunctional system with inadequate barriers to rent-seeking.

Such an interpretation is intuitively appealing, and coincides with much of the political science literature on the importance of an open, fair and competitive political system. It describes an institutional and legal arrangement, however, which is as available to large, rich districts as it is to those which are small and poor. In order to push our understanding of decentralization further, we must examine the advantages that smaller districts evidently have in its implementation. One likely advantage is transparency. The results point to the role of accountability in policy-making, and transparency is an important component of accountability. In large districts the mayor and councilmen are separated from voters by layers of bureaucracy and by the sheer size and complexity of the city over which they preside. Local politicians can counter the oversight mechanisms designed to keep watch over them with bureaucratic allies of their own. And they can take refuge in a range of municipal activities so great in number and variety that voters cannot reasonably hope to be informed about all of them. Citizens will thus rationally come to expect that public

funds “disappear” in a work program which they neither understand nor expect to see the results of. In small, rural districts, by contrast, the mayor is never far from voters. Her neighbors greet her each morning as she crosses the square. They see her clothes and her manner; they observe her level of effort. They know if she has suddenly become rich. The scale of municipal operations is a much more human one, readily comprehensible by voters, greatly facilitating accountability.

Similarly, and closely related, civil society is likely to be more homogeneous and coherent in small districts than in large ones. Partly this is due to issues of scale and complexity noted above. And partly it is a result of the manner in which people associate in large urban areas versus small towns. In the former, social bonds often form more strongly around occupations, leisure activities, and other geographically non-specific criteria. Accountants know their clients and they know other accountants, and their prosperity depends largely on both groups and not on where they live. In villages and rural areas, by contrast, the environment plays a much larger role in people’s lives, and the axis around which social activity revolves is accordingly geographic. Neighbors make common cause because their fate is tied to the same factors, such as the weather or the change in a river’s course. Where civil society is more unified and willing to work together to achieve consensual goals, accountability will tend to improve as local oversight becomes easier and its cost falls. This point is both subtle and complex, and I only mention it here.

All of this points to the fundamental difference between centralized and decentralized government – incentives. Whether *ex ante*, via the electoral process, or *ex post*, via the oversight and accountability mechanisms outlined above, decentralization fundamentally alters the incentives facing public servants, and thus their performance. Under centralization local investment is carried out by central agents whose interests are firmly aligned with those of their ministerial superiors and their constituency in the center, and not the beneficiaries of the investments for which they are responsible. Under decentralization, by contrast, the beneficiaries of public projects themselves hold the reigns of local power, and determine the future of those they depend on to serve their needs. The incentives of local politicians are thus clearly aligned with those of their voters, and the effect of this is strong enough to appear in national investment trends. Greater transparency and the lower cost of civic action explains why this phenomenon is stronger in smaller districts. In larger districts, issues of size, urban complexity, and the patterns of social relations may conspire to obstruct transparency, and hinder the accountability necessary for effective local government.

There are other explanations for the discrepancy between the performance of small and large municipalities, of course. It is possible that the social structure of smaller, poorer districts is less hierarchical than that of larger districts, and thus less open to domination by a narrow elite. Alternatively, interests of groups on either side of social cleavages such as wealth and race might naturally be more closely aligned in smaller localities, due perhaps to a lower degree of social stratification or a narrower economic base than in large urban areas. The patterns of social relations and social organization would thus affect governance not only through oversight mechanisms, as per above, but via the very preferences which different groups articulate. In either case, arriving at a consensus on how to invest public funds would be easier, and the consensus itself more robust, facilitating local government and contributing to its success. This issue is potentially a very large one, and one that crosses the boundaries of political economy into sociology. Unfortunately it is beyond the scope of this paper. I raise it here as a provocative possibility, and topic for future research.

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Annex 1 – Data Summary

Summary of Principal Component Variables, PCV Constituents, and Needs Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Principal Component Variables					
Economic 1	309	-7.58E-09	3.379288	-5.5154	10.761
Economic 3	309	6.60E-10	1.950959	-6.8422	4.3846
catvi_10	310	12.98603	22.74078	0	91.93
catvi_11	310	9.743513	11.40623	0	76.923
catvi_hi	310	21.45342	20.4527	0	85.893
catvi_lo	310	53.01626	28.3189	0.1603	98.041
catvi_me	310	2.800774	6.003828	0	58.654
cocina	310	63.18565	14.03657	15.138	90.726
comb_hi	309	18.05282	21.35939	0	89.7
comb_lo	309	80.73161	21.95467	2.4997	100
comb_me	309	1.044559	1.860857	0	14.339
comb_otr	309	0.1710101	0.3831445	0	4.1667
cuarto1	310	33.29116	11.54638	10.569	76.514
cuarto2	310	34.75675	8.07081	16.239	76.613
cuarto2f	310	68.04791	11.18261	37.435	95.505
cuarto3	310	17.61446	5.533153	2.7523	31.902
cuarto4	310	8.462401	3.735846	0.4032	18.883
cuarto4m	310	14.33763	6.984188	1.7431	34.756
cuarto5	310	5.875234	3.778269	0	18.358
dorms1	310	75.54401	11.86857	38.859	98.396
dorms2	310	18.96714	7.565	1.6043	38.425
dorms2f	310	94.51115	5.055565	74.934	100
dorms3	310	4.07507	3.498517	0	16.578
dorms4	310	1.014941	1.16489	0	6.1956
dorms4m	310	1.41378	1.66395	0	8.917
dorms5	310	0.3988394	0.5531117	0	4.3393
ecact	310	55.97236	10.76106	15.233	80.622
ecactm	310	38.5921	10.1737	8.1356	60.096
ecdsm	310	18.08835	15.75617	0	100
ecina	310	43.51541	10.89542	19.257	84.767
ecinam	310	62.55553	6.075064	40.87	84.848
ecocum	310	38.8383	10.20898	7.8571	60.507
hogar_ta	310	4.258899	0.7635836	2.04	6.32
partbru	310	43.52524	8.523663	11.61	63.05
ppdorm2	310	37.45356	10.59514	14.793	75.956
ppdorm4	310	33.72842	4.095746	16.279	43.478
ppdorm5	310	28.81803	8.967728	5.3763	58.871
Demogr 1	308	1.22E-09	1.507338	-1.8943	7.413
Demogr 2	308	-2.61E-09	1.260633	-2.7652	5.0168
pobpc.u	308	16.45709	27.28928	0	100
pobpc.r	308	89.4978	110.0184	0	1947.4
rel_cato	310	78.60554	11.02218	26.85	94.858
rel_evan	310	11.92324	8.643937	0.6503	62.183
rel_ning	310	2.507558	1.987785	0	13.657
id_sine	310	0.4922058	0.8702676	0	7.69
id_trad	310	23.18218	20.93228	0	81.408
inmasc	310	102.4356	15.32378	71.17	232.39
Altiplano	310	0.4741935	0.5001409	0	1
Orient	310	0.2580645	0.4382771	0	1
Politics	295	-2.42E-09	1.226105	-3.1397	4.4445
oficial	295	0.8440678	0.3634075	0	1
margen93	306	15.45389	11.62267	0	60.714
nulo93	306	4.20045	3.433944	0	35.949
ausent93	306	139.8737	83.67695	12.766	628.92
ausent95	310	67.93136	28.09571	0.3436	175.61

Variable	Obs	Mean	Std. Dev.	Min	Max
CG Auditing	308	-4.60E-10	1.504751	-1.341	5.6282
fis	308	0.4448052	0.4977529	0	1
inejpr_a	310	0.5774194	0.4947685	0	1
inejpr_m	310	0.1483871	0.356058	0	1
inejpr_s	310	0.4548387	0.4987614	0	1
sisin_ad	310	0.1548387	0.3623357	0	1
sayco	310	0.3516129	0.4782458	0	1
sayco_a	310	0.2967742	0.4575748	0	1
sayco_o	310	0.2483871	0.88839	0	8
Mun Adm 1	303	-2.58E-09	2.089446	-5.5917	6.6973
Mun Adm 2	303	3.49E-09	1.758446	-4.2158	2.7704
alc_co	310	0.8548387	0.3528329	0	1
alc_de	310	0.8096774	0.3931903	0	1
con_co	310	0.4064516	0.4919649	0	1
con_de	310	0.3290323	0.4706214	0	1
cuenpu_a	310	0.1032258	0.3047455	0	1
cuenpu_c	310	0.583871	0.4937124	0	1
cuenpu_o	310	0.4580645	0.4990439	0	1
evte_co	310	0.283871	0.451604	0	1
evte_de	310	0.2258065	0.4187883	0	1
invdir	310	0.3064516	0.4617649	0	1
invpub	310	0.2129032	0.4100217	0	1
manpro_d	310	0.3483871	0.4772297	0	1
manpro_u	310	0.2741935	0.4468283	0	1
otro_co	310	0.0483871	0.2149298	0	1
otro_de	310	0.0580645	0.2342435	0	1
plieg_ad	310	0.8193548	0.3853459	0	1
plieg_ca	310	0.8451613	0.3623357	0	1
plieg_pu	310	0.8483871	0.3592251	0	1
pliego	310	0.7419355	0.4382771	0	1
progcont	310	0.5774194	0.4947685	0	1
regcon	310	0.4612903	0.4993053	0	1
salar_pc	304	1082.977	1205.953	50	8300
salar_co	304	1042.796	1186.592	20	8300
suped_a	310	0.3709677	0.4838449	0	1
suped_c	310	0.5483871	0.4984578	0	1
supsa_a	310	0.3419355	0.4751251	0	1
supsa_c	310	0.5451613	0.4987614	0	1
supsa_o	310	0.5709677	0.4957382	0	1
usmanfun	310	0.3806452	0.4863305	0	1
Pr Planning	310	2.36E-09	1.591479	-2.7175	2.2313
catastur	310	0.1580645	0.3653913	0	1
dpoacoor	310	0.8548387	0.9991384	0	4
dpoaotro	310	0.6967742	1.178964	0	4
epoaham	310	0.8354839	0.3713427	0	1
evalres	310	0.8225806	0.3826409	0	1
idenalc	310	0.7967742	0.4030498	0	1
idencons	310	0.4129032	0.4931518	0	1
idencv	310	0.7322581	0.4434982	0	1
idenpdm	310	0.3741935	0.4846964	0	1
info_ed	310	0.5580645	0.49742	0	1
info_sa	310	0.583871	0.4937124	0	1
pdm94	310	0.3032258	0.4603951	0	1
plan_sye	310	0.583871	0.4937124	0	1
reconu_a	310	0.683871	0.4657157	0	1

Variable	Obs	Mean	Std. Dev.	Min	Max
Civil Insts	303	2.40E-09	2.214992	-2.113	14.531
<i>cv</i>	310	0.6419355	0.4802064	0	1
<i>indig2</i>	310	0.6290323	3.520784	0	51
<i>jvec2</i>	310	8.954839	26.25241	0	247
<i>otbregi</i>	308	34.25	41.30934	0	299
<i>otbregi2</i>	310	46.92258	49.63505	0	339
<i>otbs_e</i>	307	50.22801	59.03749	0	520
<i>otbs_pj</i>	305	43.85574	52.50669	0	416
<i>otbsoli</i>	308	40	43.9176	0	323
Pvt Sector	302	-3.24E-09	1.529804	-0.3015	18.079
<i>eereg_cm</i>	306	202.7255	1229.806	0	14117
<i>eereg_ea</i>	306	0.5555556	2.09727	0	30
<i>eereg_fi</i>	310	2.609677	26.72428	0	454
Training	310	-5.40E-09	1.676235	-2.8227	4.2889
<i>capadpe</i>	310	0.2516129	0.4346415	0	1
<i>capci1</i>	310	0.2	0.4006467	0	1
<i>capci2</i>	310	0.5709677	0.4957382	0	1
<i>capdis</i>	310	0.4870968	0.5006416	0	1
<i>caplemu</i>	310	0.3451613	0.4761895	0	1
<i>caporad</i>	310	0.3	0.4589985	0	1
<i>capprin</i>	310	0.3612903	0.4811511	0	1
<i>capprop</i>	310	0.3903226	0.4886113	0	1
<i>temaorad</i>	310	0.5064516	0.5007667	0	1
<i>temaprop</i>	310	0.4290323	0.4957382	0	1
<i>temadis</i>	310	0.316129	0.4657157	0	1
<i>temacz</i>	310	0.5193548	0.5004331	0	1
IT	310	1.64E-08	1.523458	-1.5591	5.0864
<i>sitotal</i>	310	0.4354839	0.4966218	0	1
<i>siotro</i>	310	0.2225806	0.4166515	0	1
<i>sisin_ad</i>	310	0.1548387	0.3623357	0	1
<i>sisin_ai</i>	310	0.6967742	0.4603951	0	1
<i>sisinidp</i>	310	0.3258065	0.4694331	0	1
<i>sicom</i>	310	0.2806452	0.4500409	0	1
<i>impresor</i>	310	0.2903226	0.8736913	0	10

Variable	Obs	Mean	Std. Dev.	Min	Max
Need Variables (See Database Key)					
sa_minsa	310	32.02643	20.08756	0	85.515
sa_caja	310	5.670032	6.809536	0	41.654
sa_noat	310	11.03071	9.780051	0	62.888
deslev	294	22.03739	6.866404	0	50
dilos	310	0.916129	0.2776424	0	1
sandia2	310	-1.928033	24.44059	-143.9	106.09
sandia1	310	5.874423	66.25567	-161	228.34
sa_ong	310	3.192237	5.423862	0	33.078
analf	310	30.46375	15.82312	5.5	78.7
dile	310	0.5032258	0.500798	0	1
edndia1	310	-0.8299529	57.22902	-222.15	254.76
edana6	310	26.52921	13.1925	6.378	69.718
ed_ana15	310	30.17335	15.69695	5.45	76.7
ni_low	309	60.43372	13.94498	24.507	88.391
ni_univ	309	1.210297	2.366874	0	18.984
edndia2	309	-1.046648	46.17628	-173.02	202.3
sin_alca	310	76.14236	21.88933	14.659	100
sin_alc2	310	6275.256	2919.245	214.87	10000
alca_pr	310	20.24793	20.40181	0	80.818
alca_sin	310	76.27676	21.84184	14.659	100
sbndia1	310	-4.155377	129.5403	-279.55	381.73
mingi4pc	298	0.0001408	0.0006317	0	0.0069
infot4pc	286	0.0000601	0.0005954	0	0.0095
desleo4pc	306	5.05E-06	0.0000217	0	0.0002
museo4pc	307	0.0000197	0.0000834	0	0.0007
merca4pc	304	0.0014271	0.0108282	0	0.1517
uvndia1	286	-0.0000284	0.0003887	-0.0058	0.0016
infr24pc	276	0.0040978	0.0119325	0	0.1522
deslevh	294	23.06979	7.268409	0	57.143
deslevm	294	21.10056	8.681828	0	92.308
matad4pc	307	0.0002166	0.0008352	0	0.0072
agndia1	294	-0.2505279	39.43929	-87.602	116.49
viver4pc	307	0.0000261	0.0001473	0	0.0019
agua_nr	310	67.61759	23.39711	10.452	100
rhndia1	310	-4.155377	129.5403	-279.55	381.73
sin_agua	310	74.34871	21.17225	17.92	100
sin_agu2	310	5974.549	2824.562	321.14	10000
drena4pc	301	0.0000975	0.0010796	0	0.0176
rhndia2	310	-3.57418	128.9131	-281.48	394.54
agua_dv	310	8.967957	10.36443	0	56.45
agua_fv	310	16.70372	13.75046	0	65.934
agua_ft	310	6.710726	7.161523	0	48.224

Annex 2 – Methodology, Including Principal Component Analysis and Interpretation

The surprisingly large amount of information available for Bolivia during the period 1987-1996 demands a strategy for choosing, from among 1200+ variables, those which are most appropriate and most closely related to the underlying concepts I wish to test. In particular, a number of measures in which I am interested are present in my dataset as multiple, finely differentiated variables. I have data on, for example, 16 varieties of capacity-building exercises undertaken by municipalities, and 13 different local actors who assisted in drafting municipal development plans. The challenge is to reduce such groups to at most one indicator each without loss of information.

My empirical strategy is iterative, and begins by finding the best idiosyncratic model of public investment for each of the ten sectors of interest. I fit the equation

$$G_m = \zeta S_m + \eta Z + \varepsilon_m, \quad (A1)$$

separately for central public investment (1991-3) and local public investment (1994-7) where G_m is aggregate investment per capita in the public good subscribed by municipality, S_m is a scalar or vector of the existing stock of public goods of that type (variously defined) at an initial period, and Z is a vector of socio-economic, demographic, regional, political, institutional, administrative and procedural variables which might affect investment decisions. The use of the Z term follows the literature on the demand for public goods exemplified by Bergstrom & Goodman (1973) and Rubinfeld, Shapiro and Roberts (1987) within the context of the available data. In particular, no income data is available at the municipal level in Bolivia, and so I substitute several alternative indicators of income and wealth, for example type of cooking fuel, and housing size, quality and related characteristics. But I expand the scope of the Z vector considerably compared to previous authors by including measures of the strength of local political forces as well as municipal institutional capacity. This innovation allows me to investigate the micropolitical basis of local government decision-making.

No constraints across sectors are allowed on the particular variables admissible in Z . I use the Huber/White estimator of variance to produce consistent standard errors in the presence of non-identically distributed residuals. This produces ten different models of public sector investment, one for each sector. Individually these models are quite satisfactory, with high R^2 and few variables insignificant. But because of

large variation in the specification of the Z vector, comparison across sectors is problematic. Additionally, on a theoretical level these models would seem to assert that public investment in different sectors happens according to different processes, in which different variables intervene. This is evidently unsatisfying.

In a second iteration I re-estimate equation (A1) holding the Z vector constant across all sectors. But I take advantage of the previous stage by using only those variables found significant there; in this sense the previous stage constitutes a method for reducing the 1200+ indicators to a subset of 197. But a dimensionality problem persists even so. I then employ a method of forward and backward substitution and elimination in order to reduce this subset to 22 variables encompassing the 13 categories of Z, in specifications of 23-30 variables overall. These models benefit from being readily comparable across sectors. The ratio of significant to insignificant variables drops sharply compared to the first stage, however, and R^2 values are somewhat lower.

The insignificance of the variables chosen is not entirely separable from the issue of comparability, however. In these results none of the variables is significant in most of the sectors, and many are significant in only 2 or 3. How do we interpret a given variable across sectors, knowing that an alternative one from the same group would produce a different pattern of significance and insignificance? For example, how do we interpret the insignificance of training & capacity-building variables in most models when we know from stage 1 that there is at least one alternative such variable that is significant in each sector? We evidently cannot assert for any sector that capacity building does not matter; we must conclude that the comparability constraint forces us to omit from our models information that is important in explaining investment behavior.

Indeed, given that there are 197 variables, many of them quite specific, which have explanatory power over the dependent variable, *any* subset of 20, 30, or even 100 will omit valuable information. We require a solution that allows us to retain the full breadth of information, and yet produce a specification which is both comparable and parsimonious. I turn to principal component analysis, a data reduction technique in which the objective is to find the unit-length combinations of explanatory variables with the highest variance. I follow Maddala (1977) in calculating variables z_1 to z_k where z is a linear combination of the x variables,

$$z_1 = a_1x_1 + a_2x_2 + \dots + a_Lx_L$$

$$z_2 = b_1x_1 + b_2x_2 + \dots + b_Lx_L \text{ etc.}^{17}$$

ranked in order of variance, with highest first. Principal component analysis regresses y on z_1, z_2, \dots, z_k , where $k < L$ and z 's are constructed so as to be orthogonal. So long as the z 's chosen represent combinations of variables that have economic meaning and can be interpreted, this provides a method for estimating parsimonious models with limited loss of information.

I calculate a set of principal component variables (PCVs) based on the raw variables retained in stage 1. I discard all those with low eigenvalues, per normal procedure, and then find the remaining subset which optimally estimate equation (A1), where Z is a vector of PCVs. The eigenvectors associated with each of the PCVs used in this paper are listed below; factor loadings on the raw variables can be read vertically down each column. Detailed interpretations of each PCV follow.

¹⁷ For further treatment of this topic, see also Greene (1997).

Eigenvectors and Factor Loadings

ECONOMIC

Eigenvectors

Variable	1	3
catvi_10	0.01611	0.10921
catvi_11	-0.04421	0.05136
catvi_hi	0.2084	-0.22678
catvi_lo	-0.15851	0.06463
catvi_me	0.06087	-0.04372
cocina	0.06745	0.33713
comb_hi	0.21759	-0.24884
comb_lo	-0.21306	0.26048
comb_me	0.00795	-0.19621
comb_otr	0.03941	-0.10044
cuarto1	-0.06973	-0.36405
cuarto2	-0.11508	0.21652
cuarto2f	-0.15519	-0.22
cuarto3	0.05774	0.30183
cuarto4	0.1403	0.16415
cuarto4m	0.20285	0.11295
cuarto5	0.23616	0.04638
dorms1	-0.26864	-0.1017
dorms2	0.23697	0.16318
dorms2f	-0.27588	0.00522
dorms3	0.2747	0.01897
dorms4	0.26493	-0.04564
dorms4m	0.26059	-0.05572
dorms5	0.22596	-0.07148
ecact	-0.1933	0.10251
ecactm	-0.11158	-0.01077
ecdesm	-0.0263	0.04999
ecina	0.19549	-0.09642
ecinam	0.04078	0.0789
ecocum	-0.10776	-0.01538
hogar_ta	0.15305	0.23915
partbru	-0.19109	0.06026
ppdorm2	-0.03901	-0.25241
ppdorm4	0.1756	0.13713
ppdorm5	-0.0338	0.23506

TRAINING

Eigenvectors

Variable	1
capadpe	0.28556
capci1	0.30671
capci2	0.2612
capdis	0.2793
caplemu	0.34451
caporad	0.38803
capprin	0.37869
capprop	0.34559
temacz	-0.14204
temadis	-0.20036
temaorad	-0.22559
temaprop	-0.18667

INFORMATION TECH.

Eigenvectors

Variable	1
sitotal	0.51744
siotro	0.36119
sisin_ad	0.42748
sisin_ai	-0.27289
sisinidp	0.28173
sicom	0.38812
impresor	0.3385

CENTRAL GOVT. AUDITING

Eigenvectors

Variable	1
fis	0.14973
inejpr_a	-0.03459
inejpr_m	0.22346
inejpr_s	0.04035
sisin_ad	0.29205
sayco	0.59704
sayco_a	0.56841
sayco_o	0.39998

DEMOGRAPHIC

Eigenvectors

Variable	1	2
pobpc.u	-0.16648	-0.51111
pobpc.r	0.1533	0.30239
rel_cato	-0.62433	0.17965
rel_evan	0.58003	-0.13934
rel_ning	0.41205	-0.04415
id_sine	0.21585	0.17824
id_trad	0.0192	0.64723
inmasc	-0.07623	-0.37817

POLITICAL PROTEST

Eigenvectors

Variable	1
oficial	-0.19005
margen93	-0.21741
nulo93	0.35565
ausent93	0.60371
ausent95	0.65243

PROJECT PLANNING

Eigenvectors

Variable	1
catastur	0.04701
dpoacoor	-0.00839
dpoaotro	-0.07581
epoaham	0.00306
evalres	0.07426
idenalc	-0.00973
idencons	0.0145
idencv	0.09214
idenpdm	0.14818
info_ed	0.53349
info_sa	0.51649
pdm94	0.14019
plan_sye	0.56911
reconu_a	0.24654

PRIVATE SECTOR

Eigenvectors

Variable	1
eereg_cm	0.61675
eereg_ea	0.56212
eereg_fi	0.55103

MUNICIPAL ADMINISTRATION

Eigenvectors

Variable	1	2
alc_co	0.14604	0.05317
alc_de	0.11469	0.10791
con_co	-0.17274	0.12842
con_de	-0.14717	0.14487
cuenpu_a	-0.12553	-0.0198
cuenpu_c	0.11299	0.0764
cuenpu_o	0.05624	0.07114
evte_co	0.18976	-0.04196
evte_de	0.18947	0.009
invdir	0.09721	-0.02975
invpub	0.15408	-0.06359
manpro_d	0.18016	0.02777
manpro_u	0.16696	0.04719
otro_co	0.10092	-0.11738
otro_de	0.08356	-0.11557
plieg_ad	0.33515	-0.02376
plieg_ca	0.3401	-0.00287
plieg_pu	0.31971	0.00514
pliego	0.33117	0.01178
progcont	0.15912	0.11538
regcon	0.19798	0.01987
salar_pc	0.27672	-0.08343
salar_co	0.27409	-0.08945
suped_a	-0.01201	-0.43222
suped_c	-0.03946	0.437
supsa_a	-0.07613	-0.42273
supsa_c	0.0346	0.44233
supsa_o	0.05436	0.33874
usmanfun	0.17885	0.05964

CIVIL INSTITUTIONS

Eigenvectors

Variable	1
cv	0.09745
indig2	0.01988
jvec2	0.29229
otbregi	0.4194
otbregi2	0.43286
otbs_e	0.42137
otbs_pj	0.42934
otbsoli	0.42372

Interpretation of PCVs

Economic: The first PCV loads positively on indicators associated with wealth (i.e. stocks) and higher income (flows), and negatively on those that indicate poverty and lower income. Notice especially the loadings on number of rooms per house, bedrooms per house, and type of cooking fuel. It additionally loads negatively on economically active population and positively on the economically inactive, but these values are much lower than those for wealth. Thus PCV1 is an indicator of wealth and income, rising in both. The third PCV, by contrast, loads negatively on high wealth and positively on low wealth, and – interestingly – consistently negatively on economically active women. Its most important characteristic, though, seems to be that it rises in family size (see household size and people per bedroom), which is broadly consistent with loading positively on measures of poverty. These two PCVs should thus be opposite in sign where both are significant.

Demographic: The first PCV loads positively and strongly on Protestants and rural dwellers, and negatively on Catholics and urban dwellers. Religion is by far its strongest factor. It also decreases in Spanish-speakers and men. PCV2 loads similarly to PCV1, but here the strongest factors surround the urban-rural divide, as well as native-language speakers, in which it is positive.

Political Disaffection/Protest: This PCV increases strongly with absent and null votes – a traditional sign of electoral protest in Bolivia – while loading negatively on *oficialista* mayors (i.e. affiliated with the ruling (national) coalition) as well as the 1993 municipal margin of victory. I interpret this as an indicator of political disaffection and protest.

Civil Institutions: This is an indicator of the number organizations and institutions of local civil society. It rises in all the variables, especially in the more general measures. I interpret it as a proxy for the strength of local civil institutions.

Private Sector: This PCV rises in the number of private businesses registered locally. I construe it as an indicator of the dynamism of the local private sector.

Training and Capacity-Building: This variable rises in categories of training (i.e. institutional strengthening) received by the municipality and falls in those requested but not yet received. Hence I interpret it as a measure of the intensity of capacity-building efforts undertaken by/for local government.

Information Technology: This PCV rises in the IT systems - hardware and software (especially software) - at the disposal of each municipality.

Central Government Auditing: This variable is difficult to characterize succinctly, though its interpretation is fairly clear. It loads positively on those administrative or reporting processes which constitute some form of external lever of central on local government. Thus, central government audits, municipal performance reports upwards, and the involvement of the Social Investment Fund (a central executive agency) all appear positively here, and signify direct and indirect ways in which the central state can exert influence on local government activities.

Municipal Administration: While these variables include many raw indicators, the strongest effects are as follows. The first PCV loads positively on variables related to clear and transparent municipal procedures for purchases and contracting, on mayoral discretion and on councilmen's salaries, and negatively on councilmen's discretion. I interpret this variable as indicative of the character of local governance, rising where a strong local executive administers under clear guidelines and regulations, and is (actively) overseen by a strong (i.e. well-paid) council. The second PCV loads positively on the municipal council's discretion in contracting, and especially strongly on council oversight of education and health services. Thus I interpret this PCV as indicative of an activist council, whose power comes at the expense of the mayor. The second PCV is thus not strictly opposed to PCV1, but rather different from it in thrust, representing an alternative way of organizing municipal affairs.

Project Planning: This PCV loads positively where municipalities use information on education and health when planning projects, where sectoral regulations are followed in water & sanitation, where a Municipal Development Plan exists, and where councilmen and oversight committees identify investment projects using the MDP and urban cadaster. It loads negatively where the mayor is the one who identifies investment projects, and where problems arise with the Annual Operating Plan. This is thus a straightforward indicator of informed project planning which follows consensual and open procedures.