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Lucie Gadenne

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Composition du Jury

Rapporteurs	Claudio Ferraz	*PUC-Rio de Janeiro*
	Monica Singhal	*Harvard Kennedy School*
Examinateurs	Tim Besley	*London School of Economics*
	François Bourguignon	*EHESS & Paris School of Economics*
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	Élise Huillery	*Sciences-Po Paris*
	Thomas Piketty	*EHESS & Paris School of Economics*
	Ekaterina Zhuravskaya	*EHESS & Paris School of Economics*

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Lucie Gadenne

Three Essays on Public Finance in Developing Countries

Thesis Advisor: Thomas Piketty

Jury

Reviewers	Claudio Ferraz	*PUC-Rio de Janeiro*
	Monica Singhal	*Harvard Kennedy School*
Examinators	Tim Besley	*London School of Economics*
	François Bourguignon	*EHESS & Paris School of Economics*
	Denis Cogneau	*Paris School of Economics & IRD*
	Élise Huillery	*Sciences-Po Paris*
	Thomas Piketty	*EHESS & Paris School of Economics*
	Ekaterina Zhuravskaya	*EHESS & Paris School of Economics*

Établissement :
École des Hautes Études en Sciences Sociales
190–198 avenue de France
75013 Paris
France

Laboratoire d'accueil :
Paris Jourdan Sciences Économiques - UMR 8545
48 boulevard Jourdan
75014 Paris
France

École doctorale :
École Doctorale Économie Panthéon-Sorbonne - ED 465
106–112 boulevard de l'Hôpital
75013 Paris
France

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Contents

Chapter 1

General introduction

It is a shortage of resources, and not inadequate incentives, which limits the pace of economic development. Indeed the importance of public revenue from the point of view of accelerated economic development could hardly be exaggerated. (...) The economic and cultural development of a country requires the efficient and steadily expanding provision of a whole host of non-revenue-yielding services, education, health, communications systems, and so on, commonly known as 'infrastructure'- which require to be financed out of government revenue.

Nicolas Kaldor (1963)

Balancing growth with equity in developing countries will be achieved, not by trying to affect the sources of growth (which we have no idea how to do anyway) but by designing policies that will allow the poor access to the opportunity generated by growth whenever it happens. (...) The financing of these policies raises the question of government resources. A good education system will require careful planning, but it will require money as well. So would subsidizing health and weather insurance. So, most likely, would any system of transferring resources to help set up medium and large businesses. Todays rich countries have developed strong governments and the resulting social policies by expanding their tax base as they were growing. It is hard to imagine that it could be avoided in todays developing countries.

Esther Duflo (2011)

Economists have long acknowledged that economic development stands for a lot more than increases in income per capita (Sen, 1985). Progress in education, health, the rule of law, and political freedom, to name but a few, are seen by all as key covariates and by many as causes of long run development. Basic education and health systems, sound legal and political institutions have all historically been delivered by governments. International donors and NGOs are increasingly playing a role in developing countries that may partially substitute for state action (Werker and Ahmed, 2008). Yet the main development successes of recent years, whether it be the dramatic decrease in poverty in China (Chen and Ravallion, 2004), the achievements of conditional cash transfer schemes like *Bolsa Escola* in Brazil or *Progresa* in Mexico (World Bank, 2009a), or the rapid growth of the South East Asian dragons, necessitated organized government action. The construction of well functioning states that can tax, enforce contracts, and organize public spending is thus undeniably both a cause and a symptom of economic development.

The two quotes with which this chapter opens are particularly revealing of the salience of the issue. Both come from leading academics of their time who were asked to write down their thoughts on economic developments for a policy audience. They write 48 years apart yet the similarities between their messages, beyond the differences in style, are striking. They start by making a similar diagnosis: development ('accelerated economic development' for Nicolas Kaldor, 'balancing growth with equity' for Esther Duflo) will be achieved by the expansion of government policies – both mention health and education policies. Both conclude by emphasizing the revenue constraints governments in developing countries face. Public finance was at the core of development policy in 1963, it still is today.

Two general conclusions can be drawn from the contemporary literature on governments in developing countries. On the one hand observers unanimously condemn the inefficient institutions and corrupt bureaucracy that are pervasive in developing countries (Rose-Ackerman, 2004). On the other hand the same observers often point out that governments in these countries lack resources to provide the kind of public goods that are essential to economic development, and recommend that their revenue-raising capacities be increased (Sachs et al., 2005). There is a tension between the need for more government resources to finance pro-development policies and the fact that these governments are often found to spend these resources inefficiently, by accident or by design. This tension between 'too much state' and 'too little state' is one of the motivation for this thesis.

The study of how and why governments, especially in developing countries, are corrupt and inefficient has long made its way in mainstream economics (see Olken and Pande (2012), Banerjee et al. (2009) or Bardhan (1997) for an early review of the literature). The study of institutions and their role in economic development has similarly has made important breakthroughs starting with North (1990). States' capacity to raise and spend public revenues has on the contrary been the focus of very little research. The similarities between the statements by Kaldor and Duflo 50 years apart is telling in that respect. Duflo does not have the advantage over Kaldor of being able to refer to a wide body of research on the topic that she would have had if, say, she was talking on how progress can be made in providing credit to the rural poor. The study of governments' public finances - especially taxation - in developing countries was relatively neglected by academic economists until recent years. This is at first surprising given the long and distinguished history of the study of public finance in the discipline, which dates back to at least Pigou (1932). Yet the existing theoretical frameworks in this field, with their focus on unobservability of ability or effort as the key constraint on governments' ability to tax, perform poorly in explaining tax structures in developing countries. The first order concern in these countries is probably the unobservability of transactions – a consequence of the presence of large informal sectors – which makes governments' capacity to enforce taxes a central issue of tax policy. Understanding how the specific context of developing countries change the standard tools economists use to think about public finance was another important motivation for this thesis.

This introductory chapter fulfills several functions. It first seeks to present stylized facts regarding public finance in developing countries and on the economic and political contexts that shape fiscal policies. It also introduces the key concepts of tax and spending capacity that are central to the research presented in subsequent chapters. It discusses the assumption, implicit in much of my research, that public revenues are somehow too low in developing countries today. Finally, it raises three questions which are addressed in the main body of the thesis.

Methodologically this chapter uses country level information on developing countries over the past 40 years and seeks, whenever possible, to compare their experience with historical evidence on today's rich countries. This is related in spirit to Duflo's statement that refers to the growth of government in rich countries to suggest a path for developing ones. This type of analysis is by nature limited by the existing data available. Data becomes particularly scarce when one tries to go back in time. I present statistics with regard to developing countries since the 1970s on smaller samples of countries for which they are available. One must keep in mind that these countries may be different from the larger group of developing countries. Countries for which data comparable over time is available are likely to be the ones with better accounting and statistical systems, and hence perhaps also better fiscal administrations. Building datasets on public finances that are coherent across government units to be able to draw comprehensive conclusions is hopefully one of the achievements of this thesis.

Section 2 presents the stylized facts regarding tax revenues and development, comparing the historical experience of developed countries to that of developing countries. Section 1 seeks to define the elusive concept of 'development' by presenting the economic and political context which is the background of my research. How this context shapes public finance policies and outcomes is described in section 3 which also introduces key concepts used throughout this thesis. In section 4 I turn to the question of the quality of government spending in developing countries and introduce a key question on the relationship between government revenues and expenditures. Finally section 5 moves on to providing a brief summary of each of the articles that compose the thesis. The aim there is to provide readers that have little time, or are less academically inclined, with the main contributions of my PhD research.

1 Context: developing countries since 1970

The geographical focus of this thesis is a heterogenous group of countries known as 'developing'. This choice of focus implicitly relies on the assumption that these countries differ from those in the 'developed' world (HICs) along some characteristics that matter for the comprehension of their public finances. This section seeks to point out these differences both today and in recent history to guide the reading of the subsequent chapters. The main sample used for analysis includes 130 countries for which data on tax to GDP ratios is available in the period 2000-2010: 43 high income countries (HICs), 38 upper middle income countries (UMICs), 38 lower middle income countries (LMICs) and 23 low income countries (LICs)[1]. The last three groups constitute what is generally known as the 'developing world'.

[1] The country classification used is the 2010 classification of countries by income group by the World Bank: http://data.worldbank.org/about/country-classifications/country-and-lending-groups.

A The situation today

Table 1.1 presents several measures of development for each country group in the period 2000-2010. A large number of indicators are available, I choose those that are both more often used in the literature and available for the largest number of countries.[2] The source is the *World Development Indicators* compiled by the World Bank unless specified otherwise.

Correlates of what is generally understood as economic development in the first panel show clear differences between the four groups. The distribution of average income per capita follows a simple pattern: GDP per capita is three times higher in HICs than UMICs, nearly three times higher in UMICs than LMICs, and again three times higher in the latter than in the poorest country group. Structural change of the economy is a well-know covariate of development, I proxy for it here by urbanization (share of the population that lives in cities) and the share of agriculture in GDP. The share of agriculture is close to negligible in rich countries, but roughly a third of GDP in the poorest country group; three-fourths of the population lives in cities in HICs, less than a third in LICs. The last line considers openness to trade which is not strictly speaking a measure of development but will be of interest in this thesis. The economic development gradient is less strong when it comes to trade: rich countries are only marginally more open than middle income countries[3], though the poorest group is clearly less open to trade.

The second panel considers 'outcomes' of economic development, sometimes known as indicators of 'human development'. These are the types of development goals the opening quotes of this chapter suggest must be

[2]The number of countries for which the indicators in Table 1.1 are available varies. The analysis in Table 1.2 concentrates on a fixed sample of countries and indicators for which data is available since the 1970s.

[3]The difference between HICs and UMICs becomes negligible when one excludes the small very open economies of Luxembourg and Singapore, both HICs.

financed and organized by governments: 'education, health, communication systems and so on' for Kaldor (1963) and 'policies that will allow the poor access to the opportunity generated by growth' for Duflo (2011). Low income countries always fare much worse than other country groups for all the health (life expectancy, infant mortality) and education (literacy rate, primary completion rate) indicators. Upper middle income countries look similar to rich countries in general[4]. The last two indicators are measures of income inequality. In line with Kuznet's famous inverted U curve (Kuznets, 1955) they show that middle-income countries are more unequal than both rich and poor countries, though developing countries are always more unequal than rich ones.

Proxies for 'political' development are presented in the last panel. The most widely used measure of political development is the Polity score, an index that covers a spectrum of forms of government, from fully institutionalized autocracies (a score of -10) to consolidated demcoracy (a score of +10)[5]. These scores show a clear correlation between economic and political development, though the difference between rich countries and the richest group of developing countries is small. There are numerous measures of government 'quality' available, which all refer to slightly different concepts. I choose to focus on what is possibly the most clearly defined measure of government quality: corruption, or the violation of rules by public officials for their personal interest. The following two variables measure the perception of corruption from different sources.[6] Both will be used in this chapter, the first for its larger coverage (146 countries for the Corruption Perception

[4] Data on the poverty headcount ratio at 2 dollars a day is not available for most rich countries - it is very likely that this ratio is extremely close to zero for this group as a whole.

[5] This data is compiled by the POLITY IV Project of the Center for Systemic Peace which relies on expert coding of historical and contemporary monographs. See Marshall (2011) for more details.

[6] These sources are a set of polls and surveys for the Corruption Perception Index (CPI) compiled by *Transparency International* and teams of country experts form the *International Country Risk Guide* for the *ICRG* variable.

Index) the latter for its panel dimension - the *International Country Risk Guide* starts measuring corruption in 1985. Both indexes are decreasing in the perceived corruption level. They are highly correlated (coefficient of more than 0.7) and paint a similar picture: the richer the country, the less corrupt it is. Along this dimension UMICs look a lot more like other developing countries than rich countries.

B Evolution since 1970

The evolution of 9 of these indicators since the 1970s is presented in Table 1.2 for the 58 countries for which they are available for the whole period (15 HICs, 13 UMICs, 16 LMICs, 14 LICs). The first thing to note is that all indicators have improved over time in all country groups. This suggests 'development' has occurred over the period. There is however no convergence over time between country groups. The difference in GDP per capita between the two groups of middle income countries has remained stable over time, with an increase of around 40-45% in both groups but high income countries have grown faster (a 60% increase) and low income countries have lagged behind with a more modest 13% increase. Moreover we see that all the growth in income per capita in LICs has occurred since 2000: it decreased in the 80s and 90s. Indicators of structural change however suggest some form of development occurred in LICs over this period.[7] Finally, trade has increased in all country groups, especially LMICs. Again, this is not necessarily an indicator of development but a consequence of a large increase in global trade over the period.

The picture is different for indicators of human development where there is more convergence. Primary completion rates and life expectancy have in-

[7]Considering the within-group variance to mean ratios of GDP per capita is also of interest to assess convergence. We see that is has decreased in HICs and UMICs, suggesting some 'catching up' has occurred within these groups. The same logic indicates clear divergence within groups for the two poorest country groups.

Table 1.1: Development indicators

	HICs Mean (SD)	UMICs Mean (SD)	LMICs Mean (SD)	LICs Mean (SD)
Indicators of economic development				
GDP per capita	17703 (6121)	6387 (2452)	2687 (1603)	968 (518)
Agriculture (%GDP)	3 (2)	8 (3)	19 (9)	36 (11)
Urban population (% total)	73 (18)	64 (16)	43 (14)	27 (11)
Trade (%GDP)	107 (65)	88 (40)	89 (33)	63 (30)
Indicators of human development				
Literacy rate	95 (4)	92 (7)	77 (16)	58 (24)
Primary completion rate	97 (9)	97 (10)	82 (18)	60 (22)
Life expectancy	77 (5)	71 (6)	65 (9)	54 (7)
Infant mortality	8 (13)	20 (12)	44 (27)	78 (23)
Undernourished population (% total)	5 (1)	8 (6)	16 (10)	28 (12)
Poverty ratio	. (.)	11 (12)	43 (22)	74 (15)
Gini index	32 (5)	44 (10)	43 (9)	40 (6)
Share of income held by top decile	26 (3)	35 (9)	34 (6)	32 (5)
Indicators of political development				
Polity index	7 (6)	5 (6)	3 (6)	1 (4)
Corruption Perception Index	112 (9)	98 (6)	94 (4)	92 (3)
Corruption (ICRG)	105 (8)	94 (4)	93 (4)	91 (6)

The Polity index is computed by the Polity Project(Marshall (2011)), the Corruption Perception Index is computed by *Transparency International*, and the Corruption (ICRG) index by the *ICRG* group. Both corruption variables are scaled to have a mean of 100 and a standard deviation of 10.

creased more in the poorest country group than in the other two groups.[8] In LICs trends seem to have accelerated between the 1990s and the 2000s, mirroring the evolution of income per capita. Clear improvements are observed for the main indicator of political development available since the 1970s. In the 1970s all developing country groups were, on average, non-democratic (a negative value of the index). By the period 2000-2010 the average country in these groups had democratized. This 'third wave of democratization' (Huntington, 1991) stopped far from full democratization in both LICs and LMICs, which have modestly positive scores in 2000-2010. The evolution of the corruption variable in the last lines must be interpreted with caution: it is compiled by teams of experts from the ICRG since 1985 and their own awareness of corruption may have changed over time. Nevertheless it is interesting – and perhaps in contradiction with prior expectations – to see a worsening of the corruption scores in all country groups except LMICs. The cross-country correlation between economic development and lower corruption does not seem to hold within country groups over time.

Tables 1.1 and 1.2 show that developing countries can be characterized by 1) by definition, lower levels of income per capita than developed countries 2) economies that are more agricultural, less urban and less open to international trade 3) low levels of education and health outcomes and 4) incomplete and often corrupt democracies. Within this group of countries the richest countries - UMICs - look increasingly more like rich countries, and less like poorer countries, along indicators of human development. However they are clearly closer to the poorer countries when one considers indicators of inequality and corruption.

It is useful to keep these differences in mind when reading this thesis. The first chapter takes a global and historical approach and considers all

[8] This is not true for infant mortality rates, which have decreased dramatically in richer developing countries

Table 1.2: Development indicators since 1970

	1970s Mean (SD)	1980s Mean (SD)	1990s Mean (SD)	2000s Mean (SD)
High-Income-Countries				
GDP per capita	11742 (4730)	13098 (4541)	15974 (5121)	18955 (5905)
Urban population (% total)	66 (16)	71 (14)	75 (12)	76 (12)
Agriculture (%GDP)	8 (7)	6 (5)	3 (2)	2 (1)
Trade (%GDP)	73 (23)	74 (27)	73 (28)	90 (36)
Primary completion rate	83 (25)	88 (19)	94 (12)	99 (5)
Life expectancy	71 (5)	74 (3)	76 (3)	78 (3)
Infant mortality	23 (22)	13 (12)	8 (6)	5 (3)
Polity index	4 (8)	5 (8)	7 (6)	7 (6)
Corruption (ICRG)	. (.)	112 (9)	112 (8)	106 (8)
Upper-Middle-Income-Countries				
GDP per capita	4495 (2480)	4882 (1750)	5567 (2122)	6545 (2422)
Urban population (% total)	56 (19)	63 (17)	70 (13)	75 (11)
Agriculture (%GDP)	14 (7)	11 (4)	9 (4)	6 (3)
Trade (%GDP)	60 (42)	58 (38)	65 (46)	75 (48)
Primary completion rate	73 (14)	83 (10)	91 (6)	98 (5)
Life expectancy	63 (4)	67 (3)	70 (4)	72 (7)
Infant mortality	63 (22)	42 (17)	30 (13)	21 (11)
Polity index	-2 (7)	0 (7)	4 (5)	5 (5)
Corruption (ICRG)	. (.)	102 (5)	100 (4)	96 (5)
Lower-Middle-Income-Countries				
GDP per capita	1554 (520)	1779 (731)	1879 (861)	2201 (1022)
Urban population (% total)	29 (10)	33 (11)	37 (12)	41 (13)
Agriculture (%GDP)	30 (11)	25 (10)	23 (9)	18 (8)
Trade (%GDP)	62 (32)	58 (33)	72 (35)	89 (41)
Primary completion rate	50 (14)	63 (16)	65 (19)	75 (18)
Life expectancy	54 (6)	58 (6)	59 (8)	60 (10)
Infant mortality	97 (24)	78 (20)	66 (23)	55 (25)
Polity index	-5 (5)	-4 (6)	-1 (6)	2 (6)
Corruption (ICRG)	. (.)	93 (6)	97 (4)	93 (4)
Low-Income-Countries				
GDP per capita	824 (196)	808 (184)	773 (194)	931 (445)
Urban population (% total)	16 (9)	20 (10)	23 (11)	27 (12)
Agriculture (%GDP)	43 (13)	40 (9)	40 (10)	35 (9)
Trade (%GDP)	43 (25)	45 (26)	48 (22)	53 (18)
Primary completion rate	29 (17)	35 (19)	38 (16)	55 (20)
Life expectancy	46 (5)	50 (5)	50 (7)	54 (6)
Infant mortality	121 (21)	106 (19)	95 (19)	77 (19)
Polity index	-5 (4)	-5 (4)	-0 (5)	1 (5)
Corruption (ICRG)	. (.)	96 (10)	96 (5)	92 (6)

The corruption (ICRG) variable has been rescaled to have a mean of 100 and a standard deviation of 10. The Polity index is computed by the Polity Project(Marshall (2011)) and the Corruption (ICRG) index by the *ICRG* group. The sample includes 15 HICs, 13 UMICs, 16 LMICs and 14 LICs for which data is available for all decades considered, except for the corruption index which is only available from 1985.

developing countries since 1945. The second and third chapter gradually restrict the scope of the analysis. The second chapter focuses on countries in sub-Saharan Africa. The majority of these are classified as LICs (17 out of 32). The final chapter focuses on Brazil, which is classified as a UMICs and looks very much like the typical UMIC described above with a GDP per capita of nearly 6000, a poverty ratio at 16% and a corruption index (CPI) of 98.

2 Tax revenues and development

This section presents stylized facts regarding tax revenues and development. I start by discussing the relationship between total tax revenue and gross domestic product (hereafter 'tax ratios') by considering both the variations across countries today and the historical experience of today's rich countries. I then present some evidence regarding the empirical importance of various tax sources at different levels of development.

A Tax ratios

The variables of interest here are tax revenues from different sources collected by all levels of government. The information comes from both published and unpublished data collected by the IMF, in accordance with consistent definitions and methods: the *Government Finance Statistics*, *Historical Government Finance Statistics* and the dataset on total and tax revenues compiled by Thomas Baunsgaard and Michael Keen using internal IMF information.[9] One limitation of these datasets is that it only includes formal tax collection. Olken and Singhal (2009) show that informal (off the books) taxation is widespread in developing countries and often represents a large share of revenues at the local government level. This probably leads to a (small) underestimation of tax ratios in developing countries.[10]

In order to compare the situation of developing countries today with that of now rich countries when they were at similar levels of development I use

[9] When the sources contradict preference is given to the GFS and HGFS datasets which cover a much larger set of variables. The variable 'taxes on international trade' from the Baunsgaard and Keen (2010) dataset is not used in this chapter, data on sources of tax revenues only comes from the official datasets.

[10] Olken and Singhal (2009) find that informal taxes represent 15% of total taxes paid by households on average in five low income countries. Taxes on household (taxes on income + taxes on goods and services) represent 54% of all taxes in those countries (Table 1.3). This implies that taking into account informal taxation increases the tax ratio from 12.7 to 13.7 in those countries. This is likely to be on overestimate however, as the average individual in the surveys Olken and Singhal (2009) use probably pays less than the average amount of household taxes.

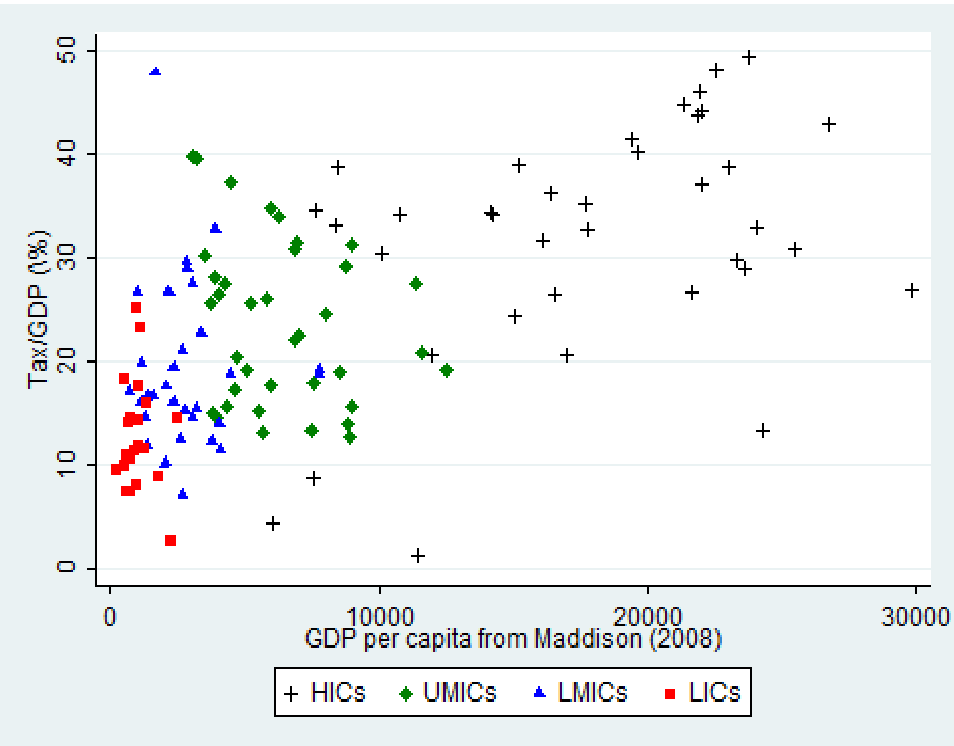
data on 4 now developed countries (France, Germany, United Kingdom and United States) for the period 1820 to 1990 compiled from different sources.[11] Finally the series of GDP per capita in 1990 international Geary-Khamis dollars constructed by Maddison (2008) are used to compare the historical level of development of now rich countries to that of developing countries today. All GDP variables in this chapter come from this source.

Figure 1.1 presents the scatter diagram of average tax ratios for the period 2000-2010 as a function of GDP per capita. The first line of Table 1.3 presents country group averages for the same period. Both show a positive relationship between per capita income and the tax ratio: HICs have an average tax ratio of 32% on average over the period, UMICs an average of 23%, LMICs levy 19% of their GDP in taxes and LICs 13% . We see however that this relationship is mostly driven by comparisons between country groups at different levels of development (Figure 1.1). The top panel of Figure 1.2 plots the same relationship for developing countries only. The considerable variation within country groups can only partially be explained by differences in GDP per capita. A comparison of Tables 1.1 and 1.3 suggests a positive correlation between tax ratios and indicators of human development. A naive reading of this correlation is implicit behind most calls for revenue mobilization in developing countries.

A key motivation for this thesis is the idea that tax revenues in developing countries are somehow 'low' compared to their needs - in other words, that there is indeed a need for ' steadily expanding' public resources as suggested by Kaldor (1963). One way to assess this claim is to compare the average tax ratios in developing countries to that observed historically in now developed

[11] Data for France is from Mitchell (2007) for 1839-1930 and the French statistical institute INSEE for 1959-1990, data for Germany was compiled from a variety of historical sources by Gabriel Zucman (it starts in 1850, no data available for the 1940s), data for the United Kingdom comes from Mitchell (2007) for 1839-1930, Clark and Dilnot (2002) for 1930-1967 and HM Treasury for 1967-1990, data for the United States, 1902-1990, comes from Carter (2006).

Figure 1.1: Tax ratios in 2000-2010 by level of development



A point represents the average for a country for the period 2000-2010.

Table 1.3: Tax revenues in 2000-2010 by country group

	HICs	UMICs	LMICs	LICs
Tax/GDP (%)	32.0	23.3	18.8	12.7
	(11.1)	(7.9)	(7.6)	(5.1)
GDP per capita	17809.7	6387.1	2752.8	978.6
	(6169.7)	(2451.6)	(1623.5)	(539.5)
%Taxes on goods and services	26.5	33.6	32.5	33.5
	(11.6)	(13.8)	(16.2)	(14.4)
% Income and property taxes	36.6	25.0	24.1	18.6
	(14.8)	(14.4)	(13.1)	(8.9)
% Social contributions	24.1	18.8	7.6	2.0
	(14.7)	(15.6)	(9.8)	(3.8)
% Taxes on international trade	4.3	9.0	10.5	22.8
	(13.1)	(12.4)	(10.3)	(14.0)
Observations	43	38	38	23

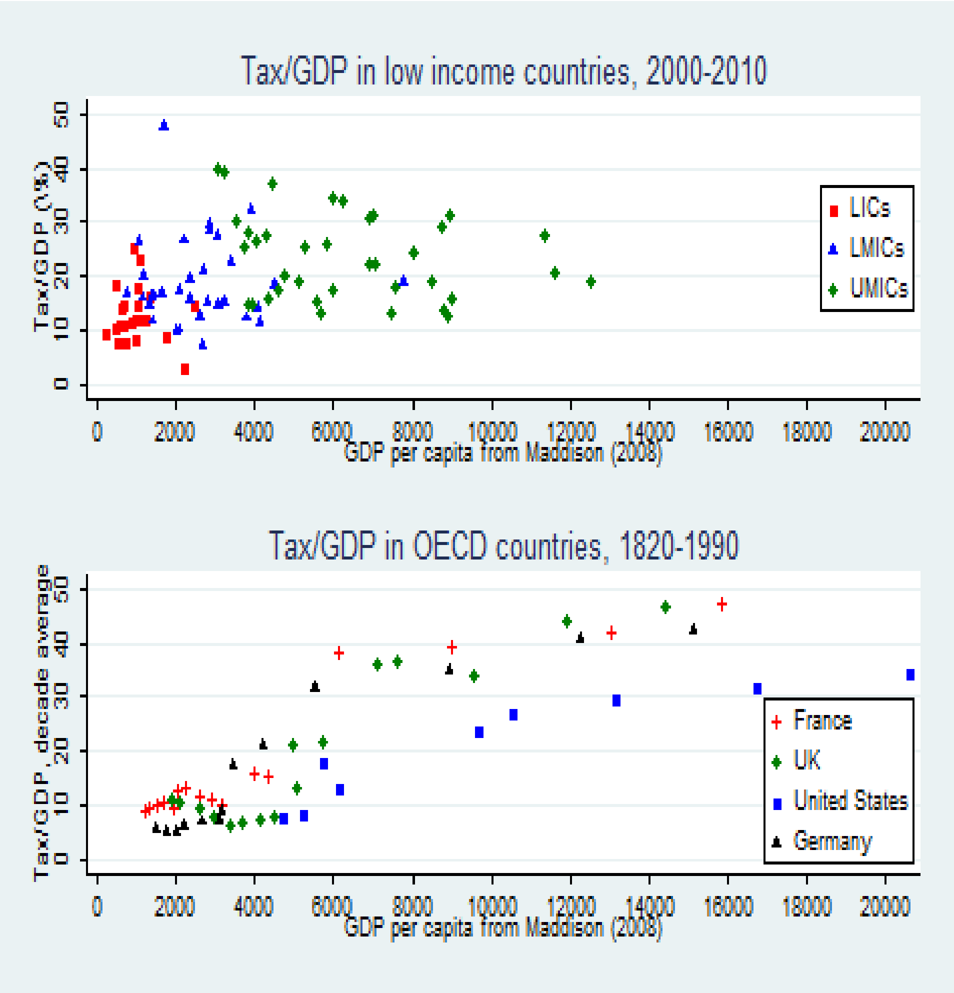
Average value for the period 2000-2010, standard deviation in parentheses. The tax group 'other taxes' is excluded from the table.

countries at similar levels of development. Figure 1.2 compares tax ratios in developing countries over the period 2000-2010 to the decade averages in 4 OECD countries for the period 1820-1940. There is a large increase in tax ratios over the 1820-1980 period in rich countries, from roughly 10% to nearly 50% in France, the UK and Germany.

First, notice that many LICs are experiencing tax ratios today of more than 20% that rich countries had rarely experienced before World War II (the UK and Germany reach this level in the inter-war period). There is no clear comparison group for the bulk of LICs today but the average country in this income groups levies 12.7% of GDP in taxes for an income per capita of roughly 1000; this is close to the situation of France in the 1820s. Second, the average tax ratio for LMICs, at 19% for an income per capita of more than 2700, is higher than that experienced by OECD countries in the sample at similar levels of economic development - but not far from Germany in the 1920s. The picture becomes different when we consider upper middle income countries: with an average GDP per capita of 6400 their level of economic development is similar to that of France and Germany in the 1950s or the United Kingdom in the 1940s, but their tax ratio is much smaller (23% versus 36% for the UK, 38% for France and 31% for Germany). Overall Figure 1.2 suggests that tax ratios in developing countries today are comparable to those experienced by today's rich countries at similar levels of development. They are slightly higher when we consider poorer developing countries, slightly lower in richer developing countries. The evidence does not contradict the idea that tax ratios in developing countries will need to increase as these countries become richer.

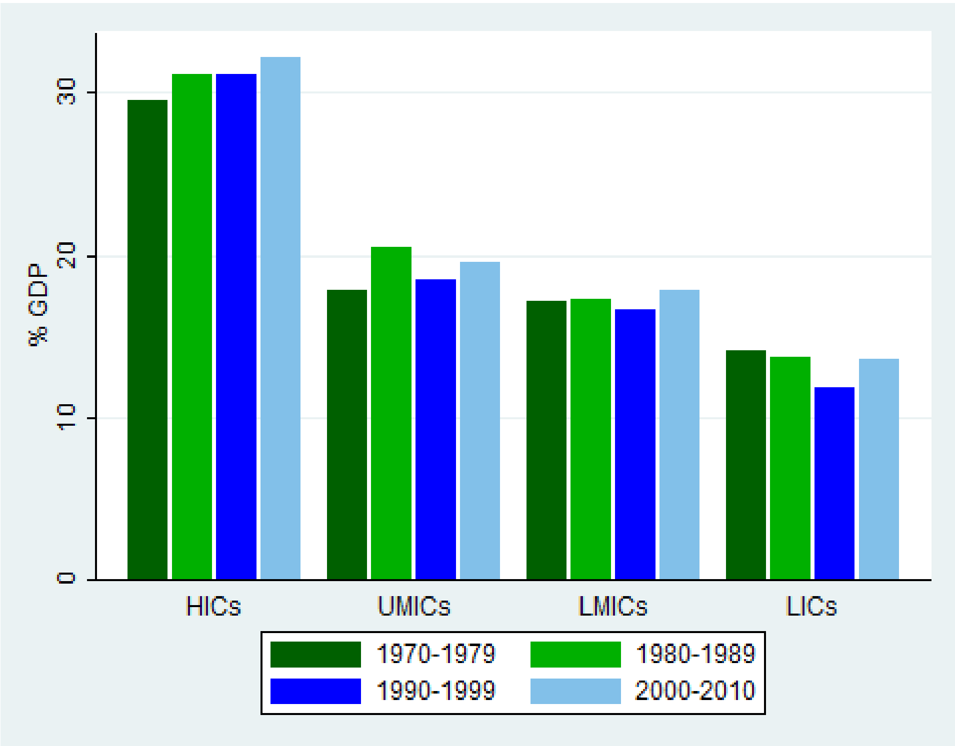
Data becomes more scarce when one tries to go back in time. I use a sample of 85 countries (28 high income, 19 upper middle income, 22 lower middle income and 16 lower income countries) for which data is available from the 1970s onwards to consider the recent evolution of tax revenues in developing countries in Table 1.3. Again, we see divergence between country groups over time. Tax ratios increased by nearly 10% in both HICs and UMICs between the 1970s and the current period. During the same period the two poorest country groups experienced a quasi-stagnation of tax ratios: there was small increase in LMICs and a small decrease in LICs. In both groups tax revenues as a share of GDP declined in the 1980s and 1990s: LICs in particular lost nearly a fifth of their tax revenues. This is at odds with what we have seen in previous figures regarding the increase in tax ratios over time in now rich countries and across countries today.

Figure 1.2: Tax revenues to GDP by level of development



A point represents the average tax to GDP ratio in a country for the period 2000-2010 (top graph) or a decade between 1820 and 1990 (bottom graph).

Figure 1.3: Tax ratios over time by level of development



Each bar represents the average tax to GDP ratio in the group for the period under consideration.

B Structure of revenues

Where do tax revenues come from? Tables 1.3 shows the distribution of tax revenues by source for each country group for the period 2000-2010. We see that countries at different levels of development levy taxes from very different sources. Poorer countries rely heavily on taxes on international trade: they represent a fifth of tax revenues in LICs and roughly 10% in UMICs and LMICs. Rich countries levy more taxes on income and social contributions, which together represent 60% of tax revenues. Both of these tax categories are generally levied on personal and corporate income, but social contributions are earmarked for social security systems which are formally independent from the government's budget. These systems are virtually absent in LICs, which collect more from taxes on trade than from all types of income tax on average. Finally taxes on goods and services represent more than a fourth of total tax revenues in all country groups. Data on the structure of taxation since 1970 is only available for a very small subset of developing countries.[12] We leave the analysis of the change in the structure of taxation over time to Chapter 3.

Overall this section has described four stylized facts on taxation in development. First, tax to GDP ratios increase with economic development, though the relationship is weaker when one compares variations within developing countries. Second, these tax ratios in developing countries are comparable (if slightly higher) to those experienced by now rich countries at similar levels of development. Third, tax ratios have increased in developed countries and richer developing countries since the 1970s but they have stagnated in poorer developing countries over the same period. Fourth, countries rely less on taxes on trade and more on taxes on personal and corporate income as they develop.

[12] It is available for only two LICs, Myanmar and Nepal.

The first chapter of this thesis compares the evolution of tax ratios and tax structures between countries over time. Its focus is on individual country experience since 1945 and in particular the lack of growth in tax ratios in low and lower middle income countries. The third chapter zooms in on Brazil, which is a typical upper middle income country: tax ratios have been increasing in recent years, from roughly 20% in the early 1990s to 30% today.[13]. It exploits variations between sub-national government units within Brazil to understand the consequences of increases in tax revenues.

[13] Data for Brazil is not available prior to 1990 in the IMF datasets.

3 Characteristics of developing countries and public finance

A Existing literature

How do the characteristics of developing countries relate to the variations in tax ratios and tax structures described in Section 2? They can be classified into two rough categories with respect to governments' public finances. Human development outcomes and corruption are typically thought of as outcomes of public policy: they are determined by policy choices and actions of public agents. All other indicators can be thought of as determinants of public finance: they constrain and influence governments' taxation and spending.[14] These have in turn be classified in the literature as either supply side determinants - those that determine how and how much a country can tax - or demand side determinants - those that determine the demand for public spending.

A number of theories have been put forward to explain the growth of tax ratios as countries develop, the famous Wagner's law.[15] On the supply-side Baumol's cost disease theory argues that productivity in the private sector increases over the course of development while it stagnates in the public sector. This naturally leads to the growth of government spending relative to GDP (Baumol, 1967). Other authors have argued that GDP growth *per se* does not necessarily affect tax ratios as much as the structural changes economies experience as they develop. A recent example is Kleven et al. (2009) who argue that the growth in the size of firms as countries develop makes tax enforcement easier by increasing the probability that an employee chooses to act as whistle-blower. The share of agriculture in GDP and urban-

[14] These indicators may also of course be influenced by governments' fiscal policy, openness to trade for example is partially determined by tariff policy. Similarly human development outcomes and corruption contribute to determining the demand for government spending.

[15] After German economist Adolph Wagner (1835-1917).

ization are plausible proxies for the kind of structural change these authors have in mind, as firms tend to be larger in the manufacturing sector and in densely populated areas. On the demand side the argument that demand for government expenditures has an income elasticity greater than one was first made by Musgrave (1969), though there are no clear micro-foundations for this theory. A related argument is that democratic governments will provide more government spending than autocratic ones, both because they have different objective functions (McGuire and Olson (1996)) and higher legitimacy to levy taxes. Aidt and Jensen (2009) find some evidence that the extension of the voting franchise in Western Europe increased tax ratios. Finally openness to trade may increase demand of government spending. Rodrik (1998) shows that there is an empirical association between trade openness and the size of government. He claims this is due to more demand for government spending as trade increases the external risk countries are exposed to.

These theories explain the growth of government size historically in rich countries as they simultaneously got richer, experienced structural change and democratized. They also perform very well in explaining cross-country differences today. They cannot however account for the weaker growth in tax ratios in lower income countries than in richer countries since 1970 in Figure 1.3. The decline then increase in GDP per capita in the poorest group may help explain the similar evolution of tax ratios in the poorest group. The evolution of indicators of 'structural change' in this group would on the contrary predict a continuous increase in tax ratios over time. The difference between upper and lower middle income countries is harder to explain: both experienced similar increases in income per capita, similar structural changes and democratization trends, and yet tax ratios stagnated in the latter.

Finally supply-side arguments have been made to explain the differences in the structure of taxation between developed and developing countries in

Table 1.3 by differences in the structure of their economy, since at least Hinrichs (1966). There is today a vast literature on the role of under-development in constraining tax structures both historically and in current developing countries (see for example Alt (1983); Bird (1992); Bird et al. (2008); Kau and Rubin (2002)). In a nutshell these authors argue that developing countries face higher administrative costs and that this makes it optimal to collect more taxes on easy to use tax handles, such as trade. Riezman and Slemrod (1987) show that countries with higher administrative costs of collecting taxes (proxied by low literacy rates, population density, and female participation in the labor force) use trade taxes more intensively as a source of revenue. Similarly Gordon and Li (2009) develop a model that takes into account the fact that governments can only tax firms in the formal sector, defined as those connected to the financial sector. They show that this drastically changes the lessons from optimal tax theory, and explains why developing countries rely heavily on trade taxes and seignorage to provide revenues.

B Tax capacity

This literature assumes that governments take the constraints limiting their tax revenues as given: economic and political changes are exogenous to governments' public finance policies. Similarly high enforcement, processing and collection costs (administrative costs, for short) are typically seen as a consequence of the structure of the economy or the (exogenously) bad quality of bureaucrats. Little attention has consequently been paid to how, and why, governments may try to alleviate those constraints. Yet governments everywhere seek to increase their tax revenues in a given economic and political context, through changes their tax administration. Appendix 5 describes such efforts amongst local governments in Brazil. OECD (2010b) gives several examples of such government attempts in sub-Saharan Africa.

The idea that governments endogenously influence the extent to which they can levy taxes is at the core of recent research by Tim Besley and Torsten Persson (Besley and Persson, 2009, 2010, 2011)[16] - BP for short. It is also at the core of two papers in this thesis. Beyond putting the concept of state capacity at the core of new academic research in economics BP's key contribution lies in their analysis of governments' choice to invest in state capacity – both fiscal and legal. My focus in this thesis is more on the consequences of these choice and on what they call fiscal capacity. I divide the concept of fiscal capacity into two components: tax capacity, and spending capacity.

I define tax capacity as *a government's ability to accurately observe and monitor economic transactions undertaken on it's territory/by its citizens and to take away some of these transactions for its own use.* Tax capacity is in this sense a concept that encompasses both the administrative costs described above and the government's political legitimacy to tax. The novelty in the analysis here, as in BP, is the assumption that governments can *invest* in tax capacity, ie increase it through actions that are 1) costly and 2) have a positive impact on tax revenues that takes time to materialize. Several examples of investments of tax capacity take are given in subsequent chapters. I develop one of those here, the creation of the income tax in the US, to illustrate the definition.

In his 1913 inaugural address US president Woodrow Wilson made a call for revenue reform. The consensus in Washington at the time was that a decrease in tariffs was needed and this could be financed by the re-introduction and generalization of the income tax, first used during the Civil War. Political support for the tax was secured in the ratification of the 16th Amendment to the US Constitution that gave Congress legal authority

[16] I am extremely indebted to this research, in particular to Besley and Persson (2009) which was a key motivation for my choice of thesis topic.

to tax income. The effective establishment of the income tax required a large overhaul of the administrative capacity of the Bureau of Internal Revenue whose workload jumped by ten-fold in a couple of years. The explanation of the new tax system to the population for exemple necessitated the creation of a Correspondence Unit of 30 employees dedicated solely to answering questions about the new levy. There was no immediate increase in tax revenues. During the first year of existence of the federal income tax (fiscal year 1914) no taxes were paid as taxpayers were only required to return their tax files, giving citizens and tax authorities the time to adjust to a new system. The bureau's staff doubled every year from 1917 to 1922 and still lagged behind its charges: when returns for 1918 arrived, the tax files for 1916 had not yet been audited.[17]

This example suggests that increases in tax capacity do come at cost - here a political and financial cost. It also illustrates the delay we can expect to see between the time at which these costs are paid and that at which benefits arise in the form of higher tax revenues.

There is little data on the quality of tax administrations comparable across developing countries. One can instead compare the overall quality of the bureaucracy as measured by the ICRG's team of experts. The first line of Table 1.4 shows that average bureaucratic quality (scaled to 100 with a standard deviation of 10) increases with economic development, with a sharp difference between HICs and the developing world. An indirect measure of tax capacity is the ease with which citizens pay taxes. It is affected by the capacity of the tax administration to facilitate and hasten tax payments. It is also a likely proxy for the administration's own costs. Finally it constrains the revenue raising capacity of a country as higher costs of paying taxes make tax evasion a more attractive option.

[17] See Witte (1985) and Thorndike (2001) for more detailed accounts of this period in US history.

Table 1.4 presents measures of the number of tax payments a typical firm has to make and the hours a typical medium-sized firm spent preparing, filing and paying the corporate income tax, VAT or sales tax, and labor taxes, from the World Bank's *Doing Business* survey[18]. Note that we expect both the number of payments and time spent paying taxes to increase with tax ratios for a given level of tax capacity – firms that are not taxed will spend no time making no payments[19]. The relationship between the costs to taxpayers and economic development is thus a priori ambiguous. The statistics in Table 1.4 indeed show an inverse U shaped relationship between taxpayers' costs and development, with the tax system being more costly in middle income countries. The magnitude of the difference between rich countries and developing countries is large: the same firm in a developing countries spends on average more than 50% more time preparing, filing and paying taxes, and makes more than twice as many tax payments in a year. These two variables are directly under the control of tax authorities - indeed many of the innovations in tax administration described in Appendix 5 seek to facilitate tax payments by lowering both the frequency of interactions between taxpayers and the tax authorities and the time taken to pay taxes. The evidence suggests there is ample room for investments in tax capacity in developing countries.

[18] See Djankov et al. (2010) for a description of the method used. In a nutshell the World Bank asks tax experts in each country to prepare the tax returns of the same hypothetical small firm.

[19] An important limit of the *Doing Business* survey is that it asks tax professionals to assess the ease of paying taxes in their country for a typical law-abiding medium-sized firm, and does not seek to weigh the estimates thus obtained by the estimated share of firms in the country that do indeed pay taxes.

Table 1.4: Indicators of tax capacity in 2000-2010

	HICs Mean (SD)	UMICs Mean (SD)	LMICs Mean (SD)	LICs Mean (SD)
Quality of bureaucracy (ICRG)	110 (5)	98 (5)	95 (5)	90 (7)
Nb of tax payments per year	17 (10)	33 (27)	43 (22)	41 (17)
Hours spent on taxes	197 (148)	339 (210)	320 (174)	282 (97)

All variables are averaged over the years 2000-2010. See Djankov et al. (2010) for a description of the method used to construct variables 'number of tax payments per year' and 'hours spent on taxes'. The ICRG measure of the quality of bureaucracy covers 41 HICs, 33 UMICs, 32 LMICs and 16 LICs. The *Doing Business* data covers 42 HICS, 38 UMICS, 41 LMICS and 24 LICs.

Question 1:

Can the concept of tax capacity help explain the recent history of tax ratios in developing countries? In particular, can it explain the stagnation of tax revenues as a share of GDP in poorer developing countries?

C Spending capacity

I define spending capacity as *a government's capacity to spend a given level of public revenue in accordance with its objectives.* This definition is positive: it takes the government's spending objectives as given, and thus abstract from any normative consideration regarding the desirability of these objectives. I leave the discussion of the quality of government spending to the next section.

Several factors can limit a government's capacity to spend its revenues as it sees fits. The most salient one is probably the extent to which it can smooth revenues over time, in other words save and borrow. If one assumes that government spending will improve growth prospects and thus future tax bases (or simply that tax bases will grow in the future as countries develop) it is optimal for developing countries to borrow[20]. Borrowing opportunities

[20] Venables (2010) is a good discussion of the optimal time profile of government consumption in developing countries.

are limited by credit availability: countries with limited access to domestic and international credit will have sub-optimal levels of debt and will be constrained in their spending capacity. Debt also has an immediate impact on spending capacity in the form of debt service: the higher the share of revenues that goes towards debt repayment, the lower the amount left to spend on a given objective. This expenditure item would of course not be a constraint if it were factored in by perfectly far-sighted governments. It may be safe to assume that no government is perfectly far-sighted and that governments often inherit debt levels from their predecessors.[21]

Table 1.5: Indicators of spending capacity over time

	1970s Mean (SD)	1980s Mean (SD)	1990s Mean (SD)	2000s Mean (SD)
Upper-Middle-Income-Countries				
Debt (% GDP)	14 (7)	27 (20)	44 (35)	30 (16)
Net external capital flows (% GDP)	4 (4)	2 (3)	2 (2)	0 (7)
Domestic credit(% GDP)	45 (14)	63 (29)	60 (38)	68 (39)
Debt service (% public expenditures)	17 (12)	23 (10)	19 (14)	12 (7)
Inflation (annual %)	38 (54)	130 (274)	99 (219)	9 (6)
Lower-Middle-Income-Countries				
Debt (% GDP)	24 (26)	39 (29)	88 (90)	62 (38)
Net external capital flows (% GDP)	3 (5)	5 (5)	4 (5)	2 (5)
Domestic credit(% GDP)	33 (13)	45 (23)	46 (34)	38 (27)
Debt service (% public expenditures)	12 (7)	20 (8)	18 (9)	8 (4)
Inflation (annual %)	13 (6)	125 (493)	60 (195)	8 (6)
Low-Income-Countries				
Debt (% GDP)	14 (14)	33 (21)	75 (46)	73 (27)
Net external capital flows (% GDP)	4 (3)	3 (3)	2 (3)	-0 (2)
Domestic credit(% GDP)	21 (11)	28 (13)	22 (13)	23 (13)
Debt service (% public expenditures)	10 (8)	19 (11)	14 (7)	9 (6)
Inflation (annual %)	12 (4)	12 (13)	11 (11)	7 (4)

Table 1.5 presents the evolution of different public finance variables associated with spending capacity for 20 UMICs, 20 LMICs and 14 LICs. The first line shows that developing countries did accumulate debt over time. They all started with debt ratios below 25% of GDP, increased their debt

[21] The concept of spending capacity thus defined is close to that of 'fiscal space' defined by Heller (2005) as 'the availability of budgetary room that allows a government to provide resources for a desired purpose without any prejudice to the sustainability of a government's financial position'.

in the 1970s and 1980s, and decreased it in recent years. In low income countries the increase in debt ratios over time is spectacular: they quintupled between the 1970s and 1990s. Variables in the second and third lines proxy for the availability of credit to the government. I consider the share of domestic credit to the private sector in GDP, a credible proxy for domestic sources of credit, and net external capacity flows, a measure of the extent to which the external world was lending to these countries. The net flows of capital to all country groups decreased over time, and become null or even negative in the period 2000-2010[22]. The availability of domestic credit, at least to the private sector, has increased over time in UMICs, suggesting financial deepening. It has increased very little in LICs and LMICs.

The consequence of high debt ratios and borrowing constraints are found in the last two lines of the table. The evolution of the share of debt service in public expenditures mirrors that of debt ratios in all three country groups: an increase in the 80s and 90s, to the extent that debt service represented a fifth of government expenditures, and a decrease in the 2000-2010. We see however that debt expenditures decrease between the 1970s and 2000s whilst debt ratios have increased. This may be due to lower interest rates and suggests an improvement in borrowing conditions. The use of seignorage to finance expenditures is potentially a symptom of constrained public spending. The last line of Table 1.5 shows an inverse U shape pattern for the evolution of inflation, again in line with the evolution of debt ratios. UMICs and LMICs experienced episodes of hyperinflation in the 1980s and to a lesser extent the 1990s when their debts were high. Inflation is under control in the recent period.

Table 1.5 tells a more general story of fiscal policies in developing coun-

[22] This could reflect both a decreasing willingness of foreign investors to invest in those countries or an increase in debt repayments from the governments to external creditor0

tries. In 1970 they had relatively low debt levels, often thanks to the prohibition on budget deficits imposed by colonizers. Faced with pressures to increase public spending and low tax ratios they accumulated debt. In the 1970s relatively high growth and commodity export booms made foreign creditors willing to lend to developing countries – debt was cheap. In the 1980s a combination of global economic slowdown, a decline in the terms of trade for commodity exports and high interest rates led to mushrooming debt and hyperinflation. This triggered a series of stabilization reforms, ubiquitous around the developing world during the 1990s and early 2000s, which cut back expenditures and made inflation and deficit cutting the key objective of fiscal policy. This subordination to overarching stabilization priorities severely limited governments' capacity to spend on whichever non-stabilization objectives they had in mind (see Siebrits and Calitz (2007) and Adam and Bevan (2004) for a detailed account of recent fiscal history in developing countries). Table 1.5 suggests these efforts were on average successful. Most developing countries have since the early 2000s entered what Adam and Bevan (2004) call the 'post-post-stabilization' phase: their key macroeconomic indicators are at sustainable levels and fiscal or inflation crises are (mostly) in the past. This suggests the constraints governments face in setting expenditure policies have loosened in recent years – they may have acquired more spending capacity.

Political considerations may also constrain public spending if the government has to placate interest groups with targeted transfers to obtain support to pursue its objectives. This is probably a characteristic of governments everywhere and a desirable constraint on public spending. However the specific political and institutional context of developing countries suggest that checks and balances (or the lack thereof) in these countries may increase rent-seeking by interest group at the expense of (what the government sees as) general-interest public spending.[23] The change in political institutions in developing countries since 1970 presented in Table 1.2 is likely to have affected the type of interest groups which are able to influence the allocation of government spending. Whether this has increased or decreased governments' spending capacity is however an open question.

Question 2:

Has the changing context of fiscal policy in developing countries increased their spending capacity? Has the stabilization of their public finances given them room to implement welfare-improving fiscal policy?

[23] See for example Alesina et al. (2008); Calderon et al. (2004); Talvi and Vegh (2005); Tornell and Lane (1999).

4 Public revenues and government spending

One cannot ask whether governments in developing countries have 'too little' revenues without considering how they use these revenues. Many economists are skeptical that making more funds available to governments in poor countries leads to better development outcomes (Easterly, 2008). We have already seen that perceived corruption levels are high in developing countries. Anecdotal evidence that government revenues are in fact wasted or diverted abound. A conservative estimate is that ex-President of Zaire Mobutu looted the treasury of $5 billion - roughly the amount of external debt in the country when he left office in 1997 (Svensson, 2005). The most exhaustive estimate of the total amount of bribes paid each year undertaken by the World Bank using firm and household survey data, suggests these cost 1 trillion per year, around 3% of world GDP (Rose-Ackerman, 2004). This is the most visible form of corruption but probably only the tip of the iceberg.

A Government accountability and development

A growing literature seeks to measure how increases in government revenues are spent in developing countries. Its conclusions are, by and large, relatively pessimistic. Olken (2007) estimates that 20 to 30% of funds that local governments in Indonesia receive to finance road projects are diverted. Tracking funds disbursed from the central government to school districts in Uganda, Reinikka and Svensson (2005) find that schools receive only 13% of the official spending on the program. In Brazil Caselli and Michaels (2011) and Ferraz and Monteiro (2010) show that windfalls from oil royalties lead to no improvement in local public good provision. Similarly Brollo et al. (2010) find that local governments that receive higher grants from the federal government become more corrupt. A more optimistic conclusion is found in Litschig (2011) who shows that these same grants also lead to some improvements in education outcomes. Using variations across countries Svensson (2000) finds some evidence that aid increases corruption in politically divided countries.

The quality or 'accountability' of governments in developing countries is therefore a concern. These two terms here mean the same thing: the accountability of government spending is the extent to which public revenues are used to promote the well-being of the population at large and not that of public officials or a political elite. Given what we know about weak accountability in these countries, is increasing public resources of developing countries such a good idea? The classic Samuelson rule for determining the optimal level of public spending states that the marginal cost of raising revenues must equal the marginal benefit of public spending. The pervasiveness of corruption and inefficiencies in public spending could lower the marginal benefit of government spending so much that increasing tax ratios may have a negative effect on developing countries.

The idea that increases in tax ratios may have a negative impact on society is hard to reconcile with the historical experience of now rich countries. No data is available for corruption or government quality in 19th century Europe so it is impossible to assess how these were affected by the growth in government revenues. An alternative is to try to estimate the impact of the growth of government on economic growth. Increases in government revenues divert resources away from the private sector, if they are not used productively we should see a clear negative coefficient. Lindert (2004)'s analysis of social spending since the 18th century shows that one cannot find a negative impact of social spending on economic growth. On the contrary, his results suggest a small positive impact on growth for the 1880-1930 period, during which the countries in his sample were roughly comparable to middle income today in terms of economic development. He argues that the productivity gains from government spending (amongst which a more healthy and educated labor force) outweigh the efficiency cost of taxation. If rich countries' historical experiences can be used as a guide to developing countries' prospects this study suggests that increasing their tax ratios will lead to net welfare gains.

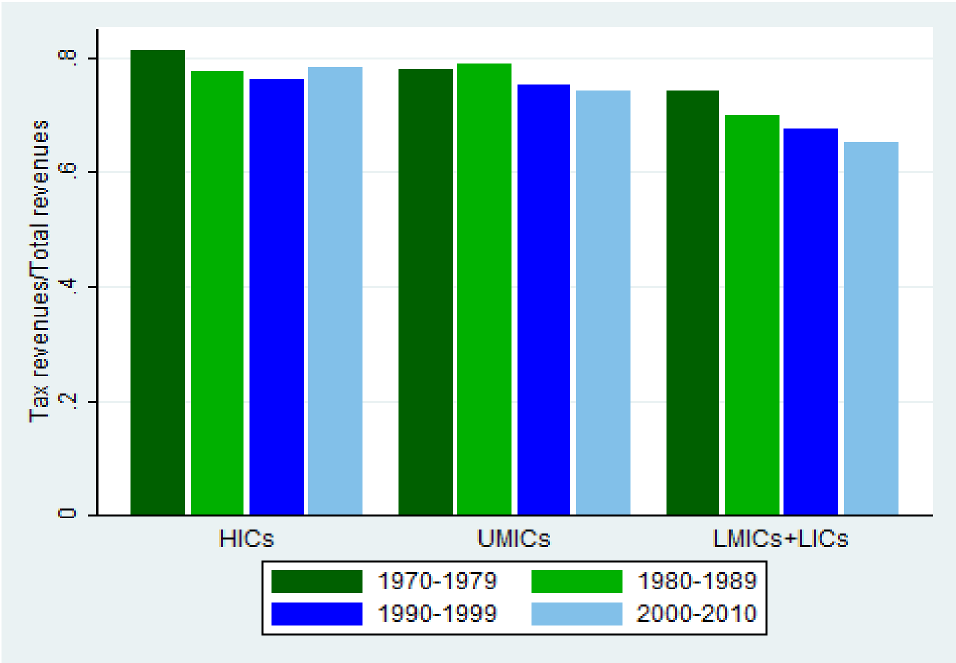
B A hypothesis: how governments are financed matters

There is a key difference between Lindert's historical study of government spending in the OECD and the micro estimates of the impact of increases in public revenues on corruption and public good provision in developing countries described above. The increasing trend in government spending in Lindert (2004) is financed by an increase tax revenues. All the papers cited above consider instead increases in non-tax revenues: transfers, oil royalties, or aid. Whilst these papers are silent on whether their results would generalize for increases in these governments' tax revenues, several arguments point in the opposite direction.

There is a long history to the idea of a strong and consistent connection between how governments are financed and their level of accountability. This idea is central to interpretations of the emergence of representative governments and democracy in OECD countries. The British narrative focuses on how the economic elites of the 17th century obtained what they wanted (secure property rights and political representation) from the Stuart dynasty in exchange for larger taxation and borrowing opportunities (see North and Weingast (1989) for one version of this narrative). The American story focuses on the 'No taxation without representation' slogan of the American colonists who rejected British colonial authority on the ground that they could not both tax them and ignore their political rights.

Several authors in political science and development studies have sought to extrapolate this historical experience of rich countries to the situation of developing ones today, turning the causality implied by the famous American

Figure 1.4: Share of tax revenues in total revenues by country group and decade



slogan upside down -'No representation without taxation' (see in particular Moore (2007) and Brautigam et al. (2008)). In a nutshell their argument is that there is a causal relation between the extent to which governments are financed by taxation and how accountable their are. This may be because governments that wish to tax more need to enter in a contract with their population to secure tax consent, or because citizens that are taxed will invest more in monitoring their governments and keeping them in check. There is some evidence to support this argument. In a case study of Argentina Gervasoni (2010) shows that states that rely more on local taxes for revenues are also more democratic. Ross (2004) finds some cross-country evidence that countries with higher tax ratios are more democratic. Paler (2012) shows that participants in a public finance game in Indonesia that are told they pay more taxes are also more willing to incur a cost to monitor politicians.

Finally, one long-standing theory in the economics literature also predicts that governments will provide more public goods when they are more financed by taxation. The 'voting with your feet' argument, dating back to Tiebout (1956) argues that governments that rely on taxing a mobile revenue base will be more responsive than those relying on non-tax revenues because they compete with one another to attract taxpayers. This argument relies on the assumption that the costs to citizens of moving out of a government's territory are low compared to the marginal value of public goods, an assumption that is likely to be strong in a developing country setting.[24] The resource curse literature is also related to this argument. This literature argues that governments become less accountable when they receive revenues from natural resources (see Van der Ploeg (2011) for a review). This issue is in many respect the flip side of the 'no representation without taxation' story: one can argue that the central political pathology of states rich in natural revenues is that they do not need to tax.

Are tax revenues spent better than revenues coming from other sources? This question is not trivial for developing countries today. Data on total government revenue is less readily available than data on tax revenues; IMF datasets allow me to construct a sample of 35 HICs, 24 UMICs and 26 LICs and LMICs (the latter two are grouped) for which data on total and tax revenues is available since 1980. Overall non-tax revenues represent on average more than 30% of public revenues in developing countries today. Figure 1.4 shows the evolution of the share of tax revenues in total public revenues in those countries over the period. Developing countries, especially poorer ones, have increasingly relied on non-tax revenues to finance public expenditures. Though details on where these revenues come from is not available

[24] The Tiebout argument may be more relevant when one is comparing local governements. Indeed Zhuravskaya (2000) finds that Russian cities who get to keep a larger share of their tax revenues - and thus have higher incentives to protect their tax bases - are more efficient in providing public goods. I discuss this at length in Chapter 5 below.

for most of the sample, it is likely that that the bulk of these revenues come from aid or the profits made by public exploitation of natural resources and public monopolies. Whether these revenues are spent differently from tax revenues is thus a relevant question for developing countries. It is also relevant from a policy perspective as most development assistance today takes the form of transfers between rich and developing countries' governments, ie increases in non-tax revenues. Some international institutions, most notably the IMF, have sought to increase tax ratios in developing countries. But technical assistance in tax capacity building is an extremely small share of the global funds earmarked to promote economic development.[25]

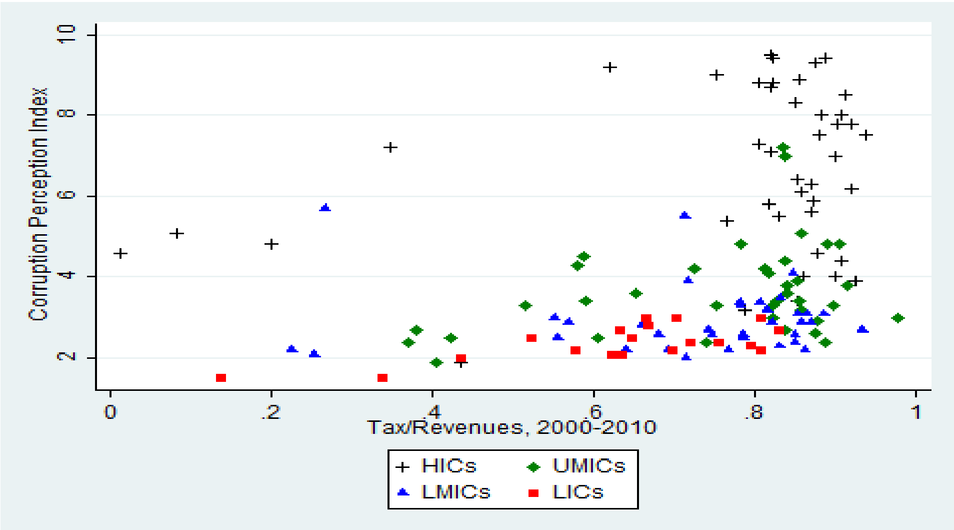
Figures 1.5 and 1.6 plot the Corruption Perception Index as a function of the share of taxes in total revenues in all countries (Figure 1.5) and developing countries only (Figure 1.6). The correlation is clearly negative: countries which are financed mostly by taxes are perceived to be less corrupt, in line with the discussion above. This correlation does not seem to be driven by the fact that richer countries are both more corrupt and more likely to be financed by taxation: Figure 1.7 plots the residuals from a regression of the Corruption Perception Index on average GDP per capita in 2000-2010 as a function of the share of taxes in total revenues. The correlation is as strongly positive as in the previous figures. One cannot reach causal conclusions from this correlation, not least because citizens which perceive their government as less corrupt may also be more willing to pay taxes. The evidence nonetheless suggests the hypothesis is not at first sight rejected by the cross-country data.

[25]OECD (2010b) shows that in 2008 technical cooperation to 'public sector financial management' in Africa is 2% of total technical copperation, itself a small share of total aid to the region.

Question 3:

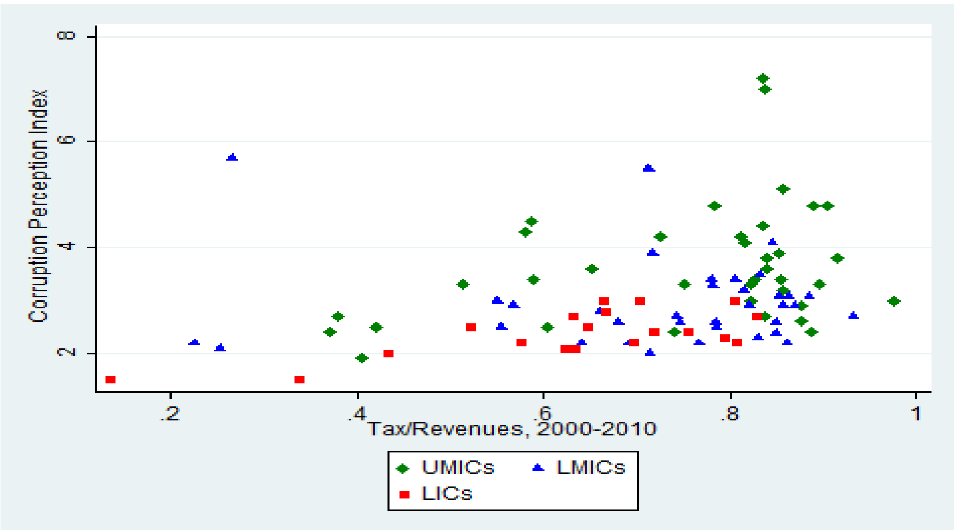
Do governments spend tax revenues better than non-tax revenues?

Figure 1.5: Corruption as a function of the share of taxes in revenues



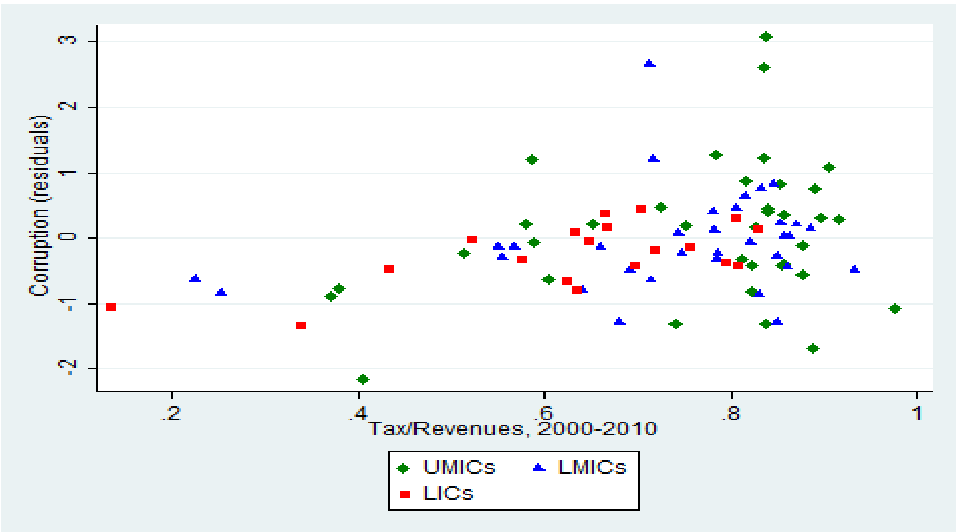
A point represents the average value for a country over the period 2000-2010.

Figure 1.6: Corruption as a function of the share of taxes in revenues (2)



A point represents the average value for a country over the period 2000-2010.

Figure 1.7: Corruption as a function of the share of taxes in revenues (3)



A point represents the average value for a country over the period 2000-2010. The variable on the y-axis is the variation in the corruption index that cannot be explained by GDP per capita.

5 A bird's eye view of the thesis

This section explains how each chapter of this thesis answers the three questions raised above and summarizes the main contributions of my research.

A Question 1: tax capacity, trade openness, and tax revenues

Chapter 3, written with Julia Cagé (Harvard University and PSE) uses the concept of tax capacity to explain one of the puzzle presented above: why have tax ratios stagnated in poorer developing countries since 1970 when they increased in richer countries? We have seen above that existing theories cannot explain this trend.

The first contribution of the research presented in this chapter is the construction of a novel panel dataset of total and trade tax revenues in developing countries for the period 1945-2006. This new dataset allows us to look at one aspect of tax structure change over time in developing countries: the share of trade taxes in total tax collection. As we see in Figure 1.8 reproduced from Figure 3.1 in the chapter this new dataset shows that total tax revenues fell in low and middle income countries between the 1970s and the 1990s, by about 2 GDP points. This is in line with the evidence presented above. Figure 1.8 adds an important piece of information: trade tax revenues also fell by two GDP points over that period. This suggests that the fall in tax revenue was due to a fall in taxes collected on trade flows.

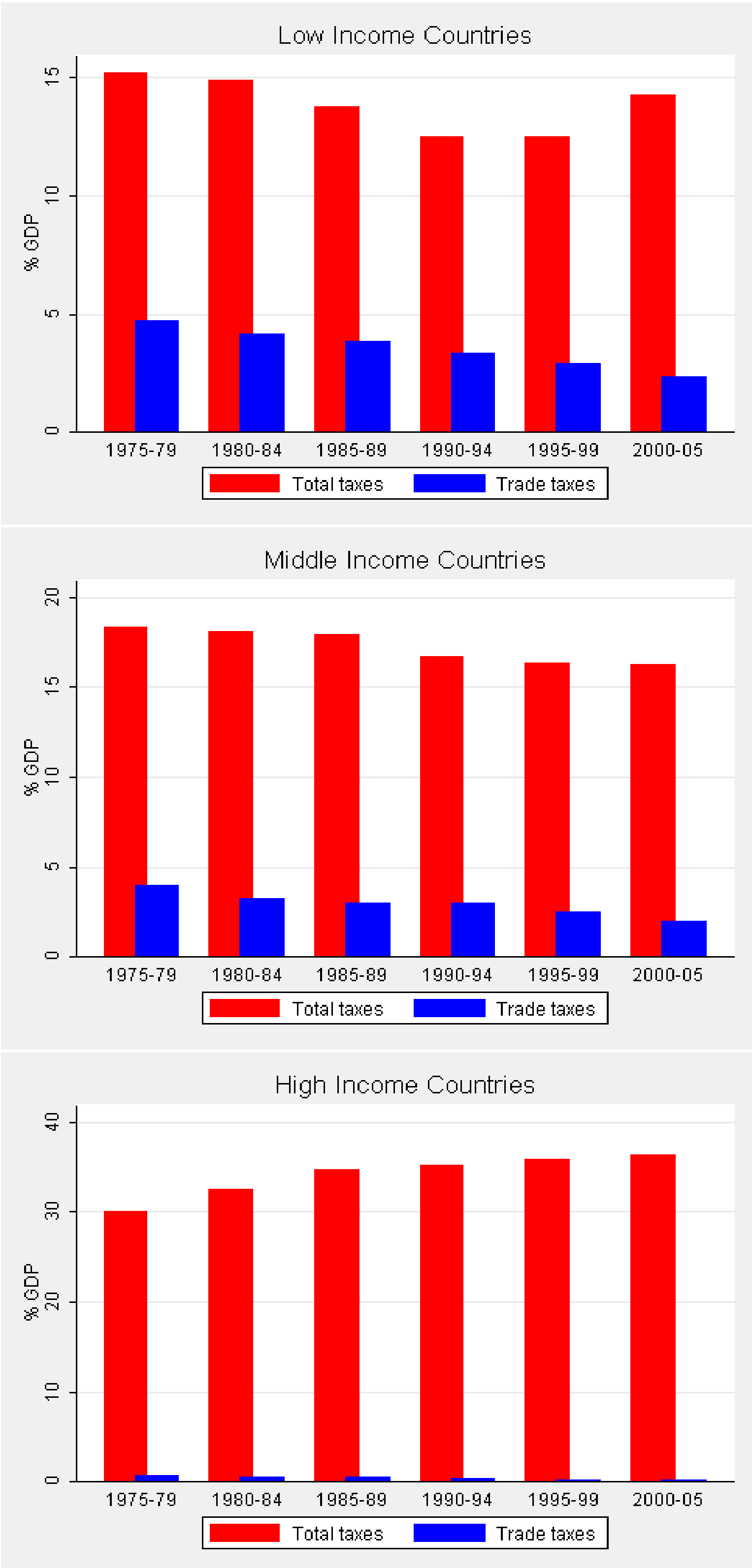
The chapter investigates this hypothesis by identifying 110 'episodes' during which revenues from taxes on trade fall substantially in developing countries since 1945 and considering what happens to total tax revenues. We show that trade taxes fall by close to 4 GDP points on average during those episodes. In more than half the countries we consider this fall in trade taxes was not compensated for by an increase in other taxes and thus lead to a fall in total tax revenues. Ten years later more than 40% of them still haven't recovered the lost tax revenues.

A key result of the optimal taxation literature is that taxes that affect production prices – such as tariffs – should never be used (Diamond and Mirrlees, 1971). A persistent recommendation of the public finance literature to developing countries has therefore been to cut trade taxes and replace them with more efficient sales taxes (see for example Keen and Ligthart (2002)). This view of the world is influential: cutting tariffs and liberalizing trade was often advocated by international financial organization throughout the period we consider. This advice was followed, as the increase in trade openness in Table 1.1 shows. What these theories cannot explain and did not predict is the fact that the lost tariff revenues was not recovered through the use of more efficient taxation on domestic income.

In this chapter we use the intuition that pre-existing tax capacity is needed to levy domestic taxes but not taxes on trade to explain what we see in the data. We build a model based on Besley and Persson (2009) in which countries can use two tax instruments to collect revenues: one is perfectly efficient but requires pre-existing tax capacity, the other – a tax on trade – is inefficient but can be freely set. This model gives predictions that are consistent with the stylized facts regarding tax ratios and tax structure and development presented in this introduction.

We then consider what happens if taxes on trade are decreased. We show that this will have a different impact on countries depending on the type of equilibria they were initially in. Countries which were already investing in tax capacity will be pushed to invest more now that their future tax revenues have decreased. The decrease in taxes is costly for them in the short-run but welfare increasing in the long-run as it hasten the shift towards a more efficient tax structure. On the other hand countries that are stuck in a low tax capacity equilibria suffer a permanent loss in tax revenues and welfare

Figure 1.8: Evolution of tax revenues as a share of GDP, 1975-2005



All values are median values for the country group and time period considered. The sample includes in each time period 26 low income countries, 40 middle income countries and 32 high income countries. See Appendix 7 for the list of countries included in our sample and a description of the variables.

as a result of the decrease in trade taxes.

Our model predicts that countries which face better returns to investments in tax capacity are more likely to recover the lost tax revenues. There are no obvious proxies for the size of these returns. Based on the arguments developed above, we use the share of agriculture in GDP, population density, and capital account openness (a potential proxy for the ease with which taxes can be evaded by shifting income abroad) to measure the ease with which a tax administration can extent its collection on domestic sources of income. Using our sample of trade liberalization episodes we find some evidence that better returns to tax investment increase the likelihood of recovery. We also find that the variables which Besley and Persson (2009) argue will increase investments in tax capacity – democracy and external wars – also lead to a higher probability of recovery.

B Question 2: government spending in sub-Saharan Africa

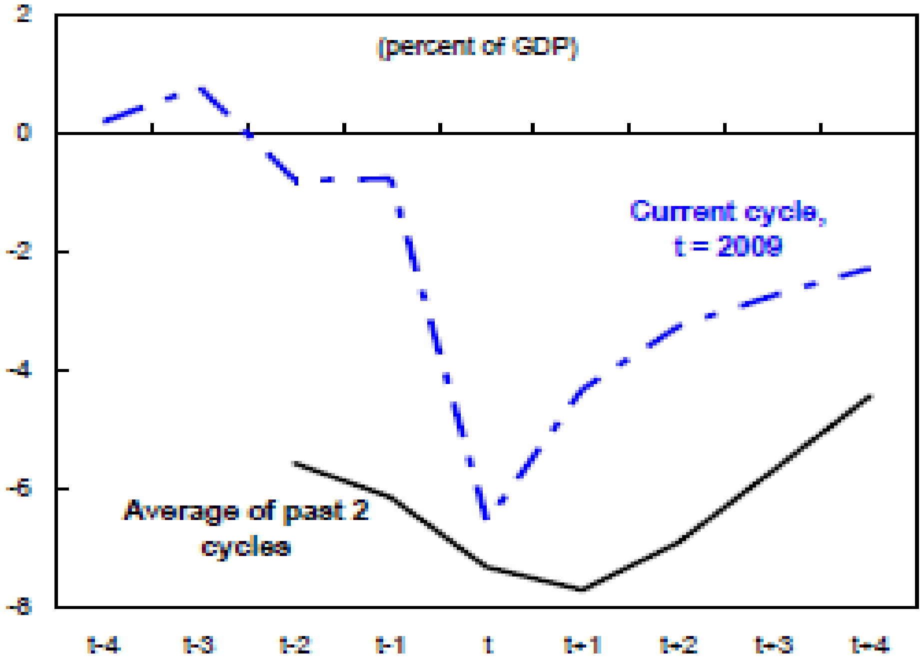
Chapter 4, written with Victor Lledo and Irene Yackovlev of the IMF considers one aspect of spending capacity, the cyclicality of government expenditures with respect to the business cycle. Previous literature has shown that government expenditures are on average pro-cyclical in the developing world: governments increase spending when the economy is booming, and cut it during recessions (Kaminsky et al., 2004; Alesina et al., 2008; Ilzetzki and Vegh, 2008). The opposite policy – contra-cyclical spending – is advocated by keynesian theories, a-cyclical policies is favored by others, but it is difficult to think of a situation in which pro-cyclical policy is optimal (see Lane (2003) for a review of these arguments).

If pro-cyclicality cannot be an unconstrained optimal policy the cyclicality of government spending is a potential measure of a country's spending capacity as defined above. Countries which cannot borrow or save at all, to take an extreme case, will have to be pro-cyclical: their revenues will increase when GDP expands, decrease in recessions, and spending will have to follow the same pattern.

This chapter investigates whether changing political and macro-economic has had any impact on the cyclicality of government spending in sub-Saharan Africa (SSA) since 1970. Anecdotal motivation for this chapter stem from observations by IMF staff regarding SSA countries' reaction to the 2009 global financial crisis. The overall impression of the IMF country representatives was that, for the first time since independence, some countries were able to implement expansionary policies to counteract the negative impact of the crisis on their population, or at least did not have to cut back spending as much as in previous crisis. Figure 1.9, from the IMF Working Paper version of this chapter shows the average evolution of fiscal balances as share of GDP in the region before and after the 2009 crisis and the three previous crises (1975, 1985 and 1991). What is striking is that SSA countries entered the 2009 crisis in a much better fiscal position (surplus in 2005 and 2006) than the previous crisis, when they were running large deficits even before the onset of the crisis. This allowed them to deepen their deficits when the crisis hit much more than during previous crises.

Using dynamic GMM techniques to control for the endogeneity of government spending, this chapter first finds that pro-cyclicality in SSA increased during the 1980s and 1990s, and decreased in recent years. There is no such change for other developing countries. We have seen in this introduction that developing countries as a whole experienced large political changes (democratization) over the period and a worsening, then improvement, of their debt levels. Restricting the sample to SSA countries this chapter estimates the impact of these changes on the cyclicality of government expenditures. It finds suggestive evidence that greater spending capacity, proxied by lower external debt, and better access to concessional financing, proxied by larger aid flows, contributed to diminishing pro-cyclicality in the region. There is

Figure 1.9: Fiscal balance in SSA countries during past and current crises



The dotted line is the average (real or predicted by the IMF) fiscal balance in SSA countries between 2005 (year $t-4$) and 2013. The solid line is the average fiscal balance in SSA during the three previous crisis, where t is 1975, 1985 or 1991.

however no evidence that political institutions affect fiscal procyclicality in sub-Saharan Africa.

C Question 3: tax capacity and government spending

Chapter 5 asks whether governments spend tax revenues better than other sources of revenues in the context of Brazilian local governments. I start by building a theoretical explanation for the idea, explained above, that there is causal relationship between how governments are financed and how they spend their revenues. The starting point is a political agency model of public finances in which public revenues come from endogenous local taxes and exogenous revenues. An incumbent politician decides how to allocate the public budget between public good provision and corruption - revenues that he keeps to himself. By assuming that this incumbent is rent-seeking I take the worse-case case scenario that one can think of based on the reading of the literature on governments in developing countries. The politician thus maximizes his intertemporal rents and the only thing that can make him provide public goods is his desire to be re-elected. The key assumption of the model is that tax revenues are perfectly observed by the politician and a representative citizen, who decides whether or not to re-elect him. Exogenous revenues, on the other hand, are a random variable whose realization is only observed by the politician. Information asymmetries lead to a difference in the extent to which the citizen can control the allocation of tax and transfer revenues. The model's key prediction is that a policy that increases local tax revenues will lead to a bigger rise in local public good provision, and less diversion of public revenues, than a policy that increases exogenous revenues by the same amount.

I then test the model's predictions by comparing how local governments in Brazil spend increases in tax and non-tax revenues. I consider increases in tax revenues generated by a program that offers municipalities subsidized loans to invest in the efficiency of their local tax administration. Selection in the program is voluntary. The challenge to identification of the impact of an increases in taxes is thus that governments' choice to participate in the program may not be orthogonal to unobservable factors that also affect tax collection and the allocation of public revenues. To study increases in 'exogenous' revenues received by municipalities I consider variations in how much federal transfers a municipality receives that are created by a rule which specifies that transfers increase discontinuously in population size.

My empirical strategy relies on a difference-in-differences estimator and 10 years of panel data on municipal tax and transfer revenues, quantity and quality of municipal health and education supply, corruption of local politicians, and a large set of local economic, demographic and political characteristics.[26] I use a specificity of the program to circumvent the selection

[26]Data on corruption comes from the randomized audits of Brazilian local governments

issue. Municipalities do not perfectly control when they start a program: they decide when then apply to the program but the date at which they start it is determined by constraints faced by the supplier of the program. This create variations in the timing of program take-up that are unrelated to local characteristics. These variations allow me to disentangle the impact of the program on tax revenues and public spending outcomes from that of (potential) time-varying determinants of selection that are unobserved.

This chapter thus offers the first empirical evaluation of the impact of investments in tax capacity. Estimation results show that the tax modernization program raises local tax revenues by 11% after four years and that this increase persists over time. The cost of the investments in tax administration are on average recovered after only two years in the program.

I then compare how these extra tax revenues are spent to how extra transfer revenues are spent. The increase in taxes is used to finance an increase in municipal education and health infrastructure and an increase in school quality. It does not lead to any increase in corruption. An increase in transfer revenues of the same magnitude has on the contrary little to no impact on municipal health and education infrastructure but increases the occurrence of corrupt practices as a share of revenues by 6% to 23%. The impacts of taxes and of transfers are estimated on different sub-populations of Brazilian municipalities; I discuss to what extent these populations are comparable. Finally I show that the impact of an increase in transfers on municipal inputs is smaller than the impact of an increase in taxes in all types of municipalities. I finally present evidence suggesting that the mechanism outlined in the model – information asymmetries – explains some of the observed differences in how taxes and transfers are spent.

since 2003, from an index of the number of irregularities observed in local public spending is constructed.

Chapitre 2

Introduction générale

C'est un manque de ressources, et non un problème d'incitations, qui limite le développement économique. On ne peut sous-estimer l'importance des revenus publics pour l'accélération de ce développement (...) Une augmentation de l'efficacité et de la quantité de services non-rémunérateurs tels que l'éducation, la santé, les systèmes de communication, tous ces services communément appelés 'infrastructure' - est nécessaire au développement économique et culturel d'un pays. Ces services doivent tre financés par des revenus publics.

Nicolas Kaldor (1963)

Il sera possible de concilier croissance et équité non pas en essayant d'influencer les sources de la croissance (ce que nous ne savons de toute faon pas faire) mais en concevant des politiques qui permettront aux pauvres d'accéder aux opportunités générées par la croissance. (...) Le financement de ces politiques pose la question des revenus publics. Un bon système éducatif demandera non seulement une gestion sérieuse, mais il également de l'argent. De mme pour les subventions à la santé et à l'assurance climatique. De mme, fort probablement, pour n'importe quel système d'aide à la création de petites et moyennes entreprises. Les pays aujourd'hui riches ont construits des gouvernements forts et des politiques sociales au cours de leur développement économique grce à l'accroissement de leur assiette fiscale. Il est difficile de croire qu'il pourrait en tre autrement avec les pays pauvres d'aujourd'hui.[a]

[a]Traductions de l'auteur.

Esther Duflo (2011)

Les économistes ont depuis longtemps reconnu que le développement économique ne se résume pas à la croissance du revenu par habitant Sen (1985). Les progrès dans le domaine de l'éducation, la santé, le respect du droit et les libertés politiques sont considérés par tous comme corrélés au développement économique, et par beaucoup comme des causes de ce développement. Historiquement les gouvernements ont toujours été à l'origine des systèmes d'éducation primaire ou de santé comme des institutions légales et politiques. Les bailleurs de fonds internationaux et les ONGs jouent certes un rôle croissant dans les pays en voie de développement et peuvent partiellement se substituer à l'action de l'Etat. Les principaux succès en matière de développement de ces dernières années, qu'il s'agissent de la baisse exceptionnelle de la pauvreté en Chine (Chen and Ravallion, 2004), de la réussite des systèmes de transferts conditionnels ('conditional cash transferts') tels que *Bolsa Escola* au Brésil ou *Progresa* au Mexique (World Bank, 2009b) ou de la croissance rapide des dragons asiatiques, sont tous cependant la conséquence de politiques gouvernementales. La construction d'Etats capables de taxer, faire respecter la loi, et organiser les dépenses publiques est donc clairement à la fois une cause et un symptôme du développement économique.

Les deux citations sur lesquelles s'ouvre ce chapitre en disent long à ce sujet. Toutes deux proviennent d'économistes à la pointe de la recherche de leur temps auxquels fut demandé de vulgariser leurs conclusions sur le développement économique. Quarante-huit années les séparent mais les similitudes entre leurs messages, au-delà des différences de style, sont frappantes. Ils commencent par un mme diagnostic : le développement ('l'accélération du développement économique' pour Kaldor, 'concilier croissance et équité' pour Duflo) nécessite une expansion des politiques publiques - tous deux mentionnent la santé et l'éducation. Tous deux concluent en insistant sur les contraintes de revenus auxquelles sont confrontés les gouvernements dans les pays en voie de développement. Les finances publiques étaient un enjeu central des politiques de développement en 1963, elles le sont encore aujourd'hui.

La lecture de la littérature contemporaine sur les gouvernements dans les pays en voie de développement mène à deux conclusions principales. D'une part les observateurs sont unanimes dans leur condamnation des institutions inefficaces et des bureaucraties corrompues qui sont la plaie de ces pays (Rose-Ackerman, 2004). D'autre part ces mmes observateurs insistent souvent sur le manque des ressources publiques nécessaires à la provision de biens publics essentiels au développement économique, et ils recommandent que les capacités a générer des recettes soient augmentées (Sachs et al., 2005). Cette tension entre le besoin de plus de revenus publics pour financer le développement et la dépense inefficace — par accident ou par choix — des ces revenus est au coeur de la recherche présentée dans cette thèse.

L'étude des causes et manifestations de la corruption et de l'inefficacité des gouvernements dans les pays en voie de développement est depuis longtemps un objet d'étude de la science économique (voir Olken et Pande (2012), Banerjee et al. (2009) ou Bardhan (1997)). L'étude des institutions et de leur rôle dans le développement économique a également fait d'importants progrès depuis North (1990). En revanche, peu de travaux de recherche s'intéressent à la capacité des Etats à prélever et dépenser des revenus publics. Les similitudes entre les citations de Kaldor et Duflo sont à cet égard également riches de sens. Duflo n'a pas l'avantage par rapport à Kaldor de pouvoir s'appuyer sur les conclusions de 50 ans de recherches sur les finances publiques, avantage dont elle bénéficierait, par exemple, sur le sujet de l'amélioration de l'accès au crédit des plus pauvres. L'étude des finances publiques dans les pays en voie de développement, en particulier l'étude de la taxation, a été relativement négligée par les économistes jusqu'à récemment. Cela peut surprendre, tant l'histoire de l'étude des finances publiques en général est longue et prestigieuse en économie, et ce au moins depuis Pigou (1932). Les modèles théoriques utilisés par cette littérature, qui se concentrent sur la contrainte d'observabilité de l'effort ou de l'habileté des agents, ne sont cependant pas en mesure d'expliquer les structures fiscales des pays en voie de développement.

Le problème de premier ordre dans ces pays est probablement l'inobservabilité des transactions - probablement due à l'importance des secteurs informels dans ces pays - qui fait de l'application de la loi fiscale à tous les agents l'enjeu numéro un de la politique fiscale. Comprendre comment le contexte spécifique des pays en voie de développement affecte les outils utilisés par les économistes pour analyser les politiques fiscales est un des buts de cette thèse.

Ce chapitre introductif a plusieurs finalités. Il présente les grands faits stylisés des finances publiques dans les pays en voie de développement, ainsi que le contexte économique et politique qui influe sur les politiques fiscales. Il introduit également les concepts fondamentaux de capacité fiscale et budgétaire qui sont au coeur de la recherche présentée dans les chapitres suivants. Il discute l'hypothèse, plus ou moins explicite dans les chapitres suivants, selon laquelle les revenus publics sont trop faibles dans les pays en voie de développement aujourd'hui. Enfin, il soulève trois questions qui feront l'objet de la recherche présentée dans cette thèse.

La démarche méthodologique de ce chapitre est d'utiliser des données sur les pays en voie de développement au cours des 40 dernières années et de comparer tant que possible leur expérience à l'évolution historique des pays aujourd'hui riches. Cette démarche s'inspire de la citation de Duflo qui se réfère à la croissance de la taille des gouvernements dans les pays riches pour suggérer une voie pour les pays pauvres. Ce type d'analyse est par nature limité par la disponibilité des données, qui devient plus problématique lorsqu'on tente de remonter dans le temps. Je présente des statistiques depuis les années 1970 sur des échantillons de pays plus petits pour lesquelles les données sont disponibles. Il est important de garder à l'esprit que ces pays ne sont pas forcément représentatifs de tous les pays en voie de développement : les pays qui ont produit des données comparables depuis 1970 ont probablement de meilleurs systèmes comptables et statistiques. Ils ont donc peut-tre aussi de meilleures administrations fiscales. La construction de bases de données cohérentes sur les finances publiques est également un des buts de cette thèse.

La Section 1 présente les faits stylisés sur les finances publiques dans les pays en voie de développement (ci-dessous 'PVDs'). La section 2 tente de définir le concept fugace de 'développement' en présentant le contexte économique et politique dans lequel se situe ma recherche. La manière dont ce contexte affecte les finances publiques est décrite dans la Section 3 qui introduit également les concepts fondamentaux dont il sera question par la suite. La Section 4 se penche sur la question de la qualité des dépenses publiques dans les PVDs et introduit une problématique importante sur la relation entre types de revenus publics et dépenses publiques. Enfin la Section 5 offre un résumé de chacun des articles qui composent la thèse. Le but ici est de fournir aux lecteurs pressés par le temps, ou peu enclins à la lecture de textes académiques, les contributions principales de cette thèse.

1 Contexte : les pays en voie de développement depuis 1970

Cette thèse s'intéresse à un groupe hétérogène de pays connus sous le nom de 'pays en voie de développement'. Ce choix d'objet d'étude repose sur l'hypothèse implicite que ces différences entre ces pays et les pays 'développés' affectent l'analyse de leurs finances publiques. Cette section présente ces différences, aujourd'hui et depuis 1970, afin de guider la lecture des chapitres suivants. L'échantillon principal utilisé inclut 130 pays pour lesquels les données de ratio revenus fiscaux sur GDP sont disponibles sur la période 2000-2010 : 43 pays à revenus élevés (PRE), 38 pays à revenu moyen supérieur (PRMS), 38 pays à revenu moyen inférieur (PRMI) et 23 pays à revenu faible (PRF).[1] Ces trois derniers groupes de pays sont généralement considérés comme 'en développement'.

A Les PVDs aujourd'hui

Le Tableau 2.1 présente une description des différents niveaux de développement des quatre groupes de pays. Il existe de nombreux indicateurs de développement. J'ai choisi ceux utilisés le plus fréquemment dans la littérature et disponibles pour le plus grand nombre de pays[2]. Toutes les données proviennent de la publication *World Development Indicators* de la Banque Mondiale sauf celles pour lesquelles une autre source est mentionnée.

La première partie du tableau présente plusieurs mesures de ce qui est communément appelé le développement économique. On voit d'importantes différences entre les quatre groupes de pays, notamment leur niveau moyen de PIB par habitant. La distribution est assez simple : les pays les plus riches

[1] La classification utilisée est celle de la Banque Mondiale en 2010 : http://data.worldbank.org/about/country-classifications/country-and-lending-groups.

[2] L'échantillon utilisé dans le Tableau 2.1 varie selon les indicateurs. Les statistiques présentées dans le Tableau 2.2 sont calculées sur un échantillon constant de pays pour lesquels les données sont disponibles depuis 1970.

ont un revenu par habitant trois fois plus élevé que les pays à revenu moyen supérieur, eux-mme sont trois fois plus riches que les pays à revenu moyen inférieur, qui sont enfin trois fois plus riches que les pays à revenu faible. Le changement structurel des économies accompagne leur enrichissement. Je mesure ce changement ici par la part de l'agriculture dans le PIB et l'urbanisation (la part de la population qui habite dans des villes). La part de l'agriculture dans le PIB est très faible dans les pays riches mais monte à un tiers dans les pays les plus pauvres ; les trois-quarts de la population habitent en ville dans les pays à revenu élevé, moins d'un tiers dans les pays à revenu faible. L'indicateur présenté dans la dernière ligne - l'ouverture au commerce international - n'est pas à strictement parler une mesure du développement économique mais sera discuté maintes fois dans cette thèse. On remarque que la corrélation avec le niveau de développement économique est moins forte pour cet indicateur que pour le changement structurel : les pays riches sont très légèrement plus ouverts au commerce international que les pays à revenu moyen[3].

La deuxième partie du tableau s'intéresse aux 'conséquences' du développement économique regroupées sous le terme 'développement humain'. Ce sont précisément les objectifs de développement mentionnées par les deux citations sur lesquelles ce chapitre s'ouvre comme étant du domaine des Etats : 'l'éducation, la santé, les systèmes de communication' pour Kaldor (1963) et les 'politiques qui permettront aux pauvres d'accéder aux opportunités générées par la croissance' pour Duflo (2011). Les pays les plus pauvres - pays à revenu faible - sont toujours dans une situation peu favorable par rapport aux autres groupes, que l'on regarde les indicateurs dans le domaine de la santé (espérance de vie, mortalité infantile) ou de l'éducation (taux d'alphabétisation, taux d'accomplissement du cursus primaire). Les PVDs les

[3]La différence entre les pays à revenu elevé et les pays à revenu moyen supérieur disparait lorsqu'on exclut de l'échantillon les deux petites économies ouvertes que sont le Luxembourg et Singapour.

plus riches sont au contraire à des niveaux assez proches de ceux des pays développés, sauf en ce qui concerne le taux de mortalité infantile[4]. Les deux derniers indicateurs sont des mesures d'inégalité des revenus. On voit que les pays à revenu moyen présentent des revenus plus inégaux que les pays les plus riches ou les plus pauvres, mais que les PVDs affichent tous des revenus plus inégaux que les pays développés - ce qu'a montré Kuznets avec sa fameuse courbe en U inversé (Kuznets, 1955).

TABLE 2.1 – Indicateurs de développement

	PREs	PRMSs	PRMIs	PRFs
Indicateurs du développement économique				
PIB par habitant	17703 (6121)	6387 (2452)	2687 (1603)	968 (518)
Agriculture (%PIB)	3 (2)	8 (3)	19 (9)	36 (11)
Population urbaine (% total)	73 (18)	64 (16)	43 (14)	27 (11)
Commerce international (%PIB)	107 (65)	88 (40)	89 (33)	63 (30)
Indicateurs du développement humain				
Taux d'alphabétisation	95 (4)	92 (7)	77 (16)	58 (24)
Taux d'achèvement de l'école primaire	97 (9)	97 (10)	82 (18)	60 (22)
Espérance de vie	77 (5)	71 (6)	65 (9)	54 (7)
Mortalité infantile	8 (13)	20 (12)	44 (27)	78 (23)
Population sous-alimentée (% total)	5 (1)	8 (6)	16 (10)	28 (12)
Ratio de pauvreté	. (.)	11 (12)	43 (22)	74 (15)
Index de Gini	32 (5)	44 (10)	43 (9)	40 (6)
Part du revenu détenu par les 10% plus riches	26 (3)	35 (9)	34 (6)	32 (5)
Indicateurs du développement politique				
Index Polity	7 (6)	5 (6)	3 (6)	1 (4)
Corruption Perception Index	112 (9)	98 (6)	94 (4)	92 (3)
Corruption (ICRG)	105 (8)	94 (4)	93 (4)	91 (6)

Valeurs moyennes pour 2000-2010, écarts-types entre parenthèses. L'index Polity est construit par le Polity Project(Marshall (2011)), l'index *Corruption Perception Index* est construit par *Transparency International*, et l'index corruption (ICRG) par le groupe *ICRG*. Les deux variables de corruption ont été redimensionées pour avoir une moyenne de 100 et un écart-type de 10.

La dernière partie du tableau présente des indicateurs de développement 'politique'. La mesure du développement politique la plus communément utilisée est l'index *polity*, un index synthétique qui classe toutes les formes possibles de gouvernement, des autocraties institutionnalisées (score de -

[4]L'indicateur ratio de pauvreté n'est pas disponible pour les pays les plus riches. Il est fort probablement très proche de zéro.

10) jusqu'aux démocraties consolidées (score de +10)[5]. Ces scores montrent une corrélation claire entre le développement politique et le développement économique, bien que la différence entre pays à revenu élevé et pays à revenu moyen inférieur soit faible.

Il existe de nombreux indicateurs qui tentent de mesurer la 'qualité' des gouvernements qui utilisent tous des définitions légèrement différentes. J'ai choisi de me concentrer sur l'aspect de la qualité des gouvernements la mieux définie : la corruption, c'est-à-dire le fait pour un élu ou fonctionnaire d'enfreindre une règle pour obtenir un avantage personnel. J'utilise deux mesures de la perception de la corruption par les citoyens, compilées à partir de différentes sources[6] La première est utile car elle couvre un grand nombre de pays (146 pays pour l'indicateur CPI), la deuxième parce qu'elle a une dimension temporelle- l'équipe du *International Country Risk Guide* (ICRG) a commencé à mesurer la corruption en 1985. Les deux indicateurs décroissent avec le niveau de corruption peru et ont une moyenne de 100 et un écart-type de 10. Ils sont très fortement corrélés (coefficient de corrélation de 0.7) et mènent aux mmes conclusions : plus un pays est riche, moins il est corrompu. Les pays à revenu moyen supérieur ressemblent plus aux autres PVDs qu'aux pays riches en ce qui concerne la corruption.

[5] Ces données sont compilées par le projet POLITY IV du *Center for Systemic Peace* qui se base sur une lecture de sources contemporaines et historiques par des experts.

[6] Ces sources sont des sondages et enqutes pour le *Corruption Perception Index* (CPI) de l'ONG *Transparency International*, et les experts-pays de l'équipe du *International Country Risk Guide* pour la variable ICRG.

B Les PVDs depuis 1970

On s'intéresse maintenant au développement des PVDs depuis 1970 à l'aide de neuf indicateurs présentés dans le tableau 2.2. Ces indicateurs sont disponibles sur l'ensemble de la période pour 58 pays (15 PREs, 13 PRMSs, PRMIs et 14 PRFs). On remarque tout d'abord une amélioration de tous ces indicateurs au fil du temps dans tous les groupes de pays. Ceci suggère un processus global de 'développement' à l'échelle mondiale. Mais il n'y pas de convergence claire entre les groupes de pays. La différence entre le PIB par habitant des pays à revenu moyen supérieur et des pays à revenu moyen inférieur est restée stable, tous deux ont cru de 40-45%. Les pays les plus riches ont cr plus vite (60%) et les pays les plus pauvres sont restés à la traîne avec une croissance plus modeste (13%). Il est par ailleurs frappant de constater que ces derniers ne se sont pas enrichis entre les années 1970 et les années 1990, au contraire. Les indicateurs de changement structurel suggèrent toutefois qu'une certaine forme de développement économique a bien eu lieu pendant cette période mais qu'il s'est accompagné d'un appauvrissement. Enfin, on remarque une ouverture croissante au commerce international dans tous les pays, surtout ceux à revenu moyen inférieur. Ceci témoigne d'un phénomène de mondialisation des échanges.

On remarque plus de convergence entre les pays lorsqu'on s'intéresse aux indicateurs de développement humain. Les taux d'achèvement de l'école primaire et l'espérance de vie ont plus augmenté pour le groupe le plus pauvre. L'indicateur principal de développement politique, l'index *Polity*, s'est également nettement amélioré au cours du temps. Dans les années 1970, tous les groupes de PVDs étaient en moyenne non-démocratiques (les index sont négatifs). En 2000-2010, le pays moyen est devenu une démocratie. Cette 'troisième vague de démocratisation' (Huntington, 1991) n'est cependant pas allée jusqu'à changer les pays pauvres et moyennement pauvres en démocraties consolidées ; ces deux groupes ont des scores positifs mais faibles dans les années 2000. La prudence est de mise quand à l'évolution de la variable sur la corruption. Elle est le résultat d'interprétations forcément subjectives des experts de l'ICRG dont les attitudes vis-à-vis des différentes formes de corruption ont probablement changé au cours du temps, au gré de leur importance dans le débat public. Il est néanmoins intéressant - et peut-tre contre-intuitif - de constater une aggravation des scores de perception de la corruption dans tous les groupes de pays, sauf dans les pays à revenu moyen inférieur. On ne retrouve pas dans la dimension temporelle la corrélation négative entre développement économique et corruption constatée ci-dessus par la comparaison entre les pays.

Les tableaux 2.1 et 2.2 permettent de définir grossièrement les pays en voie de développement comme des pays qui 1) ont un revenu par habitant plus faible que les pays développés (par définition) 2) une structure économique plus agricole, moins urbaine et légèrement moins ouverte au commerce international 3) des indicateurs de santé et d'éducation faibles et 4) des démocraties non consolidées et souvent corrompues. Au sein de ce groupe, les pays les plus riches ressemblent de plus en plus aux pays développés en ce qui concerne les indicateurs de développement humain. Ils sont cependant plus proches des autres pays en voie de développement lorsqu'on regarde les indicateurs d'inégalité de revenu et de développement politique, en particulier la corruption.

Il est utile de garder ces différences en tte lors de la lecture des chapitres qui constituent cette thèse. Le premier chapitre s'appuie sur des comparaisons entre pays et au cours de l'histoire et s'intéresse à tous les PVDs depuis 1945. Le second chapitre se concentre sur les pays d'Afrique sub-saharienne. La plupart d'entre eux sont classifiés comme pays à revenu faible en 2010 (17 sur 32). Le chapitre final porte sur le Brésil, un pays à revenu moyennement supérieur assez typique de son groupe avec un PIB par habitant de presque

Table 2.2 – Indicateurs de développement au cours du temps

Décennie :	1970	1980	1990	2000
Pays à revenu élevé				
PIB par habitant	11742 (4730)	13098 (4541)	15974 (5121)	18955 (5905)
Population urbaine (% total)	66 (16)	71 (14)	75 (12)	76 (12)
Agriculture (%PIB)	8 (7)	6 (5)	3 (2)	2 (1)
Commerce international (%PIB)	73 (23)	74 (27)	73 (28)	90 (36)
Taux d'achèvement de l'école primaire	83 (25)	88 (19)	94 (12)	99 (5)
Espérance de vie	71 (5)	74 (3)	76 (3)	78 (3)
Mortalité infantile	23 (22)	13 (12)	8 (6)	5 (3)
Index Polity	4 (8)	5 (8)	7 (6)	7 (6)
Corruption (ICRG)	. (.)	112 (9)	112 (8)	106 (8)
Pays à revenu moyen supérieur				
PIB par habitant	4495 (2480)	4882 (1750)	5567 (2122)	6545 (2422)
Population urbaine(% total)	56 (19)	63 (17)	70 (13)	75 (11)
Agriculture (%PIB)	14 (7)	11 (4)	9 (4)	6 (3)
Commerce international (%PIB)	60 (42)	58 (38)	65 (46)	75 (48)
Taux d'achèvement de l'école primaire	73 (14)	83 (10)	91 (6)	98 (5)
Espérance de vie	63 (4)	67 (3)	70 (4)	72 (7)
Mortalité infantile	63 (22)	42 (17)	30 (13)	21 (11)
Index Polity	-2 (7)	0 (7)	4 (5)	5 (5)
Corruption (ICRG)	. (.)	102 (5)	100 (4)	96 (5)
Pays à revenu moyen inférieur				
PIB par habitant	1554 (520)	1779 (731)	1879 (861)	2201 (1022)
Population urbaine(% total)	29 (10)	33 (11)	37 (12)	41 (13)
Agriculture (%PIB)	30 (11)	25 (10)	23 (9)	18 (8)
Commerce international (%PIB)	62 (32)	58 (33)	72 (35)	89 (41)
Taux d'achèvement de l'école primaire	50 (14)	63 (16)	65 (19)	75 (18)
Espérance de vie	54 (6)	58 (6)	59 (8)	60 (10)
Mortalité infantile	97 (24)	78 (20)	66 (23)	55 (25)
Index Polity	-5 (5)	-4 (6)	-1 (6)	2 (6)
Corruption (ICRG)	. (.)	93 (6)	97 (4)	93 (4)
Pays à revenu faible				
PIB par habitant	824 (196)	808 (184)	773 (194)	931 (445)
Population urbaine(% total)	16 (9)	20 (10)	23 (11)	27 (12)
Agriculture (%PIB)	43 (13)	40 (9)	40 (10)	35 (9)
Commerce international (%PIB)	43 (25)	45 (26)	48 (22)	53 (18)
Taux d'achèvement de l'école primaire	29 (17)	35 (19)	38 (16)	55 (20)
Espérance de vie	46 (5)	50 (5)	50 (7)	54 (6)
Mortalité infantile	121 (21)	106 (19)	95 (19)	77 (19)
Index Polity	-5 (4)	-5 (4)	-0 (5)	1 (5)
Corruption (ICRG)	. (.)	96 (10)	96 (5)	92 (6)

Valeurs moyennes pour la décennie, écarts-types entre parenthèses.L'index Polity est construit par le Polity Project(Marshall (2011)), l'index *Corruption Perception Index* est construit par *Transparency International*, et l'index corruption (ICRG) par le groupe *ICRG*. La variable de corruption a été redimensionée pour avoir une moyenne de 100 et un écart-type de 10.

6000, un ratio de pauvreté de 16% et un index de corruption CPI de 98.

2 Revenus publics et développement

Cette section présente les faits stylisés sur les revenus fiscaux et le développement. Je commence par discuter le rapport entre le ratio 'revenus fiscaux sur PIB' (ratio fiscal ci-dessous) et le développement économique en utilisant les variations actuelles entre pays et l'expérience historique des pays aujourd'hui riches. Je présente ensuite les principales sources de revenus fiscaux à différents niveaux de développement.

A Ratios fiscaux

Les variables qui nous intéressent ici sont les revenus fiscaux totaux collectés par tous les niveaux de gouvernements. Les données proviennent de sources publiques et non publiques du FMI[7], toutes étant construites selon les mmes définitions. Ces bases de données ne contiennent que les revenus fiscaux formels. Olken et Singhal (2009) montrent que les revenus locaux dans les PVDs prelèvent souvent des impôts informels et que ceux ci représentent une part non négligeable des budgets locaux. Les bases de données officielles sous-estiment donc probablement un peu les ratios fiscaux des PVDs.[8]

Afin de comparer la situation actuelle des PVDs avec celle des pays riches lorsqu'ils étaient à des niveaux de développement similaires, j'utilise des données sur quatre pays riches pour la période 1820-1940.[9] Enfin les

[7] Ces données sont les *Government Finance Statistics, Historical Government Finance Statistics* et la base de données sur les revenus fiscaux totaux et les revenus douaniers collectée par Thomas Baunsgaard et Michael Keen à partir de sources internes au FMI. La variable 'revenus fiscaux' de la base de données de Baunsgaard and Keen (2010) n'est pas utilisée dans ce chapitre, les statistiques sur les différentes sources de revenus fiscaux provenant toutes de sources officielles.

[8] Olken et Singhal (2009) estiment que les impôts informels représentent 15% des impôts totaux payés par les ménages en moyenne dans cinq pays à revenu faible. Ces impôts (impôts sur les revenus + impôts sur les biens et services) représentent eux mmes 54% des impôts totaux dans ces pays. Ceci implique que le ratio fiscal moyen pourrait passer de 12.7 à 13.7% si on prenait en compte les impôts informels. Il est cependant probable que les individus moyens observés dans les enqutes utilisées par ces auteurs paient moins d'impôts que le ménage moyen.

[9] Les données sur la France viennent de Mitchell (2007) pour 1839-1930 et de l'INSEE pour 1959-1990, les données sur l'Allemagne ont été collectées par Gabriel Zucman à partir de sources historiques, les données sur l'Angleterre viennent de Mitchell (2007) pour 1839-

séries de PIB par habitant en dollars internationaux Geary-Khamis de 1990 viennent de Maddison (2008) et sont utilisées pour comparer les niveaux actuels de développement des pays riches avec ceux des PVDs. Toutes les statistiques sur le PIB dans ce chapitre proviennent de cette source.

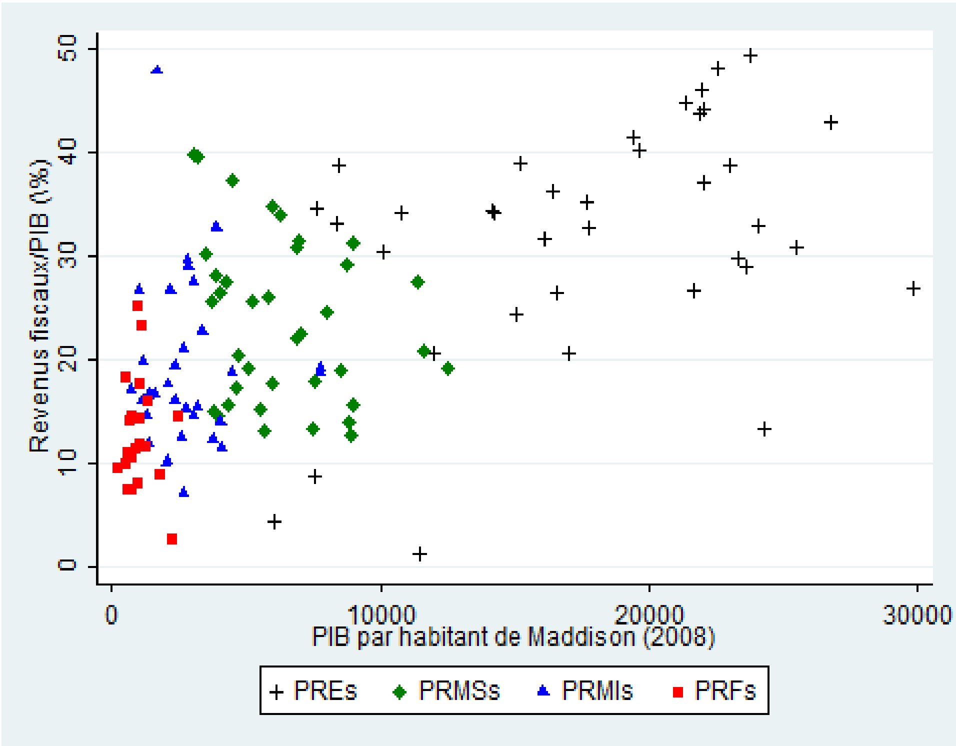
La figure 2.1 présente les ratios fiscaux moyens sur la période 2000-2010 par pays en fonction du PIB par habitant. La première ligne du tableau 2.3 montre les moyennes par groupe de pays pour cette période. Ces deux méthodes révèlent la mme corrélation entre le revenu par habitant et le ratio fiscal : les pays à revenu élevé ont un ratio fiscal de 32% en moyenne sur la période, les pays à revenu moyen supérieur un ratio moyen de 23%, les pays à revenu moyen inférieur prélèvent 19% de leur PIB en impôts et les pays à revenu faible 13%. On remarque cependant que cette corrélation positive est principalement due à la comparaison entre les groupes de pays. Le premier graphique de la Figure 2.2 présente la mme relation mais uniquement pour les pays les plus pauvres (pays à revenu moyen inférieur et pays à revenu faible). Il reste une variation importante au sein des groupes de pays qui ne peut tre que très partiellement expliquée par des différences de PIB.

Un des hypothèses centrales de cette thèse est que les revenus fiscaux dans les PVDs sont trop faibles par rapport à leurs besoins. Une manière d'interroger la validité de cette hypothèse est de comparer les ratios fiscaux actuels des PVDs avec ceux des pays riches lorsqu'ils étaient à des niveaux similaires de développement. La Figure 2.2 compare les ratios fiscaux dans les PVDs pour la période 2000-2010 aux moyennes décennales dans quatre pays de l'OCDE entre 1820 et 1990. On observe une augmentation continue des ratios fiscaux entre 1820 et 1990, d'environ 10% à presque 50% en France, au Royaume-Uni et en Allemagne.

On remarque tout d'abord que de nombreux pays à revenu faible prélèvent

1930, Clark (2002) pour 1930-1967 et HM Treasury pour 1967-1990 ; enfin les données pour les Etats-Unis, 1902-1990, viennent de Carter (2006).

FIGURE 2.1 – Ratios fiscaux en 2000-2010 par niveau de développement



Un point représente un pays pour la période 2000-2010.

TABLE 2.3 – Revenus fiscaux en 2000-2010 par groupe de pays

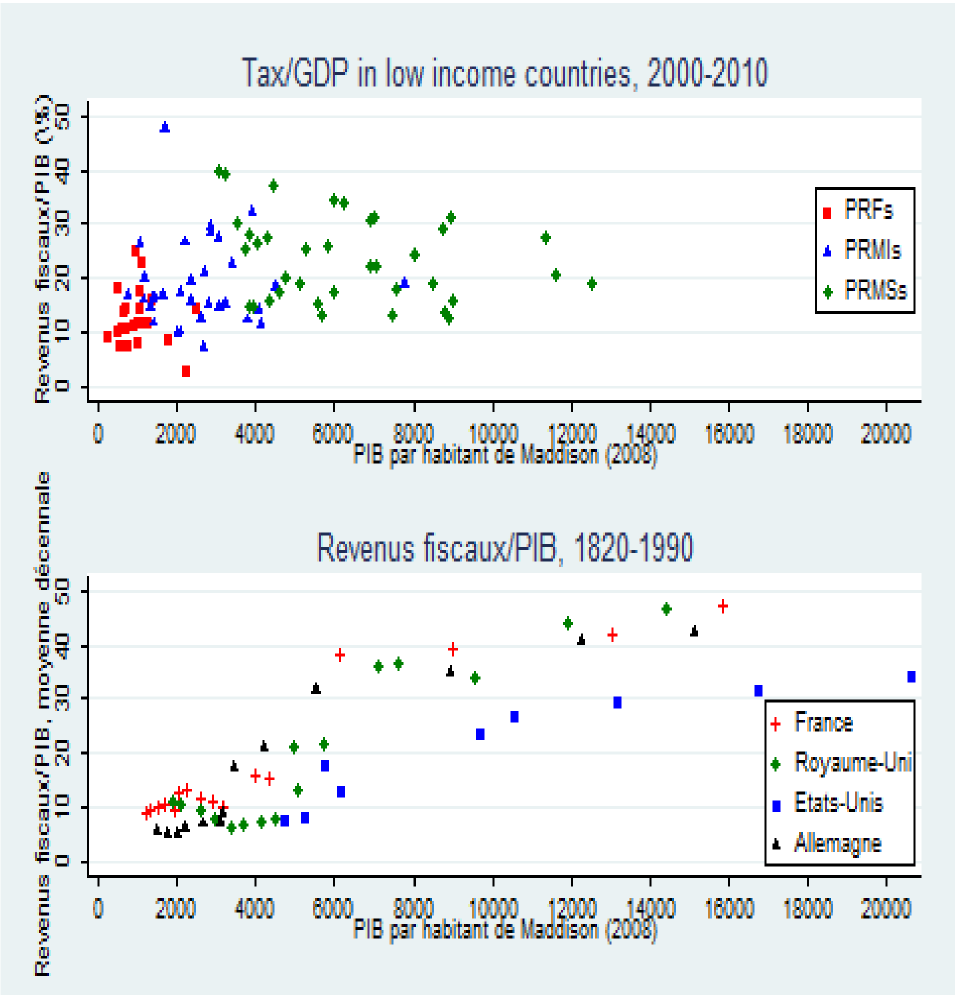
	PREs	PRMS	PRMIs	PRFs
Revenus fiscaux/PIB (%)	32.0	23.3	18.8	12.7
	(11.1)	(7.9)	(7.6)	(5.1)
PIB par habitant	17809.7	6387.1	2752.8	978.6
	(6169.7)	(2451.6)	(1623.5)	(539.5)
% Impôts sur les biens et services	26.5	33.6	32.5	33.5
	(11.6)	(13.8)	(16.2)	(14.4)
% Impôts sur le revenu et la propriété	36.6	25.0	24.1	18.6
	(14.8)	(14.4)	(13.1)	(8.9)
% Contributions sociales	24.1	18.8	7.6	2.0
	(14.7)	(15.6)	(9.8)	(3.8)
% Impôts sur le commerce international	4.3	9.0	10.5	22.8
	(13.1)	(12.4)	(10.3)	(14.0)
Observations	43	38	38	23

Moyennes pour 2000-2010, écarts-types entre parenthèses. La catégories 'autres impôts' est exclue.

aujourd'hui plus de 20% du PIB en impôt, ce que les pays riches ont rarement fait avant la Seconde guerre mondiale. La situation moyenne dans les pays à revenu faible aujourd'hui, des ratios fiscaux de 12.7% et un revenu par habitant de 1000 en moyenne, est très proche de celle de la France en 1820, et ce mme s'il n'existe pas de groupe de comparaison pour beaucoup des pays à revenu faible aujourd'hui, plus pauvres que tous les pays riches de l'échantillon en 1820. On observe ensuite que le ratio fiscal moyen dans les pays à revenu moyen inférieur, 19% pour un revenu par habitant de 2700, est plus elevé que ce qu'on observe dans les pays riches à un niveau similaire de développement mais relativement proche de la situation de l'Allemagne dans les années 1920. Au contraire les pays à revenu moyen supérieur prélèvent plutôt moins d'impôts que les pays riches à des niveaux similaires de revenu par habitant. Avec un revenu de 6400 par habitant ils sont similaires au Royaume-Uni des années 1940 ou la France et l'Allemagne des années 1950, mais leurs ratios fiscaux sont en moyenne plus faibles (23% contre 36% au Royaume-Uni, 38% pour la France et 31% pour l'Allemagne). La Figure 2.2 suggère ainsi que les ratios fiscaux dans les PVDs aujourd'hui sont globalement comparables à ceux des pays riches à des niveaux similaires de développement. Les données ne contredisent donc pas l'idée que les revenus fiscaux des PVDs sont amenés à croître au fur et à mesure qu'ils deviennent plus riches.

Les données sont plus rarement disponibles lorsqu'on remonte dans le temps. J'utilise un échantillon de 85 pays (28 PRE, 19 PRMS, 22 PRMI et 16 PRF) pour lesquels les données sont disponibles depuis les années 1970 pour observer l'évolution récente des revenus fiscaux dans les PVDs. L'impression générale qui ressort du Tableau 2.2 est celle d'une divergence entre les groupes de pays au cours du temps. Les ratios fiscaux ont cr de près de 10% dans les deux groupes les plus riches entre les années 1970 et 2000. Sur la mme période, ils ont plus ou moins stagné dans les deux

FIGURE 2.2 – Ratios fiscaux et développement économique



Un point représente un pays en 2000-2010 (graph du haut) ou une décennie entre 1820 et 1990 (graph du bas).

groupes de pays les plus pauvres. Les ratios fiscaux ont mme décliné dans les deux groupes pendant les années 1980 et 1990, les pays à revenu faible en particulier ont perdu un cinquième de leurs revenus fiscaux. Ceci contredit ce que l'on a précédemment observé sur l'évolution croissante des ratios fiscaux au cours du temps et avec le développement économique.

B Structure des revenus fiscaux

D'o viennent les revenus fiscaux des PVDs ? Le Tableau 2.3 présente la distribution des revenus fiscaux par source pour chaque groupe de pays pour la période 2000-2010. On voit que les pays ont une structure fiscale très différente à différents niveaux de développement. Les pays les plus pauvres dépendent beaucoup des impôts sur le commerce international qui représentent un cinquième des revenus fiscaux des pays à revenu faible et 10% des revenus des pays à revenu moyen inférieur. Les pays riches prélèvent beaucoup plus d'impôts sur le revenu et de contributions sociales - ces catégories représentent 60% de leurs recettes fiscales. Ces prélèvements pèsent tous deux sur les revenus des personnes physiques et morales, la différence étant que les contributions sociales financent des systèmes de sécurité sociale budgétairement séparés des comptes de l'Etat. Ces systèmes sont quasi-absents des pays les plus pauvres - les pays à revenu faibles collectent plus de revenus grce aux impôts sur le commerce international que par le biais de ces impôts sur les personnes. On remarque enfin que les impôts sur les biens et services représentent plus d'un quart des revenus totaux dans tous les groupes de pays. Les données portant sur la structure fiscale à partir des années 1970 ne sont généralement pas disponibles[10]. Le chapitre 3 s'intéresse à l'évolution des structures fiscales dans les PVDs en utilisant une nouvelle base de données.

Cette section a présenté quatre faits stylisés principaux sur la taxation et le développement. Le premier montre que les ratios de revenus fiscaux sur PIB augmentent avec le développement économique, mais on a vu que cette corrélation est plus faible si on compare les PVDs entre eux. On a vu ensuite que ces ratios dans les PVDs aujourd'hui sont comparables avec ceux observés dans les pays riches à des niveaux de développement similaires. Ces

[10] Elles ne sont disponibles que pour deux pays à revenu faible, la Birmanie et le Népal.

ratios fiscaux n'ont pas augmenté entre 1970 et 2010 dans les pays les plus pauvres alors qu'ils croissaient dans les pays riches et les PVDs les plus riches. Enfin, plus les pays sont riches moins ils prélèvent d'impôts sur le commerce international et plus ils en prélèvent sur les personnes.

Le premier chapitre de cette thèse compare l'évolution des ratios fiscaux et structures fiscales au cours du temps entre pays. Il s'intéresse à l'expérience de chaque pays depuis 1945, et plus particulièrement à l'absence de croissance des ratios fiscaux dans les pays pauvres. Le troisième chapitre s'intèresse au Brésil, qui est là encore un pays à revenu moyen inférieur typique : les ratios fiscaux y ont cru de 20% au début des années 1990 à 30% aujourd'hui.[11] Il utilise des variations entre les gouvernements subnationaux au sein du Brésil pour comprendre les conséquences de cette augmentation des revenus fiscaux.

[11]Les données du FMI n'ont aucune information sur le Brésil avant 1990.

3 Caractéristiques des PVDs et finances publiques

A Revue rapide de la littérature

Les caractéristiques des PVDs permettent-elles d'expliquer les variations de ratios fiscaux et de structures fiscales présentées dans la Section 1 ? On peut distinguer deux catégories de caractéristiques. La première regroupe les indicateurs que l'on considère généralement comme déterminés par les politiques publiques : les indicateurs de développement humain et la corruption. Les autres indicateurs sont généralement pensés comme des déterminants des finances publiques qui contraignent et influencent les choix d'impôts et de dépenses des gouvernements.[12] La littérature distingue ensuite deux types de déterminants des finances publiques. Les premiers sont des déterminants de l'offre de finances publiques, ils influent sur la quantité d'impôts que l'Etat peut prélever. Les seconds influent sur la demande de dépenses publiques à laquelle les gouvernements sont confrontés.

Il existe de nombreuses théories cherchant à expliquer l'augmentation des ratios de revenus fiscaux sur PIB au cours du développement économique, la fameuse loi de Wagner[13]. Baumol (1967) développe une théorie de l'offre selon laquelle la productivité relative du secteur privé par rapport au secteur public augmente avec le développement. Ceci mène naturellement à une croissance de la taille du secteur public dans l'économie. D'autres auteurs soutiennent que ce n'est pas tant la croissance du PIB en soi qui affecte la taille de l'Etat mais plutôt le changement structurel qui accompagne cette croissance. Ainsi Kleven et al. (2009) qui montrent théoriquement que l'augmentation de la taille des entreprises induite par la croissance économique

[12] Ces indicateurs sont évidemment eux-mmes influencés par les politiques fiscales ; l'ouverture au commerce international en particulier est partiellement déterminée par la politique douanière. De mme, les niveaux d'éducation et de corruption d'un pays contribuent à déterminer les attentes des populations vis-à-vis de leurs gouvernements et donc le niveau et la structure des dépenses publiques.

[13] D'après l'économiste allemand Adolph Wagner (1835-1917).

facilite la tche de l'administration fiscale en augmentant la probabilité qu'un employé décide de dénoncer les fraudes commises par son entreprise. Les deux indicateurs présentés ci-dessus - la part de l'agriculture dans le PIB et l'urbanisation - mesurent potentiellement bien le type de changement structurel que ces auteurs ont en tte car les entreprises sont plus larges dans le secteur industriel et dans les villes.

La première théorie de la demande a été formulée par Musgrave (1969) qui fait l'hypothèse que la demande pour la dépense publique a une élasticité revenu supérieure à 1. Il n'y cependant pas de fondations microéconomiques claires à cette théorie. Une autre explication est que les gouvernements démocratiques vont devoir dépenser plus que les gouvernements autocratiques, car ils ont des objectifs différents (McGuire and Olson, 1996) et une plus grande légitimité qui leur permet de prélever plus d'impôts. Aidt and Jensen (2009) montrent ainsi que l'élargissement du droit de vote en Europe a donné lieu à une augmentation de la part des revenus fiscaux dans le PIB. Enfin l'ouverture au commerce international est une source potentielle d'accroissement de la demande pour les dépenses publiques : Rodrik (1998) montre qu'il y a une corrélation empirique entre ouverture au commerce international et taille de l'Etat. Il l'explique par le fait que l'ouverture augmente la vulnérabilité des économies aux chocs extérieurs, et donc la demande des populations pour des dépenses publiques d'assurance sociale.

Ces théories expliquent bien la croissance historique de la taille des gouvernements dans les pays aujourd'hui riches alors que ceux-ci s'enrichissaient, s'industrialisaient et se démocratisaient. Elles permettent également d'expliquer les différences contemporaines entre pays. Elles ne peuvent cependant rendre compte de la plus faible croissance des ratios fiscaux dans les pays pauvres que dans les pays riches depuis les années 1970. La baisse du PIB par habitant dans les pays à revenu faible peut expliquer une partie de la baisse des ratios fiscaux. L'industrialisation, la démocratisation et l'ouverture progressive de ces pays pendant la mme période suggère au contraire qu'ils auraient d pouvoir et vouloir prélever plus d'impôts. La différence entre les groupes de pays à revenu moyen ne peut s'expliquer par aucune de ces théories car les mmes types de changements ont eu lieu dans ces deux groupes.

Plusieurs types de théories de l'offre permettent enfin d'expliquer les différences de structures fiscales présentées dans le tableau 2.3. Ces théories s'appuient sur les différences de structures économiques, et ce au moins depuis Hinrichs (1966). Il existe aujourd'hui une vaste littérature expliquant comment le sous-développement contraint les PVDs à utiliser des structures fiscales différentes de celles des pays développés (voir par exemple Alt (1983); Bird (1992); Bird et al. (2008), Kau et Rubin (2002)). Elle défend l'idée que les PVDs ont des cots administratifs plus élevés et donc qu'il est optimal pour eux de taxer les assiettes facilement accessibles, comme le commerce international. Riezman et Slemrod (1987) montrent ainsi que les pays avec des cots administratifs élevés (mesurés approximativement par le taux d'alphabétisation, la densité de population et le taux d'activité des femmes) prélèvent une part plus grande de leurs revenus grce aux impôts sur le commerce international. De mme, Gordon et Li (2009) construisent un modèle de taxation optimale qui prend en compte le fait que les gouvernements peuvent uniquement taxer les entreprises dans le secteur formel - définies ici comme celles ayant accès au secteur financier. Ils montrent que cette hypothèse change fondamentalement les prédictions de la théorie de la taxation optimale et explique pourquoi les PVDs utilisent beaucoup les impôts douaniers et l'inflation pour financer leurs dépenses publiques.

B Capacité fiscale

Cette littérature fait l'hypothèse que les contraintes qui limitent la capacité des Etats à prélever des impôts soient données : les changements économiques et politiques qui allègent ces contraintes sont exogènes à l'action des gouvernements. De mme, les cots administratifs (cots de collection et de mise en application de la loi fiscale) sont généralement envisagés comme déterminés par la structure de l'économie et la mauvaise qualité (exogène) de la bureaucratie. L'étude de la faon dont les gouvernements peuvent eux-mmes s'affranchir de ces contraintes, et à quelles conditions, est par conséquent très peu étudiée. Tous les gouvernements du monde tentent cependant d'augmenter leurs revenus fiscaux dans un contexte économique et politique donné, en réformant leur administration fiscale. L'annexe 5 décrit en détail comment les gouvernements locaux brésiliens tentent d'augmenter leurs revenus fiscaux en modernisant leur administration fiscale. OECD (2010a) présente plusieurs exemples similaires dans les pays d'Afrique subsaharienne.

L'idée selon laquelle la capacité à prélever et dépenser les revenus publics est endogène aux choix des gouvernements est au coeur de travaux récents menés par Tim Besley et Torsten Persson (Besley et Persson, 2009, 2010, 2011) - ci-dessous BP. Elle est également au coeur de deux des trois articles de cette thèse. La première contribution de BP à la littérature économique est le fait d'avoir fait du concept de capacité étatique - fiscal and legal capacity - un concept clef en économie politique du développement. La deuxième est leur analyse des conditions qui mènent les Etats à choisir d'investir dans leur capacité étatique. L'objet d'étude de cette thèse porte surtout sur la *fiscal capacity* des Etats (ce concept regroupe les capacités fiscales et budgétaires des Etats, que je distingue ci-dessous) et les conséquences de l'augmentation de cette capacité.

La capacité fiscale d'un Etat consiste en son *habileté à observer et surveiller les transactions économiques qui ont lieu sur son territoire et à prélever un partie de ces transactions pour en faire un usage public.* La capacité fiscale comprend donc à la fois les cots de l'administration fiscale et la légitimité politique des Etats à prélever des impôts. Ce qui est nouveau dans cette thèse, ainsi que dans les travaux de BP, est l'hypothèse selon laquelle les gouvernements peuvent investir dans cette capacité fiscale, c'est à dire l'améliorer par le biais d'actions qui 1) sont coteuses et 2) ont un impact sur les revenus fiscaux qui n'est pas immédiat. Les chapitres de cette thèse offrent plusieurs exemples de ce qu'est un investissement dans une capacité fiscale. Je développe ici le cas de la création de l'impôt sur le revenu aux Etats-Unis afin d'illustrer la définition.

Le président américain Woodrow Wilson fait en 1913 dans son premier discours à la nation un appel vibrant pour une réforme fiscale. Le consensus à Washington à cette époque portait sur la nécessité de baisser les tarifs douaniers et de financer cette baisse de revenus par la réintroduction et généralisation de l'impôt sur le revenu, utilisé temporairement pendant la guerre civile. La première étape fut d'obtenir une coalition politique en faveur de la réforme qui pilota la ratification du 16e amendement à la Constitution américaine. Cet amendement donne le droit au gouvernement fédéral de taxer les revenus des personnes physiques et morales et fut suivi par une loi des finances rétablissant l'impôt sur le revenu. La mise en place effective de ce nouvel impôt nécessita une réorganisation complète de l'administration fiscale (*Bureau of Internal Revenu*) dont la masse salariale fut multipliée par dix en quelques années. Un énorme effort pédagogique fut en particulier nécessaire pour expliquer le nouvel impôt à la population par le biais d'une équipe de 30 personnes qui se consacrait uniquement à la réponse aux questions des citoyens. Il n'y eut aucune rentrée d'impôts pendant la première année fiscale, 1914. On demanda simplement aux citoyens de remplir leur première feuille d'impôt (sans débourser un centime) afin de leur permettre de s'habituer au nouveau système et de mettre à l'épreuve le système de contrôle de l'administration fiscale. La taille de l'administration doubla chaque année entre 1917 et 1922 mais a mis du temps avant d'atteindre tout le potentiel de collecte du nouvel impôt : quand les feuilles d'impôt de 1918 furent envoyées celles de 1916 attendaient toujours d'tre examinées (voir Witte (1985) et Thorndike (2001) pour plus de détails sur cette période de l'histoire des Etats Unis).

Cet exemple montre bien que l'augmentation de la capacité fiscale a un cot - en l'espèce politique et financier. Il illustre aussi le délai nécessaire entre le moment o l'Etat va assumer ce cot et celui o le rendement de l'investissement devient positif sous la forme de nouveaux revenus fiscaux.

Il est difficile de comparer la qualité des administrations fiscales de différents pays. On peut par contre comparer la qualité de la bureaucratie en général telle qu'elle est mesurée par l'ICRG. La première ligne du tableau 2.4 montre que celle-ci croît avec le développement économique et est clairement bien plus élevée dans les pays riches que dans les PVDs. Le temps que les citoyens passent à payer leurs impôts et le nombre de paiements qu'ils doivent faire dans l'année est une mesure indirecte de la capacité fiscale des Etats, pour trois raisons. Plus l'administration fiscale est efficace plus le paiement des impôts sera facile. On peut également faire l'hypothèse que les cots de paiement des impôts supportés par les contribuables sont positivement corrélés avec les cots de collecte des administrations fiscales. Enfin plus le paiement des impôts est complexe, plus les citoyens risquent de chercher à se soustraire à leurs obligations fiscales, limitant ainsi la capacité fiscale des Etats. Le *Doing Business Survey* de la Banque Mondiale mesure le nombre de paiements fiscaux effectués chaque année ainsi que le temps passé à payer ses impôts pour une entreprise de taille moyenne dans 183 pays du monde.[14]

La moyenne de ces mesures pour chaque groupe de pays est présentée dans le tableau 2.4. A qualité de l'administration fiscale donnée on s'attend

[14]Voir Djankov et al. (2010) pour une description de la méthode utilisée dans cette enqute.

à ce qu'il soit plus facile de payer des impôts dans les pays prélevant moins d'impôts : une entreprise qui n'est assujettie à aucun impôt ne passera aucun temps à les payer.[15]

Le tableau 2.4 montre qu'il existe effectivement une corrélation en forme de U inversé entre les cots supportés par les contribuables et le développement économique. Ceux-ci sont plus élevés dans les pays à revenu moyen. Les différences entre pays riches et PVDs sont néanmoins importantes : la mme entreprise passe en moyenne 50% de temps en plus à préparer et payer ses impôts dans un PVD que dans un pays riche, et fait deux fois plus de paiements en une année. Ces deux variables sont directement sous le contrôle des gouvernements par le biais de leur administration fiscale. L'annexe 5 montre que les gouvernements locaux brésiliens qui veulent augmenter leurs revenus fiscaux font notamment des efforts considérables pour faciliter le paiement de l'impôt. Ces statistiques suggèrent donc que les gouvernements dans les PVDs ont beaucoup de marge de manoeuvre pour améliorer leur capacité fiscale.

C Capacité budgétaire

La capacité budgétaire d'un Etat consiste en *sa capacité à dépenser un montant donné de revenus publics en accord avec ses objectifs.* Cette définition, tout comme la définition de capacité fiscale ci-dessus, est positive : les objectifs de l'Etat sont considérés comme donnés et on ne se pose pour l'instant aucune question normative sur la désirabilité de ces objectifs. Cette question est abordée dans la section 4.

Plusieurs facteurs peuvent limiter la capacité d'un gouvernement à dépenser ses revenus comme il le souhaite. La contrainte la plus évidente est sa ca-

[15] Une limitation importante de cette base de données est que l'enqute demande à des experts en taxation de mesurer le temps que passe une entreprise *qui respecte la loi* à payer ses impôts et ne cherche pas à pondérer ses données par la part estimée des entreprises dans le pays qui paye effectivement des impôts.

TABLE 2.4 – Indicateurs de capacité fiscale en 2000-2010

	PREs	PRMSs	PRMIs	PRFs
Qualité de la bureaucratie (ICRG)	110 (5)	98 (5)	95 (5)	90 (7)
Nb de paiements par année	17 (10)	33 (27)	43 (22)	41 (17)
Heures passées à payer les impôts	197 (148)	339 (210)	320 (174)	282 (97)

Moyennes pour la période 2000-2010, écarts-types entre parenthèses. Voir Djankov et al. (2010) pour une description de la méthode utilisée lors de la construction des variables 'nombre de paiements par an' et 'heures passées à payer les impôts'. La mesure de l'ICRG de la qualité de la bureaucratie couvre 41 PREs, 33 PRMSs, 32 PRMIs et 16 PRFs. La base de doing *Doing Business* couvre 42 PREs, 38 PRMS, 41 PRMIS et 24 PRFs.

Question 1 :
Le concept de capacité fiscale permet-il d'expliquer l'histoire récente des revenus fiscaux dans les PVDs ? En particulier, permet-il d'expliquer la stagnation de ces revenus dans les pays les plus pauvres ?

pacité à lisser ses revenus au cours du temps, c'est à dire son accès à des méthodes d'épargne et d'emprunt. Si on fait l'hypothèse que les dépenses publiques auront un impact positif sur la croissance future (ou simplement que l'assiette fiscale d'un pays croît avec le développement économique), la stratégie optimale pour les PVDs consiste à s'endetter.[16] L'accès au crédit contraint les possibilités qu'ont les gouvernements à emprunter. Un pays avec un accès limité aux marchés financiers sera ainsi structurellement endetté de manière sous-optimale. Le niveau de dette a également un impact immédiat sur la capacité budgétaire des gouvernements dans la mesure o il détermine le niveau du service de la dette : une part élevée du service de la dette dans les dépenses publiques implique que le gouvernement pourra moins dépenser pour poursuivre ses objectifs. Ce type de dépense ne serait pas une contrainte si les gouvernements le prenaient en compte de manière rationnelle avec un horizon infini. Les gouvernements héritent cependant souvent des niveaux de dette élevés de leurs prédécesseurs : on peut donc considérer que ces niveaux hérités sont bien des contraintes qui pèsent sur leur capacité budgétaire.

Le tableau 2.5 présente l'évolution d'indicateurs en rapport avec la capacité budgétaire des gouvernements dans les PVDs depuis 1970 (l'échantillon comprend 20 PRMI, 20 PRMS et 14 PRF). On voit tout d'abord que tous les PVDs avaient dans les années 1970 des niveaux de dette relativement bas (en dessous de 25% du PIB) mais qu'ils se sont ensuite fortement endettés dans les années 1980 et 1990 avant de diminuer leur dette depuis 2000. L'évolution de la part de la dette dans le PIB est particulièrement impressionnante dans les pays les plus pauvres puisqu'elle a quintuplé entre les années 1970 et 1990. Les lignes 2 et 3 du tableau cherchent à mesurer l'accès au crédit des PVDs. La part du crédit domestique au secteur privé dans le

[16]Venables (2010) discute le profil optimal des dépenses publiques au cours du temps dans les PVDs.

TABLE 2.5 – Indicateurs de capacité budgétaire

Décennie	1970	1980	1990	2000
Pays à revenu moyen supérieur				
Dette (% PIB)	14 (7)	27 (20)	44 (35)	30 (16)
Flux de capitaux nets (% PIB)	4 (4)	2 (3)	2 (2)	0 (7)
Crédit domestique (% PIB)	45 (14)	63 (29)	60 (38)	68 (39)
Service de la dette (% dépenses publiques)	17 (12)	23 (10)	19 (14)	12 (7)
Inflation (annuelle %)	38 (54)	130 (274)	99 (219)	9 (6)
ays à revenu moyen inférieur				
Dette (% PIB)	24 (26)	39 (29)	88 (90)	62 (38)
Flux de capitaux nets (% PIB)	3 (5)	5 (5)	4 (5)	2 (5)
Crédit domestique (% PIB)	33 (13)	45 (23)	46 (34)	38 (27)
Service de la dette (% dépenses publiques)	12 (7)	20 (8)	18 (9)	8 (4)
Inflation (annuelle %)	13 (6)	125 (493)	60 (195)	8 (6)
ays à revenu moyen faible				
Dette (% PIB)	14 (14)	33 (21)	75 (46)	73 (27)
Flux de capitaux nets (% PIB)	4 (3)	3 (3)	2 (3)	-0 (2)
Crédit domestique (% PIB)	21 (11)	28 (13)	22 (13)	23 (13)
Service de la dette (% dépenses publiques)	10 (8)	19 (11)	14 (7)	9 (6)
Inflation (annuelle %)	12 (4)	12 (13)	11 (11)	7 (4)

Moyennes décennale, écarts-types entre parenthèses.

PIB est une mesure de la taille des marchés financiers nationaux, les flux de capitaux nets mesurent la quantité de crédits accordés par les marchés internationaux ou les bailleurs de fonds aux gouvernements. Ces flux ont baissé dans tous les groupes de pays au cours du temps pour finir nuls (les flux vers l'étranger étant égaux au flux venant de l'étranger) ou négatifs dans les années 2000[17]. Les marchés financiers domestiques semblent s'tre développés dans les pays à revenu moyen supérieur, ce qui permet peut-tre aux gouvernements de mieux se financer auprès des investisseurs nationaux.

Les deux dernières lignes du tableau 2.5 illustrent les conséquences d'une capacité budgétaire limitée. L'accroissement puis la baisse de la part des dépenses consacrées au service de la dette au cours du temps s'explique par l'évolution similaire des ratios de dette sur PIB. On remarque que près d'un quart des dépenses publiques devait tre réservé au remboursement de la dette dans les PVDs au cours des années 1980. Le fait que cette part ait

[17]Ceci peut s'expliquer soit par une baisse des prts aux gouvernements consentis par les investisseurs étrangers, soit par une augmentation des remboursements de la dette par les gouvernements auprès de ces mmes investisseurs.

baissé entre les années 1970 et 2000 alors que les niveaux de dette ont augmenté s'explique probablement par une amélioration des conditions d'emprunt entre ces deux périodes. L'utilisation de l'inflation pour financer les dépenses publiques est un symptôme d'une capacité budgétaire (et fiscale) limitée. La dernière ligne du tableau 2.5 indique que l'inflation, comme la dette, fut extrmement élevée dans les PVDs dans les années 1980 et 1990, les pays à revenu moyen traversant de nombreux épisodes d'hyperinflation durant cette période.

Le tableau 2.5 raconte plus généralement l'histoire récente des politiques fiscales dans les PVDs. Ces pays ont souvent hérité de leurs colonisateurs des taux d'endettement bas car les déficits budgétaires étaient souvent prohibés dans les colonies. Les premières décennies d'indépendance ont donné lieu à une demande de dépenses publiques très forte et les gouvernements se sont endettés fortement. Les conditions d'endettement, très favorables dans le contexte de forte croissance et de boom des matières premières des années 1970, se sont rapidement détériorées au début des années 1980. La hausse brutale des taux d'intért fut vite suivie par les premiers épisodes de crises de la dette et d'hyperinflation. La réponse de la plupart des PVDs, encouragés ou contraints par les institutions internationales, fut une longue série de plans de stabilisation et d'ajustements structurels que l'on observe partout dans le monde en voie de développement des années 1990 et du début des années 2000. Ces plans impliquent que leurs politiques budgétaires ont longtemps été subordonnées à un double objectif : baisse de l'inflation et des déficits publics. Ceci a fortement limité leur utilisation des revenus publics à des fins autres que la stabilisation de leurs économies (voir aussi Siebrits and Calitz (2007) et Adam and Bevan (2004)). Le tableau 2.5 indique que ces efforts ont fini par porter leurs fruits. La plupart des PVDs sont entrés depuis le début des années 2000 dans une phase que Adam and Bevan (2004) qualifie de 'post-post-stabilisation' : les indicateurs macro-économiques sont sortis du rouge depuis quelques années et les crises fiscales et d'hyperinflation appartiennent (généralement) au passé. Les contraintes qui pèsent sur la capacité budgétaire des gouvernements se sont ainsi probablement relchées au cours de la dernière décennie.

La capacité des gouvernements à dépenser leurs revenus comme il leur plaît est également contrainte par des considérations politiques ; ils doivent satisfaire les demandes de nombreux groupes d'intért pour construire des coalitions politiques viables. Cette contrainte pèse certainement sur les gouvernements de tous les pays et est certainement désirable. Une vaste littérature suggère cependant que les contextes politiques et institutionnels des PVDs favorisent peut tre trop la recherche de rentes au détriment de la poursuite d'intért généraux, voir par exemple Alesina et al. (2008); Calderon et al. (2004); Talvi and Vegh (2005); Tornell and Lane (1999). Ce contexte ont changé depuis les années 1970 - cf. tableau 2.2 - les processus de démocratisation ont certainement donné plus d'influence à certains groupes politiques sur le processus budgétaire, et moins à d'autres. L'impact de ces changements sur la capacité budgétaire des gouvernements est incertain.

Question 2 :

La capacité budgétaire des PVDs a-t-elle été affectée par les changements de contexte économique et politique entre 1970 et 2010 ? Les politiques de stabilisation des finances publiques leur ont-elles permis de libérer des marges de manoeuvre pour mettre en place des politiques fiscales à mme d'augmenter le bien-tre de leurs populations ?

4 Revenus publics et qualité de la dépense

On ne peut se demander si les revenus publics sont trop faibles dans les PVDs sans prendre en compte comment ces revenus sont dépensés. Beaucoup d'économistes doutent qu'augmenter les revenus à la disposition des gouvernements dans les pays pauvres facilitera leur développement économique ou humain (Easterly, 2008). On a vu précédemment que les indicateurs de corruption 'perue' sont particulièrement élevés dans les PVDs. Il existe de nombreux exemples qui suggèrent qu'une large part des revenus publics est bel et bien détournée et/ou dépensée de manière inefficace. On estime ainsi que l'ex-Président du Zare Mobutu a pillé au moins 5 milliards de dollars au budget de l'Etat, l'équivalent du montant de la dette de son pays à son départ en 1997 (Svensson, 2000). L'estimation la plus rigoureuse et compréhensive du montant total de pots-de-vin payés par an faite par la Banque Mondiale suggère que ceux-ci représentent environ 1 billion de dollars par an, soit 3% du PIB mondial (Rose-Ackerman, 2004). Les pots-de-vin sont la manifestation la plus visible de la corruption, ce montant représente probablement la face emmergée d'un iceberg bien plus profond.

A Qualité des gouvernements et développement

De nombreux travaux de recherche récents cherchent à mesurer comment les gouvernements dépensent les revenus publics dans les PVDs. Leurs conclusions sont globalement plutôt pessimistes. Olken (2007) estime que 20 à 30% des fonds des gouvernements locaux en Indonésie destinés à financer des projets routiers sont détournés. Reinikka et Svensson (2005) suivent les fonds versés par le gouvernement central aux autorités locales en charge des écoles en Uganda et trouvent que seuls 13% des fonds sont effectivement dépensés par les écoles. Au Brésil Caselli et Michaels (2011) et Ferraz et Monteiro (2010) montrent qu'une augmentation des revenus des municipalités provenant de l'exploitation des ressources pétrolières n'a strictement aucun impact sur la provision de biens publics ou l'économie locale. De mme Brollo et al. (2010) trouvent que les municipalités qui reoivent des transferts plus élevés du gouvernement fédéral sont également plus corrompues. Seul Litschig (2011) qui examine l'impact de ces mmes transferts au Brésil sur les dépenses municipales d'éducation montre un effet positif d'un accroissement des revenus publics sur un indicateur de développement humain - ici le nombre d'années d'éducation. En faisant une comparaison entre pays, Svensson (2000) montre enfin qu'une augmentation de l'aide budgétaire aux gouvernements mène à plus de corruption.

La qualité - *accountability* en anglais - des dépenses publiques dans les PVDs est donc problématique. On définit ici la qualité des dépenses publiques par la part des revenus publics effectivement utilisés dans le but d'améliorer le bien-tre des populations et non pas celui des agents du secteur public ou d'une élite politique. Sachant la faible qualité des dépenses publiques dans les PVDs doit on souhaiter que leurs ressources publiques augmentent ? La règle classique qui détermine le niveau optimal des dépenses publiques - règle dite de Samuelson - indique que le cot marginal de collecte des ressources publiques doit tre égal au bénéfice marginal des dépenses publiques. Les niveaux de corruption et d'inefficacité des gouvernements dans les PVDs font baisser le bénéfice marginal d'un dollar de dépenses publiques. Si cette baisse est importante il est possible qu'augmenter les revenus fiscaux de ces pays ait un impact négatif sur leur bien-tre.

On peut là encore se tourner vers l'histoire des pays riches pour tenter de mesurer l'impact d'une augmentation des revenus publics sur la qualité des dépenses et l'économie en général. Il n'existe aucune donnée sur la corruption ou la qualité des gouvernements en Europe au 19e siècle mais on peut estimer l'effet de l'augmentation de la taille des gouvernements sur la croissance économique. Les revenus publics prélèvent des ressources sur le secteur privé, s'ils sont utilisés de manière non productive on s'attend à voir un impact négatif clair. L'étude des dépenses publiques depuis le 18e siècle faite par Lindert (2004) ne trouve aucun impact négatif sur la croissance économique. Au contraire, ses résultats montrent un impact positif pour la période 1880-1930 au cours de laquelle les pays de son échantillon ressemblaient aux pays à revenu moyen d'aujourd'hui. Il explique cela par le fait que les dépenses publiques ont augmenté la productivité de ces pays, notamment en rendant la main d'oeuvre plus éduquée et en meilleure santé, et que ces gains de productivité ont été plus élevés que la perte d'efficacité due à l'augmentation des impôts. Si l'on s'autorise à tirer des leons pour les PVDs de l'histoire des pays riches, et que l'on pense que les gouvernements européens au 19e siècle n'étaient pas nécessairement plus efficaces que ceux des PVDs, aujourd'hui ces résultats suggèrent que l'augmentation des ressources publiques dans les PVDs aurait un impact positif sur le bien-tre de leurs sociétés.

B Hypothèse : les impôts sont mieux dépensés que les revenus non fiscaux

Il existe une différence fondamentale entre l'étude historique de Lindert et les estimations plus micros des effets d'une augmentation des ressources publiques dans les PVDs présentées ci-dessus. Lindert (2004) étudie une augmentation des dépenses publiques financée quasiment exclusivement par une augmentation des impôts. Les travaux de recherche cités ci-dessus s'intéressent au contraire tous à des augmentations de revenus non fiscaux : transferts intergouvernementaux, revenus provenant de l'exploitation des ressources naturelles, aide au développement. Ces travaux ne cherchent pas à savoir si leurs résultats sont généralisables à une augmentation des revenus provenant de l'impôt ; la rapide description d'un autre type de littérature sur les revenus publics et le développement ci-dessous suggère que cette généralisation ne serait pas valable.

L'idée qu'il existe une corrélation persistante entre la manière dont les gouvernements sont financés et comment ils dépensent leurs revenus est présente depuis longtemps dans la littérature en sciences politiques. Cette théorie est au coeur des interprétations de l'émergence de démocraties représentatives dans les pays de l'OCDE. En Angleterre, on a ainsi étudié comment les élites économiques du 17e siècle ont obtenu ce qu'elles désiraient (la protection de leurs droits de propriété et une représentation politique) de la dynastie des Stuarts en leur offrant en échange une plus grande capacité à collecter des impôts et à emprunter (voir North et Weingast (1989) par exemple). La littérature sur l'indépendance des Etats-Unis insiste sur le fameux slogan 'Pas de taxation sans représentation' qui symbolise l'opposition des colonies américaines au pouvoir anglais, construite sur le principe que ces derniers ne pouvaient à la fois les taxer et ne pas leur donner de droits politiques.

Plusieurs travaux en sciences politiques et dans le champ des 'development studies' ont cherché à tirer des implications pour les PVDs aujourd'hui de ces expériences historiques en inversant la causalité implicite du slogan américain - 'Pas de représentation sans taxation' (voir en particulier Moore (2007) et Brautigam et al. (2008)). En résumé, leur théorie tend à prouver qu'il existe une relation causale entre la part des impôts dans les ressources publiques d'un pays et la qualité de son gouvernement. Ceci peut s'expliquer par le fait qu'un gouvernement qui chercher à augmenter ses revenus fiscaux doit accepter de respecter un contrat social implicite avec sa population pour obtenir un minimum de consentement à l'impôt, ou bien parce que les citoyens surveillent plus leurs élites politiques et s'impliquent plus dans la vie politique lorsqu'ils deviennent des contribuables. Des études empiriques ont confirmé que cette théorie était plausible. Gervasoni (2010) montre qu'en Argentine les états qui prélèvent plus d'impôts sont également plus démocratiques. De mme Ross (2004) trouve que les pays qui ont des ratios fiscaux plus élevés sont plus démocratiques. Paler (2012) montre que des participants à un jeu de rôle sur les finances publiques en Indonésie à qui on explique qu'ils paient plus d'impôts consentent plus facilement à subir un cot pour surveiller l'action de leurs représentants politiques.

Il existe également une théorie dans la littérature économique qui prédit que les gouvernements feront plus attention aux souhaits de leurs citoyens lorsqu'ils sont financés par l'impôt. L'idée que les citoyens 'votent avec leurs pieds' remonte à Tiebout (1956) qui soutient que les gouvernements dont les revenus sont prélevés sur une assiette mobile seront plus attentifs aux demande des citoyens qui constituent cette assiette car ils sont en compétition entre eux et cherchent tous à maximiser la taille de cette assiette. Cette idée repose sur l'hypothèse que les citoyens peuvent se déplacer librement et à moindre cot entre des territoires gérés par de différents gouvernements, hypothèse probablement trop forte dans le contexte des PVDs.[18] La littérature sur la *natural resource curse* ('malédiction des ressources naturelles') apporte également une contribution au débat. Cette littérature explique que les gouvernements deviennent plus corrompus et moins attentifs aux demandes de leurs citoyens lorsqu'ils ont accès à des revenus tirés de l'exploitation des ressources naturelles.[19] Ce problème est d'une certaine manière l'autre face de la théorie 'pas de représentation sans taxation' : on peut ainsi penser que le problème principal des pays riches en ressources naturelles vient du fait qu'ils n'auront pas besoin de taxer leur population.

Les revenus provenant de l'impôt sont-ils mieux dépensés que les revenus publics ? Avant d'expliquer les raisons qui suggèrent une réponse positive à cette question il est utile de s'arrter sur son importance. Les données budgétaires portant sur tous les types de revenus dans les PVDs sont glo-

[18]Cette hypothèse est certainement moins forte lorsqu'on cherche à comparer des gouvernements locaux entre eux. Zhuravskaya (2000) montre en effet que les villes russes qui conservent une plus grande part des revenus fiscaux qu'elles collectent - et donc ont plus d'incitations à soigner leurs contribuables - produisent des biens publics de manière plus efficace. Je discuterai l'hypothèse de Tiebout dans le chapitre 5 ci-dessous.

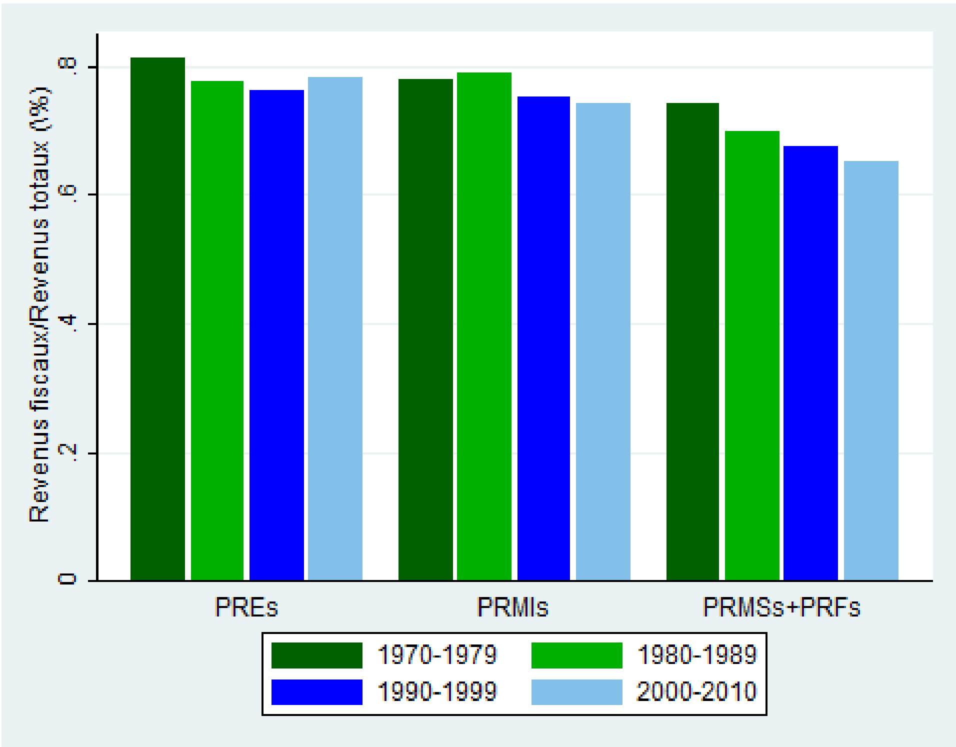
[19]Voir Van der Ploeg (2011) pour une revue de cette littérature.

balement moins complètes que celles qui portent uniquement sur les revenus fiscaux. Les bases de données du FMI permettent de construire un échantillon de 35 PRE, 24 PRMS et 26 pays pauvres (pays à revenu moyen inférieur et pays à revenu faible) pour lequel les données sur les revenus publics totaux sont disponibles. La figure 2.3 présente l'évolution de la part des revenus fiscaux dans les revenus dans ces pays depuis 1980. On remarque que les PVDs, et en particulier les plus pauvres, dépendent de plus en plus des revenus non-fiscaux pour financer leurs dépenses publiques. Ces revenus proviennent principalement de l'aide au développement et de l'exploitation des ressources naturelles. Savoir si ces revenus sont dépensés différemment des revenus provenant de l'impôt est donc une question importante actuellement pour les PVDs. C'est aussi une question pertinente du point de vue des politiques de développement en général car l'aide au développement prend principalement la forme de transferts de revenus entre les Etats, elle augmente donc les revenus non fiscaux des PVDs. Certains bailleurs internationaux, en particulier le FMI, ont parfois comme objectif d'augmenter les ratios fiscaux dans ces pays ; cependant la part de l'aide technique aux administrations fiscales dans l'aide totale déboursée est aujourd'hui très faible.[20]

Les figures 2.4 et 2.5 présentent la corrélation entre l'index CPI de corruption et la part des impôts dans les revenus publics pour tous les pays de notre échantillon (figure 2.4) et uniquement dans les PVDs (figure 2.5). Cette corrélation est clairement négative : les pays financés le plus par l'impôt sont aussi les moins corrompus, comme suggéré par la théorie. On sait par ailleurs que les pays riches sont à la fois moins corrompus et plus financés par l'impôt, ceci pouvant expliquer cette corrélation négative. La figure 2.6 montre la corrélation entre les résidus d'une régression de l'index CPI sur le PIB par habitant en 2000-2010 (c'est-à-dire la part de la variation

[20] OECD (2010b) révèle qu'en 2008 la coopération technique à la 'gestion des ressources publiques' en Afrique représente 2% de la coopération technique totale, qui est elle-mme une toute petite part de l'aide au développement.

Figure 2.3 – Part des revenus fiscaux dans les revenus publics totaux par groupe de pays et décennie

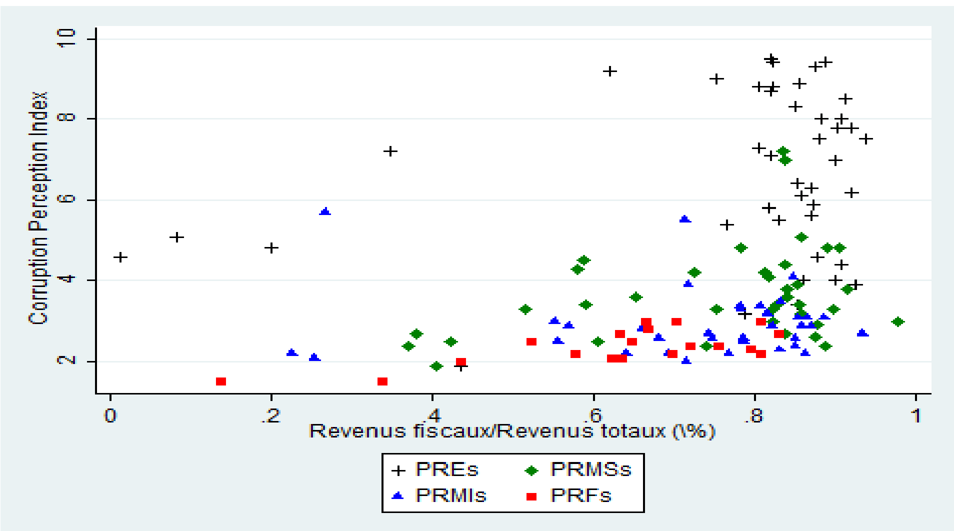


dans l'index CPI qui ne peut tre expliquée par des différences de niveaux de vie) et la part des impôts dans les revenus totaux. La corrélation reste clairement négative. On ne peut interpréter cette corrélation comme un rapport de causalité entre ces deux variables - notamment parce que des citoyens qui pensent que leur gouvernement est moins corrompu vont probablement tre plus consentants à payer leur impôt. Les données suggèrent néanmoins qu'une comparaison entre pays ne rejette pas l'hypothèse développée ici.

Question 3 :

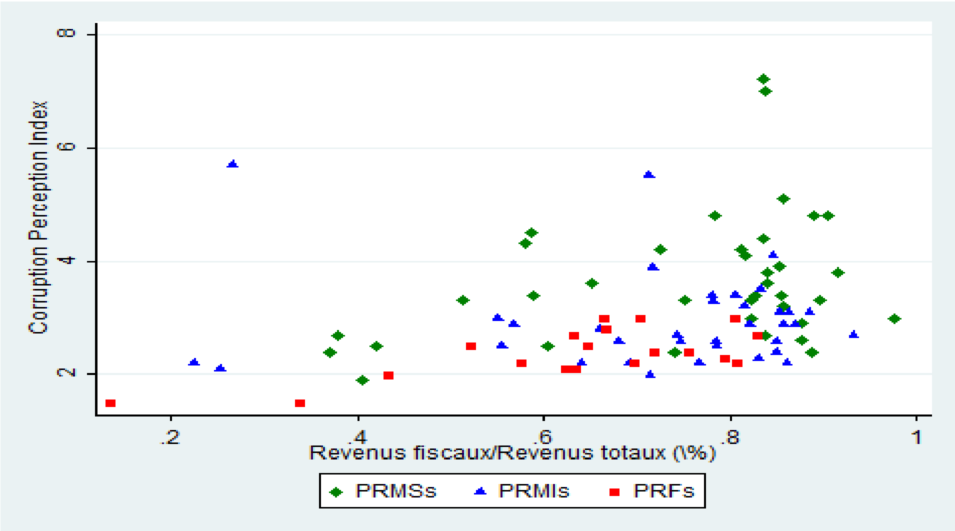
Les gouvernements dépensent-ils mieux les revenus provenant de l'impôt que les autres types de revenus ?

FIGURE 2.4 – Corruption et part des revenus fiscaux dans les revenus public totaux



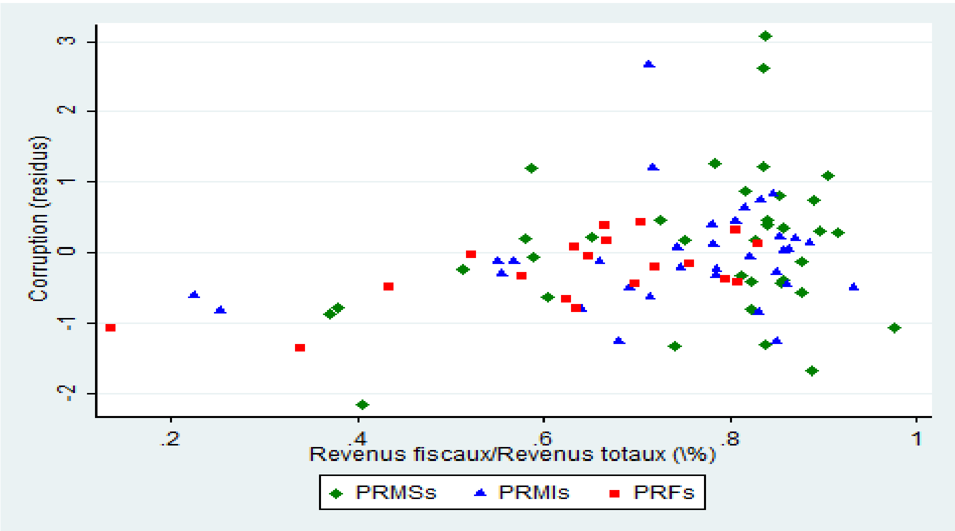
A point represents the average value for a country over the period 2000-2010.

Figure 2.5 – Corruption et part des revenus fiscaux dans les revenus public totaux (2)



A point represents the average value for a country over the period 2000-2010.

Figure 2.6 – Corruption et part des revenus fiscaux dans les revenus public totaux (3)



A point represents the average value for a country over the period 2000-2010. The variable on the y-axis is the variation in the corruption index that cannot be explained by GDP per capita.

5 Résumé de la thèse

Cette section explique comment les chapitres de cette thèse répondent aux questions soulevées ci-dessus et résument les principales contributions de ma recherche.

A Question 1 : capacité fiscale, commerce international, et revenus fiscaux

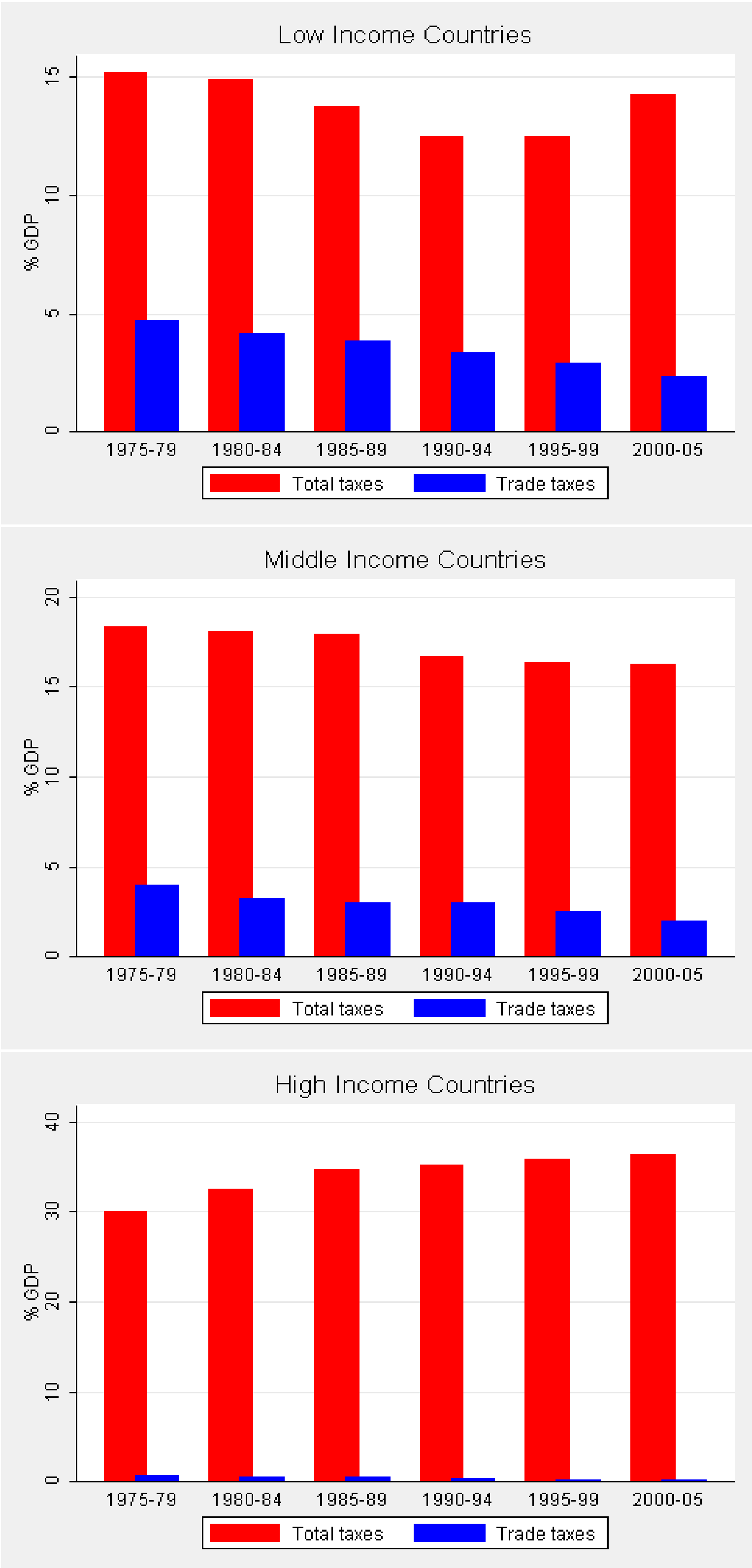
Le chapitre 3 écrit avec Julia Cagé (Université de Harvard et PSE) utilise le concept de capacité fiscale pour expliquer le fait que les ratios fiscaux n'aient pas bougé dans les pays les plus pauvres depuis 1970. On a vu que les théories existantes ne peuvent expliquer ce fait. La première contribution de ce chapitre est l'utilisation d'une nouvelle base de données sur les revenus fiscaux totaux et les revenus provenant des taxes sur le commerce international dans les PVDs depuis 1945. Cette nouvelle base nous permet de travailler sur l'évolution des structures fiscales dans ces pays. La figure 2.7, qui correspond à la figure 3.1 dans le chapitre indique une baisse des ratios fiscaux dans les pays les plus pauvres d'environ 2 points de PIB entre les années 1970 et 1990 - ce qu'on observait déjà avec la base de données utilisée plus haut. Elle apporte une nouvelle information importante : on voit que les revenus provenant des impôts sur le commerce international ont eu aussi baissé de 2 points de PIB sur cette période. Ceci suggère que la baisse des revenus fiscaux provient d'une baisse des revenus provenant des tarifs douaniers.

Ce chapitre explore cette hypothèse en identifiant 110 'épisodes' de baisses importantes des revenus provenant des tarifs douaniers dans les PVDs depuis 1945 et en regardant l'impact de ces épisodes sur les revenus fiscaux totaux. Nous montrons que les revenus douaniers chutent de près de 4 points de PIB en moyenne pendant ces épisodes. Dans la moitié des pays de notre échantillon cette chute n'est pas compensée par une augmentation des autres revenus, et donc mène à une baisse des revenus fiscaux totaux. Dix ans après la chute plus de 40% d'entre eux n'ont toujours pas récupéré tous les revenus fiscaux perdus.

La littérature sur la taxation optimale se caractérise par un résultat fondamental : les taxes qui affectent les prix de production, comme les tarifs douaniers, sont sous-optimales et ne devraient jamais tre utilisées (Diamond and Mirrlees, 1971). La recommandation de cette littérature aux PVDs est donc de supprimer ces tarifs, et de les remplacer par des taxes sur la consommation, plus efficaces (voir par exemple Keen et Ligthart (2002)). Cette théorie a eu de l'influence : la baisse des tarifs fut très souvent recommandée, voire imposée, aux PVDs par les institutions internationales pendant la période qui nous intéresse. Les statistiques présentées dans le tableau 2.1 montrent que ces recommandations ont été suivies d'effet : on voit que les PVDs se sont progressivement ouverts au commerce international. Ces théories ne peuvent cependant expliquer, et encore moins prédire, la baisse des revenus fiscaux totaux conséquente à la baisse des revenus douaniers car elles font l'hypothèse qu'augmenter les impôts à la consommation peut se faire facilement.

Dans ce chapitre nous utilisons l'hypothèse selon laquelle une capacité fiscale préexistante est nécessaire au prélèvement d'impôts domestiques mais pas à la collecte des tarifs douaniers pour expliquer ce que nous observons dans les données. Nous construisons un modèle sur la base de celui de Besley et Persson (2009) dans lequel les pays peuvent utiliser deux types d'instruments fiscaux : l'un est parfaitement efficace mais limité par la capacité fiscale d'un pays, l'autre - le tarif douanier - n'est pas contraint mais est inefficace. Les gouvernements peuvent choisir d'investir dans leur capacité fiscale afin d'augmenter leurs revenus provenant de l'impôt efficace dans le futur. Les prédictions de ce modèle sont en cohérence avec les faits stylisés

FIGURE 2.7 – Evolution des ratios fiscaux, 1975-2005



L'échantillon inclut 26 pays à revenu faible (*low income countries*) 40 pays à revenu moyen (*middle income countries* et 32 pays à revenu elevé (*high income countries*). Voir l'annexe 7 pour une description de la base de données utilisée et la liste des pays dans l'échantillon.

sur les ratios fiscaux la structure fiscale et le développement présentés dans cette introduction.

Nous considérons ensuite l'impact d'une baisse des tarifs. Nous montrons que cet impact sera différent selon le type d'équilibre qui caractérise les pays. A cet égard, les pays qui investissaient déjà dans leur capacité fiscale avant la baisse des tarifs vont augmenter leur investissement car leurs revenus futurs ont baissé. La chute des tarifs a un cot de court-terme dans ces pays mais, à long terme, la transition plus rapide vers une structure fiscale plus efficace augmente leur bien-tre. Cependant d'autres pays sont dans une trappe à capacité fiscale avant la baisse des tarifs - ils n'investissent jamais dans leur capacité à prélever des impôts. Le cot de la chute des tarifs est permanent dans ces pays, car ils ne récupèreront jamais les revenus perdus en augmentant leurs impôts domestiques.

Notre modèle prédit que les pays pour lesquels le rendement de l'investissement dans leur capacité fiscale est plus élevé sont aussi ceux plus à mme de récupérer les revenus perdus par la chute des tarifs en augmentant leurs impôts domestiques. Il n'existe pas de manière évidente de mesurer la taille de ce rendement. Nous utilisons la part de l'agriculture dans le PIB, la densité de la population et l'ouverture des comptes de capitaux (qui détermine partiellement les possibilités d'évasion fiscale par le biais de placements à l'étranger) pour mesurer le rendement de l'investissement dans la capacité fiscale. Nous trouvons que ces rendements augmentent effectivement la probabilité que les pays dans notre échantillon récupèrent les revenus perdus par l'ouverture au commerce international. Les indicateurs de démocratie et de participation dans des guerres non civiles, qui déterminent le choix d'investir dans la capacité fiscale dans le modèle de Besley et Persson (2009) augmentent également cette probabilité.

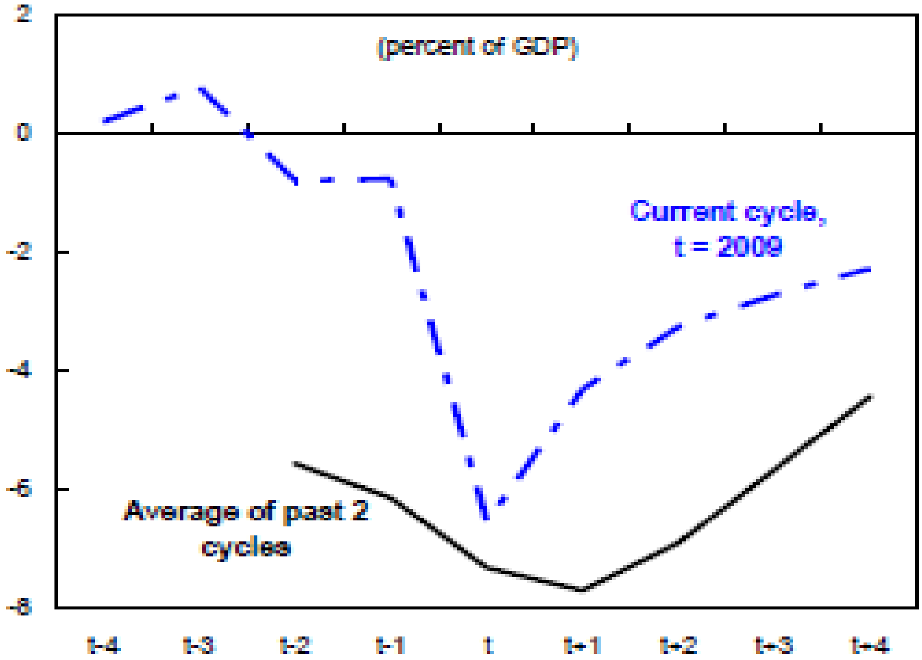
B Question 2 : dépenses publiques en Afrique sub-saharienne

Le chapitre 4, coécrit avec Victor Lledo et Irene Yackovlev (tous deux économistes au FMI) s'intéresse à un aspect de la capacité budgétaire, la cyclicalité des politiques publiques, en Afrique sub-saharienne. La littérature économique a montré que les dépenses publiques dans les PVDs sont généralement pro-cycliques : les gouvernements dépensent plus quand l'économie est en phase de croissance, et coupent dans les dépenses lors des récessions(Kaminsky et al., 2004; Alesina et al., 2008) Ilzetzki et Vegh (2008). Les théories keynésiennes préconisent la politique inverse (politiques contra-cycliques), d'autres préfèrent des politiques fiscales acycliques ; il est clair que les politiques pro-cycliques ne sont pas optimales car elles renforcent les fluctuations économiques (Lane, 2003).

La cyclicalité des politiques fiscales est une mesure de la capacité budgétaire telle qu'elle est définie ci-dessus. Un pays qui ne peut ni emprunter ni épargner conduira nécessairement des politiques pro-cycliques : ses revenus vont augmenter en périodes de croissance du PIB, diminuer automatiquement lors des récessions, et les dépenses publiques devront suivre les fluctuations des revenus.

Ce chapitre tente de mesurer l'impact du changement des conditions politiques et macro-économiques auxquelles sont confrontés les gouvernements africains depuis 1970 sur la cyclicalité de leurs dépenses publiques. Ce travail de recherche a été initialement motivé par les observations du personnel du FMI en Afrique lors de la crise financière de 2008-2009. Il semblait à l'époque aux représentants-pays du FMI que ces pays étaient en train de mettre en place des politiques fiscales expansionnistes pendant une récession, et ce pour la première fois depuis leur indépendance. La figure 2.8, tirée de la version IMF Working Paper de ce chapitre, montre l'évolution de la balance fiscale en % du PIB dans la région avant et après la crise de 2009 et au cours des trois crises précédentes (1975, 1985 et 1991). Il apparait clairement que les pays africains sont entrés dans les dernières crises avec une position fiscale beaucoup plus forte (surplus budgétaires en 2005 et 2006) que lors des crises précédentes. Ceci leur a permis de creuser leurs déficits au coeur de la crise pour soutenir leurs économies bien plus que lors des précédentes crises.

FIGURE 2.8 – Surplus fiscaux dans les pays d'Afrique au cours des dernières crises



La courbe en pointillés est le surplus fiscal moyen (réel ou prévu par le FMI) dans les pays d'Afrique sub-Saharienne entre 2005 (année $t-4$) et 2012. La courbe pleine est le surplus fiscal moyen pendant les trois crises précédentes, t est 1975, 1985 ou 1991.

Nous utilisons des techniques GMM dynamiques pour contrôler pour l'endogenéité des dépenses publiques et trouvons que la pro-cyclicalité dans les pays africains a augmenté pendant les années 1980 et 1990 puis baissé depuis l'an 2000. Nous ne trouvons pas d'évolution similaire dans les autres PVDs. Nous nous concentrons ensuite uniquement sur l'Afrique sub-saharienne pour tenter d'expliquer les variations de cyclicalité des politiques publiques entre pays et dans le temps. On a vu dans cette introduction que les PVDs ont dans l'ensemble traversé d'importants changements politiques (démocratisation) pendant la période ainsi que deux décennies de crises inflationnistes et budgétaires, suivies d'une période de stabilisation. Nous estimons l'impact de ces changements sur la cyclicalité des dépenses publiques et trouvons que l'amélioration des capacités budgétaires des pays, mesurées par leur taux d'endettement, et un meilleur accès à des sources de financement externes (mesurées par l'aide au développement) ont contribué à la baisse de la pro-cyclicalité dans la région. Nous n'observons cependant aucun impact des changements politiques sur la cyclicalité des dépenses publiques.

C Question 3 : capacité fiscale et dépenses publiques au Brésil

Le chapitre 5 étudie la question du rapport causal entre source du financement des ressources publiques et manière dont sont dépensées ces ressources dans le contexte des gouvernements locaux brésiliens (municipalités). Il offre tout d'abord un modèle théorique qui propose un fondement à l'idée, développée ci-dessus, selon laquelle plus les gouvernements sont financés par l'impôt, plus ils doivent satisfaire les attentes de leurs citoyens dans leurs choix de dépenses publiques. Je construis un modèle d'agence au sein duquel les revenus publics proviennent d'impôts locaux, endogènes au contrat entre les citoyens et les gouvernements, et de revenus exogènes. Le gouvernement décide de l'allocation de ces revenus entre la production d'un bien public et les rentes - les revenus qu'il garde pour lui-mme, c'est-à-dire la corruption. Je fais l'hypothèse que ce gouvernement cherche uniquement à maximiser ses rentes inter-temporelles. Cette hypothèse est volontairement pessimiste pour prendre en compte les pires prédictions de la littérature sur les gouvernements dans les PVDs. La seule raison qui peut inciter le gouvernement à produire des biens publics est la possibilité que le citoyen le réélise en contrepartie. L'hypothèse clé du modèle est que les revenus fiscaux sont parfaitement observés par le citoyen représentatif mais que les revenus exogènes sont une variable aléatoire dont la réalisation n'est observée que par le gouvernement. Cette asymétrie d'information entre le gouvernement et le citoyen implique que le citoyen contrôle mieux les choix budgétaires du gouvernement lorsqu'une part plus grande des revenus publics provient de l'impôt. Le modèle prédit donc qu'une politique publique qui augmente les revenus fiscaux mènera à une plus grande augmentation de la provision de bien publics, et par conséquent à moins de corruption, qu'une politique qui augmente les revenus exogènes d'un mme montant.

Je teste les prédictions de ce modèle en comparant comment les municipalités brésiliennes dépensent des augmentations de leurs revenus fiscaux et de leurs revenus de transfert. J'utilise des variations dans le montant des revenus fiscaux qui sont la conséquence d'un programme qui permet aux municipalités d'améliorer leur capacité fiscale. Les municipalités choisissent ou non de participer à ce programme, ce qui pose un problème d'identification de l'impact d'une augmentation des impôts grce au programme : les municipalités qui choisissent de participer sont-elles aussi celles qui dépensent mieux leurs revenus publics ? Pour étudier l'impact de l'augmentation des revenus exogènes, j'utilise une règle d'allocation des transferts fédéraux aux municipalités qui génère des variations exogènes du montant de transfert reu.

Ma stratégie d'identification repose sur une méthode dite de 'différence-de-différences' et l'utilisation d'une riche base de données qui couvre l'univers entier des municipalités brésiliennes sur onze ans. Ces données portent sur les revenus fiscaux et de transferts des gouvernements, la qualité et la quantité des infrastructures municipales de santé et d'éducation, la corruption des gouvernements et tout un ensemble de variables concernant les caractéristiques économiques, politiques et démographiques des municipalités.[21] J'utilise une spécificité du programme pour adresser le problème de

[21]Les données sur la corruption proviennent d'audits randomisés des municipalités

la sélection des municipalités. Ces dernières ne peuvent pas contrôler parfaitement la date à laquelle elles commencent à bénéficier du programme : elles décident quand poser leur candidature au programme (toutes les candidatures sont finalement acceptées) mais la date précise à laquelle elles commencent à en bénéficier est déterminée par les contraintes institutionnelles de l'institut qui gère le programme. Cette spécificité crée des variations dans les dates de début de programme qui sont exogènes aux choix des municipalités et me permet donc d'identifier séparément l'impact du programme en lui-mme et un potentiel effet de sélection.

Ce chapitre propose donc la première évaluation empirique de l'impact d'investissements dans la capacité fiscale. Mes résultats montrent que le programme augmente les revenus fiscaux de 12% après quatre ans et que cette augmentation persiste dans le temps. Le cot des investissements est amorti au bout de deux ans.

Je compare ensuite l'impact d'une augmentation des impôts et d'une augmentation des transferts sur l'allocation des dépenses publiques. L'augmentation des impôts grce au programme est utilisée pour financer une augmentation des infrastructures municipales d'éducation et de santé, une amélioration de la qualité de ces infrastructures, mais n'a aucun impact sur la corruption. Une augmentation de taille équivalente des transferts reus par les municipalités n'a au contraire pas ou très peu d'impact sur les infrastructures municipales mais augmente significativement la corruption. Je discute ensuite les différents mécanismes économiques qui peuvent expliquer ces différences, et montre que le mécanisme suggéré par mon modèle théorique - les asymétries d'information - permet d'expliquer une partie de ces différences.

brésiliennes depuis 2003. J'étudie la qualité de ces données dans le chapitre.

Chapter 3

Tax Capacity and the Fiscal Consequences of Trade Liberalization

It's far easier to levy a tariff than to collect value added tax. You just need a guy at the border (...) But as more and more countries join the World Trade Organisation (WTO) they join in the commitment to reduce tariffs.
Jeffrey Owens, director of the OECD Center for Tax Policy Administration, 2008[a]

[a](Reuters)

Abstract

Trade taxes are an important source of revenue for developing countries. These revenues have fallen over the past decades as these countries liberalized trade. Many developing countries simultaneously experienced a decrease in their total tax revenues, suggesting trade liberalization may have come at a fiscal cost. Using a novel panel dataset of tax revenues and government expenditures in developing countries for the period 1945-2006 we identify 110 episodes of decreases in tariff revenues and consider whether countries are able to recover those lost revenues through other tax resources. We show that trade taxes fall by close to 4 GDP percentage points on average during those episodes. Less than half of the countries recover the lost tax revenues 5 years after the start of the episode. The picture is similar when we consider government expenditures. We use the intuition that pre-existing tax capacity is needed to levy domestic taxes to explain theoretically why some countries are unable to recover all tax revenues lost from lowering tariffs. We find that the fiscal cost of trade liberalization is a non-linear function of countries' incentives to invest in tax capacity, and that some will be stuck in a low tax capacity trap. Finally we provide some empirical evidence in line with the model's predictions.

JEL classifications: H10, H20, F13, O17

Keywords: Taxation and development, Trade liberalization, State capacity, Tax and tariff reform

This chapter was written with Julia Cagé (Harvard University and Paris School of Economics).

1 Introduction

When Robert Peel implemented one of Great Britain's first large over-the-board decrease in tariffs in 1842 over a third of tax revenues in the country came from export and import duties. This budget overhaul was financed by the re-introduction of the income tax and the mobilization of the modern tax bureaucracy built during the Napoleonic Wars. The extra tax revenue raised was more than expected, allowing for further tariff reforms and the famous repeal of the Corn Laws in 1846 (Bairoch, 1989). This episode is but one example of a general historical pattern. In the first stage of industrialization now-developed countries relied heavily on tariffs to provide tax revenues. They gradually lowered them once they had developed a fiscal administration which made it possible to raise tax revenues through other means (Ardant, 1972). Developing countries have similarly greatly decreased their tariffs over the last 40 years, often pressured by international organizations and trading partners. However little attention has been paid to the question of whether the fall in tax revenues implied by this decrease was compensated for through other tax resources.

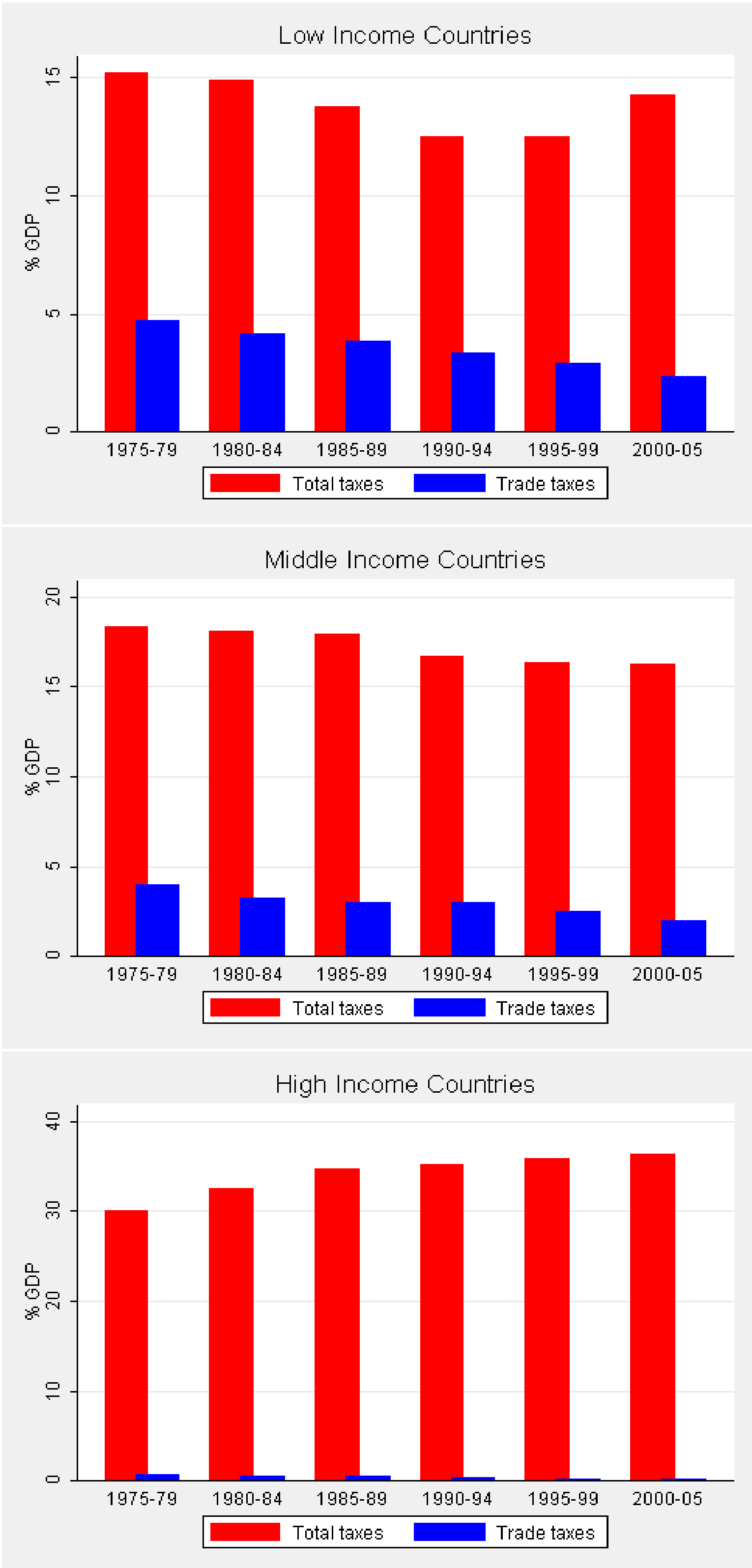
The evolution of trade tax and total tax revenues from 1975 to 2005 suggests that the decrease in tariffs was accompanied by a fall in total tax revenues in developing countries. In Figure 3.1 we plot separetely for low income countries (LICs), middle income countries (MICs) and high income countries (HICs) the evolution between 1975 and 2005 of total and trade tax revenues as a share of GDP. At the start of the period tariff revenues are a major source of public resources in countries at lower levels of development. They are a third of total tax revenues (nearly 5% of GDP) in LICs, a fifth in MICs and less than 2% in HICs.

Revenues from trade taxes decrease as a share of GDP in all country groups over the period with very different consequences on total tax revenues. In poorer countries they fall by 2 GDP percentage points between 1975 and 2000. There is a simultaneous fall in total tax revenues of the same magnitude. Not until the last period (2000-2005) do we see an increase in total tax revenues, which nevertheless remain lower than in 1975. Similarly MICs also loose 2 GDP percentage points of trade and total tax revenues over the period 1975-2000. The contrast with the experience in HICs is striking. Revenues from tariffs in rich countries are today a third of what they were in the 1970s but this has clearly been compensated by an increase in collection of domestic taxes, with total taxes increasing from 30% to 36% of GDP. Overall Figure 3.1 shows a 13% fall in tax revenues in developing countries between 1975 and 2000 and suggests that this decrease was a consequence of a fall in trade tax revenues.

These trends are not driven by higher growth in less developed countries over the period. Appendix Figure 7.1 presents the evolution of trade tax and total tax revenues *per capita* over the period and paints a similar picture. The divergence between rich and poor countries is even more noticeable when put in per capita terms. Whilst tax revenues per capita more than double in rich countries they halve in the least developed ones.

This paper's first contribution lies in its comprehensive empirical account of the fiscal consequences of trade liberalization. We construct a novel dataset of tax revenues in 103 developing countries for the period 1945-2006 from different historical and contemporary sources. To the best of our knowledge this is the most exhaustive existing dataset on tax revenues in developing countries. We develop a method to detect large and prolonged downward shocks in tariff revenues – which we call 'episodes' – and their impact on total tax revenues. We identify 110 such episodes in which countries experience a more than 1 GDP percentage point fall in tariff revenues. We say that countries 'recover' fiscally when their total tax revenues is at least equal to its level at the start of the episode.

Figure 3.1: Evolution of tax revenues as a share of GDP, 1975-2005



All values are median values for the country group and time period considered. The sample includes in each time period 26 low income countries, 40 middle income countries and 32 high income countries. See Appendix 1 for the list of countries included in our sample and Appendix 3 for a description of the variables.

We find that trade tax revenues fall by nearly 4 GDP percentage points on average during those episodes, a fall equivalent to 20% of total tax revenues. More than half of the countries suffer an immediate loss in total tax revenues contemporaneous to the fall in trade tax revenues. This loss persists in the medium-run: ten years later 45% of these countries have not recovered all lost tariff revenues through other sources of taxation. The picture is very similar if we consider the evolution of government expenditures. Nearly half of the countries which experienced a large fall in trade tax revenues also experienced a simultaneous fall in their total revenues and expenditures which persisted for at least ten years.

Our second contribution is to explain theoretically why some countries recover the lost trade tax revenues through domestic taxation and some do not. The model is build on the intuition that countries at an early stage of development rely on trade taxes for revenues because these taxes do not require much tax administration – or tax capacity – to be levied, as opposed to domestic taxes such as the income tax or the VAT. We define tax capacity as a government's ability to accurately observe and monitor economic transactions on its territory and take away some of these transactions for its own use. Formally, we build on the theoretical framework constructed by Besley and Persson (2009) which explains in which conditions a state will choose to invest in its state capacity in order to increase its revenue raising powers in the future. We add to this framework the possibility for the state to use a tariff which requires no pre-existing capacity to be levied. This fiscal choice is embedded in a simple trade model in which domestic taxes are lump-sum and tariffs are distortive. Endogenous investments in tax capacity alter a country's choice of tax mix and openness to trade over time, in line with the key stylized facts regarding taxation and development that we present. Total tax revenues increase over time, and the ratio of tariffs to domestic taxes decreases.

We then consider the fiscal consequences of a permanent (exogenous) fall in tariff revenues. Our main result is that countries faced with low returns to tax investments are stuck in a 'low tax capacity trap': they will suffer a permanent fall in tax revenues after the fall in tariffs. In all other countries the fall actually increases incentives to invest in raising future tax revenues and thus hastens the transition towards a more efficient tax mix. It leads to a short-run revenue loss and a gradual recovery that happens faster the higher the returns to tax investments and the demand for public goods.

Two policy implications stem from our model. First, we show that trade liberalization comes at a fiscal cost. This cost could erode support for further trade liberalization but can be overcome by technical investments in tax capacity building. Second, increasing developing countries' tax capacity will lead them to open to international trade: technical aid in resource mobilization will trigger a decrease in tariffs.

We test the model's predictions using our sample of trade liberalization episodes. We find that countries' characteristics at the time of the shock help explain their future capacity to recover lost trade tax revenues. To proxy for the ease with which tax capacity can be increased we use population density – income and consumption taxes are harder to levy in sparsely populated areas –, the share of agriculture in GDP – a likely correlate of the size of the informal sector – and capital account openness, which makes tax evasion harder to fight. We find that countries with a more tax friendly economic environment thus measured recover the lost tax revenues faster. We also provide a test of the predictions in Besley and Persson (2009) that democratic countries and those at war will invest more in tax capacity. We find that more democratic countries are more likely to recover the lost trade tax revenues through increases in domestic taxation and some evidence that experiencing a war increases the likelihood of recovery in the medium-run.

This paper's implicit normative assumption is that a sustained 20% fall in tax revenues is welfare decreasing. It constrains public good provision in countries which, for most of the period under consideration, were characterized by unsustainable debt levels and faced with major public investment challenges. Our goal is not to enter the debate regarding the efficiency (or lack theoreof) of public spending in developing countries, nor to provide a complete general equilibrium analysis of the welfare impact of trade liberalization. However we note that increasing domestic revenue mobilization has long been a central element of the development strategies of both the international community and many low income countries (Sachs et al., 2005; Gupta and Tareq, 2008; OECD, 2010a). In most of our discussion we take as given that developing countries use tax revenues to finance welfare enhancing public spending.[1]. Our predictions regarding which countries are likely to recover the taxes lost due to trade liberalization nevertheless remain the same when we consider the case of a non-benevolent government in an extension to the model.

The topic of this paper is closely related to the work of Baunsgaard and Keen (2010) that first points out the potential fiscal cost of trade liberalization. Using 25 years of panel data they estimate how domestic tax revenues react to changes in trade tax revenues in the short-run. They show that there has only been incomplete replacement of lost trade tax revenues in low-income-countries. Our approach furthers their analysis of the fiscal consequences of trade liberalization in three important dimensions. First our use of a longer and more complete dataset allows us to generalize our results to the entire tax history of developing countries since independence. Second our empirical method abstracts from short-term co-movements between domestic tax and tariff revenues which may be unrelated to structural changes

[1]This is consistent with a recent literature that points out that differences in capacity to tax lead to persistent differences in growth rates or the quality of public provision (Aizenman and Jinjarak, 2007; Aghion et al., 2011). On the importance of state capacity for development see also Acemoglu (2005).

in reliance on trade as a tax handle. This allows us to identify the impact of trade liberalization on total tax revenues in the short- and medium-run. Finally, we explain theoretically the variety of countries' fiscal experiences we observe in the data.

Our theoretical framework is a close cousin of that developed by Besley and Persson (2009, 2010, 2011) which we extend to the choice of tax mix in an open economy. We thus contribute to the nascent literature on tax capacity by providing a first application of this concept to the recent history of developing countries and to a question of immediate relevance to policy makers.

The model outlined in this paper also complements the theoretical literature on the choice of optimal tax mix. Keen and Ligthart (2002) show that in a standard optimal taxation model replacing tariff revenues is efficiency improving, as tariffs are more distortive than domestic taxes. Several authors have mitigated this benchmark result suggesting that this change in tax mix may not be unambiguously welfare-improving in the presence of market imperfections (Keen and Ligthart, 2005; Naito, 2006) or a large informal sector (Emran and Stiglitz, 2005). We go one step further by showing that replacing tariffs with domestic taxes can only be done in countries which are willing to incur the cost of augmenting their capacity to tax domestically.

This paper is finally related to the literature that studies how the specific constraints faced by developing countries explains their tax mix. Riezman and Slemrod (1987) show that countries facing higher tax collection costs rely more heavily on tariffs because they are easy to levy (see also Aizenman (1987) for a theoretical approach to this question). Easterly and Rebelo (1993) find that larger countries rely more heavily on the income tax than on trade taxes because the former has larger setup bureaucratic costs. We build on these results by endogenizing (domestic) tax collection costs through the introduction of investments in tax capacity. A similar approach is taken by Cukierman et al. (1992) who show how the use of a suboptimal tax instrument (seignorage) depends on the efficiency of the tax system and model the latter as the outcome of a strategic choice by governments. Kleven et al. (2009) offer an alternative theoretical explanation of why developing countries rely little on taxes with a large domestic base such as the income tax or the VAT. Their model is however silent regarding how economic development affects the choice of tax mix. Finally there is a growing empirical literature on how developing countries can increase tax collection through improvements in tax administration (Piketty and Qian, 2009; Pomeranz, 2010).

The outline of the paper is as follows. Section 2 describes the data and method we use and presents the key facts regarding the extent of recovery of lost trade tax revenues through domestic sources of taxation. Section 3 provides historical motivating evidence for the idea that countries at an early stage of development need to rely on tariffs for revenues and will lower them once they have built sufficient tax capacity. Section 4 outlines the model built around this idea and key predictions regarding the fiscal cost of trade liberalization. Section 5 tests these predictions using our sample of episodes of tariff declines. We conclude with Section 6.

2 The fiscal consequences of trade liberalization

A Data

We collect data on total and trade tax revenues from three different sources. For the period 1975-2006 we use the tax database built by Baunsgaard and Keen (2010) which covers 117 countries and was constructed using the revenue information provided by the IMF's periodic consultations with member countries. We complete this dataset for the period 1972-1975 and for missing countries by using data from the *Government Finance Statistics* and the *Historical Government Finance Statistics* (IMF). For the 1945-1971 period we use data from Mitchell (2007). More information on the construction of this dataset is provided in Appendix 3.

We obtain an unbalanced dataset on total tax revenues and trade tax revenues for 117 countries between 1945 and 2006.[2] For the purpose of our analysis we exclude all countries which never levy more than 1% of GDP in trade taxes in the post 1975 data, since our 'shocks' on tariff revenues are defined as at least a 1 GDP percentage point fall in tariff revenues. This excludes most developed countries from our sample. We are left with a sample of 103 developing countries. To the best of our knowledge this is the most complete existing dataset on tax revenues in developing countries combining historical and contemporary data. We scale these tax volumes by both population and GDP. Our key results are obtained using trade tax and total tax revenues as a share of GDP. We discuss robustness using per capita variables as well.

A fall in tax revenues may not lead to a decrease in a country's capacity to provide public goods if it is compensated for by an increase in non-tax revenues, such as revenues from the exploitation of natural resources by a public monopoly or development aid. A more direct measure of a country's capacity to provide public goods is its public expenditure to GDP ratio. Data on government expenditures is less readily available than data on tax revenues, yet we seek to complete our dataset by collecting data on government expenditures from the *Government Finance Statistics*, the *Historical Government Finance Statistics* and Mitchell (2007). This covers 80 of our 103 developing countries.

[2]We exclude 18 countries for which our series is too short (less than 15 years) to identify medium-run impacts of decreases in trade tax revenues. This excludes mostly countries from the ex-Soviet block.

B Episodes of decreases in tariff revenues

Method

We identify episodes of decreases in tariff revenues by defining 'shocks' to trade tax revenues. To ensure that our definition of episodes is not affected by noisy variations in our data, we apply the Hodrick-Prescott (HP) filter method to smoothed tax series.[3] A fall in trade taxes is considered an episode if there is at least a 1 GDP percentage point fall in tariff revenues between a local maximum (which we call the start year s) and the following local minimum. Our results are robust to defining an episode by at least a 2 GDP percentage points fall in tariff data. However since – by construction – the higher the threshold, the lower the number of episodes, our favorite specification is the one with at least a 1 GDP percentage point fall. We choose to work with episodes rather than just studying how total tax revenues vary with trade tax revenues because detecting large downward shocks in tariff revenues allows us to abstract from potentially noisy short-term movements and consider the medium-run fiscal cost of trade liberalization.

We define the magnitude of the episode as the difference in trade tax revenues between the date of the local maximum (year s) and the date of the following local minimum. The length of the episode is the number of years between the local maximum and the following minimum. To measure the fiscal consequences of these shocks we use the data on total tax revenues. We compare tax revenues in each year after the start of the episode to their value in the year s in which the episode starts. We say that a country experiences a recovery when total tax revenues are equal to, or higher than, the value in year s. There is therefore 'no recovery' in a country if the episode leads to a fall in tariff revenues which is never compensated for by

[3] We use a HP filter with a standard smoothing parameter of 6.25. Our results are robust to modifying this parameter.

an increase in other tax revenues. We use the same method to study the impact of these shocks on government expenditures.

Figure 3.3 illustrates graphically how we construct the episodes and define recovery, using the example of Guatemala for which we have data for the period 1972-2004. The vertical dashed red line represents the start of the episode which corresponds to a local maximum for the smoothed trade tax revenue series. The episode starts in 1977 and trade tax revenues fall by 2.4 GDP percentage points between 1977 and 1984. It is driven by a fall in tariffs: we observe a 25% fall in the average tariff rate after 1977 compared to the average level during the 1970s (see Section C below for an investigation of the causes of the episodes). The vertical blue line corresponds to the year of the recovery, the first date at which total tax revenues come back to the level to which they were at the start of the episode. This happens in 2002: Guatemala took 25 years to recover from this episode.

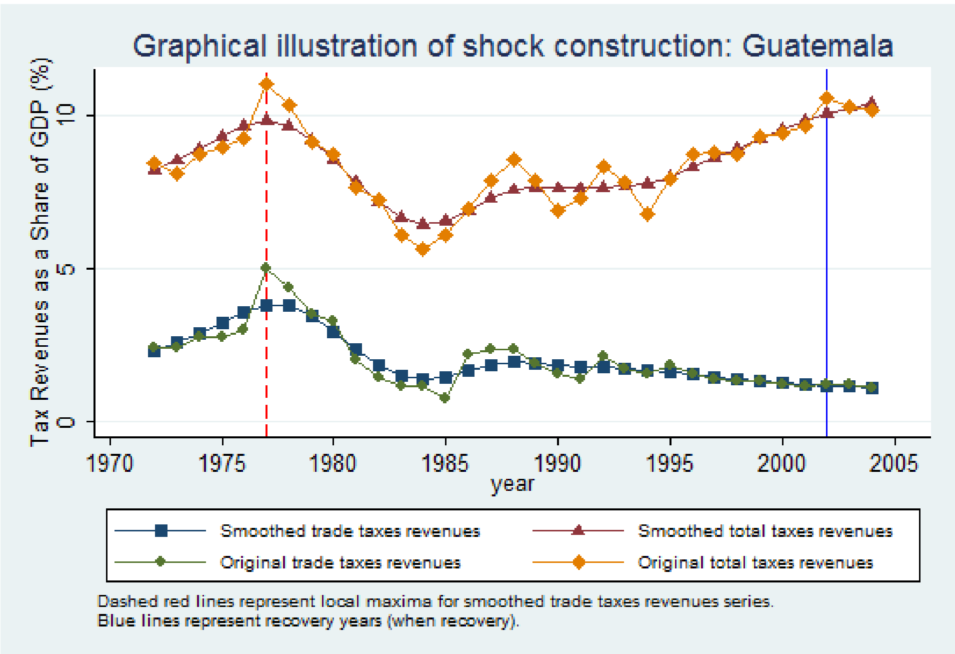


Figure 3.3: Guatemala

Results

86 countries experience at least one episode of tariff revenue decline over the period and 24 countries experience 2 episodes. Our sample for most of the analysis in this paper includes therefore 110 episodes listed in Appendix 4. Most took place in the 1970s (37 episodes) or the 1980s (38). Only 6 countries experienced a shock before 1970 – this may be driven by the fact that our sample size is much smaller before 1970 due to data availability. 29 episodes occurred in the period 1990-2006.

Table 3.1 presents the key characteristics of these episodes. The decreases in tariff revenues are substantial: 3.8 GDP percentage points on average, over half the amount of tariff revenues collected at the start of the episode (7.4% of GDP). This corresponds to a 20% fall in total tax revenues. The magnitude of the episodes ranges anywhere between 4% of total tax revenues (Tunisia in 1983) and 60% (The Gambia in 1985). Countries are on average not able to compensate for this loss of tariff revenues by an increase in other sources of taxation: 55% of them suffer an immediate loss in total tax revenues and 45% have not completely recovered the lost revenues 10 years after the shock.[4] Moreover, 28% of the episodes lead to a fall in total tax revenues which, as far as we can tell from our sample, is permanent: we observe these countries for more than 20 years on average. Finally, countries which did recover took on average 5.7 years to do so.

The picture is similar when we consider government expenditures. Shocks on trade tax revenues lead to a sustained decrease in government expenditures that countries are on average not able to compensate for. 60% of the countries suffer an immediate loss in government expenditures and more than 40% of them have not come back to their initial level of expenditures

[4] This number is calculated excluding the two countries which we do not observe for at least 10 years after the start of the episode.

10 years after the shock.

Table 3.1: Descriptive statistics on episodes of tariff revenue declines

	Mean	SD	Nb obs
Time of shock	1982.5	9.1	110
Size of the episode (% GDP)	3.8	2.9	110
Tariff revenues (%GDP)	7.4	5.2	110
Tax revenues (%GDP)	19.9	9.3	110
Size of the episode (% tax revenues)	20.3	12.4	110
Share that recovers after 1 year	44.5	49.9	110
Share that recovers after 5 years	48.2	50.2	110
Share that recovers after 10 years	55.5	49.9	110
Time to recovery (years)	5.7	7.4	79
If no recovery, potential recovery time (years)	21.2	5.7	31
Share that recovers after 1 year (expenditure)	40.0	49.3	75
Share that recovers after 5 years (expenditure)	47.9	50.3	71
Share that recovers after 10 years (expenditure)	57.4	49.8	68

Robustness

Our method for the identification of episodes is potentially vulnerable to shocks to GDP which would affect the tax-to-GDP ratios we consider even if tax revenues are unchanged. An alternative that still allows for meaningful comparison between countries is to consider the evolution of tax revenues per capita. We therefore use a second method which defines an episode as a fall of at least 25% in tariff revenues per capita between a local maximum and the following local minimum. We choose the 25% threshold to obtain a number of shocks close to that obtained using the first method. All our results are robust to the use of a 30% threshold.

Table 3.2 presents the summary statistics for the 131 shocks obtained when we use this definition. They are on average bigger than episodes found using the first definition. They represent a 40% fall in total tax revenues per capita. However what is striking from Table 3.2 is that the share of countries which recover is extremely similar to that in Table 3.1 for both immediate and medium-run recovery. This remains true if we vary the threshold used to define a shock: descriptive statistics of the episodes identified using a 30% fall in trade taxes per capita or a 2 GDP points fall in trade taxes scaled by GDP are available in the paper's online Appendix. The key picture that emerges from our data is therefore robust to different definitions of what constitutes an episode of large decrease in tariff revenues. Roughly half of the countries suffer a short-term loss in total tax revenues when their tariff revenues fall, and this loss lasts for more than 10 years for the majority of them.

Table 3.2: Descriptive statistics on episodes of tariff revenue declines, per capita definition

	Mean	SD	Nb obs
Time of shock	1984.5	8.3	127
Size of the episode (% GDP)	61.7	23.0	127
Tariff revenues per capita	127.4	184.8	127
Tax revenues per capita	606.7	1193.1	127
Size of the episode (% tax revenues)	41.2	47.6	127
Share that recovers after 1 year	48.0	50.2	127
Share that recovers after 5 years	50.4	50.2	125
Share that recovers after 10 years	58.9	49.4	124
Time to recovery (years)	4.7	7.2	87
If no recovery, potential recovery time (years)	20.4	6.8	40

Looking for a fiscal 'recovery' after a fall in trade taxes is inappropriate if this fall has been anticipated. Countries may decide to increase domestic taxation before lowering tariffs precisely to counterbalance for the coming fall in trade tax revenues. The level of domestic tax revenues we observe at the start of the episode would then already compensate the anticipated loss in tariff revenues. We consider this possibility by examining the evolution of domestic taxes in the 5 years preceding the start of the episode. In 7 of our 110 cases we observe an increase in domestic taxes at least as large as the fall in trade taxes during the episode. This could indicate an anticipation of the decline in tariffs. We discuss below the robustness of our empirical results to excluding these episodes from our sample.[5]

C Why did trade taxes decrease?

Trade liberalization is not the only possible cause of decreases in tariff revenues. It could also be a consequence of a fall in trade volumes or a shock to the exchange rate. More worrying for our analysis a major destructive event (a large war or a natural catastrophe) may lead to a simultaneous collapse in trade and domestic tax collection, making no recovery of the lost trade tax revenues trivially the only possible outcome. Using data on tariffs, trade volumes, exchange rates and dates of entry in regional and international trade agreements, we propose a typology of the causes of the episodes. An episode for which the country is seen to enter a free trade agreement the year the episode starts or during the following 3 years is defined as being a consequence of trade liberalization. Breaks in tariff revenues, trade volumes or exchange rates around the start year are similarly identified as potential 'causes' of the episodes. Appendix 4 gives the cause of each episode that we identify.

We find that nearly 60% of the episodes are associated with a move towards greater trade liberalization, because of entry in a free trade agreement (36% of the episodes) or a fall in tariff rates (21%). Another 14% experienced a clear fall in either exports or imports and 6% an exchange rate shock. 26 episodes remain for which we cannot identify any clear cause of the shock – in most cases because we do not have any data on potential sources of shocks. We turn to the political history of these countries to help explain the cause of the fall in trade taxes. Some, like Cameroon in the 1970s, embarked on economic liberalization reforms which included lowering barriers to trade. Others, like Namibia in 1985, experienced serious political unrest

[5]Descriptive statistics in Table 3.2 are very similar if we exclude these episodes.

or civil wars which may explain why tariff revenues collapsed. We restrict our empirical analysis to episodes which are caused by trade liberalization, a shock in exchange rates or a fall in trade volumes as a robustness check.

3 Historical background

Our model in Section 4 builds on the assumption that domestic sources of taxation such as the income tax or the VAT require more tax capacity to be levied than trade taxes. This implies that countries at early stages of development with low tax capacity rely on trade taxes as a source of revenues and gradually build tax capacity until they have enough to only use domestic taxes. This assumption is motivated by our careful reading of the tax history of now developed countries and the literature explaining differences in tax structures across countries, which we present briefly in this section.

Table 3.3: % Tariff revenues in rich countries, 1850 and 2000

	1850	2000
US	93.1	0.7
Norway	59	0.3
Sweden	36.2	0.2
Great Britain	32.9	0.5
France	11.7	0.3
Spain	10.6	0.5
Prussia/Germany	9.9	0.4

Data source for 1850: Ardant (1972).

It has been recognized since at least Hinrichs (1966) that a country's choice of tax mix depends on its level of development. Rodrik (1995) argues that countries at an early stage of development use mostly taxes on international trade as 'revenue-hungry rulers in countries with poor administrative capabilities know that trade is an excellent tax handle'. In his in-depth history of taxation Ardant (1972) shows that all states initially rely on the taxation of key trading points to provide revenues because transactions in ports and trading cities are the easiest ones to monitor. This idea is reflected in differences in trade tax collection between countries at different stages of development: Riezman and Slemrod (1987) present evidence from the 1970s that countries that rely on tariff revenues for a large share of their revenues do so because the high administrative costs of domestic taxation make tariffs the first best option.

Table 3.3 shows that in 1850 trade taxes were a large share of total tax revenues in now developed countries. The United States in particular stands out for relying nearly entirely on tariffs for revenues. Great Britain, the richest country at the time, still obtained a third of its revenues from custom duties. In 2000 however tariff revenues represent less than 1% of the total budget in all OECD countries. What happens in between is the 'tax transition' described in Hinrichs (1966): governments grow over time and they simultaneously decrease their taxes on trade and increase taxation of domestic income and consumption. Figure 3.4 depicts this evolution in the United States. Until the beginning of the Civil War in 1861 virtually all public revenues came from tariffs. Revenues from trade taxes have since been falling steadily whilst total tax revenues quadrupled as a share of GDP. Most of the increase occurred during two historical events: the entry of the United States into World War One in 1917 and Roosevelt's New Deal starting in 1932. Table presents descriptive statistics on the historical evolution of tax revenues for 9 now-developed countries between 1820 and 1995. Over the period we observe a clear decrease in trade tax revenues and an increase in domestic tax revenues which more than compensates the decrease in revenues from trade taxes.

The theoretical framework presented in the following section argues that the simultaneous decline in trade tax revenues and increase in domestic tax revenues was no coincidence. The costly and progressive development of a

Table 3.4: Tax revenues over time in now developped countries

Period	Nb Obs	Trade Tax Revenue	Domestic Tax Revenue	Total Tax Revenue
1820-1849	51	1.39	3.80	5.12
		(0.68)	(4.25)	(3.87)
1850-1899	301	1.84	5.48	7.32
		(0.81)	(4.44)	(4.10)
1900-1949	412	1.66	11.26	12.92
		(1.18)	(9.95)	(9.64)
1950-1995	376	0.64	21.12	21.76
		(0.54)	(6.39)	(6.21)

Standard errors in parentheses. For the period 1820-1849, the sample includes France and the United States; for the rest of the period (1850-1995), Canada, Denmark, Finland, France, Germany, Italy, Japan, Norway and the United States. The data is from Mitchell (2007).

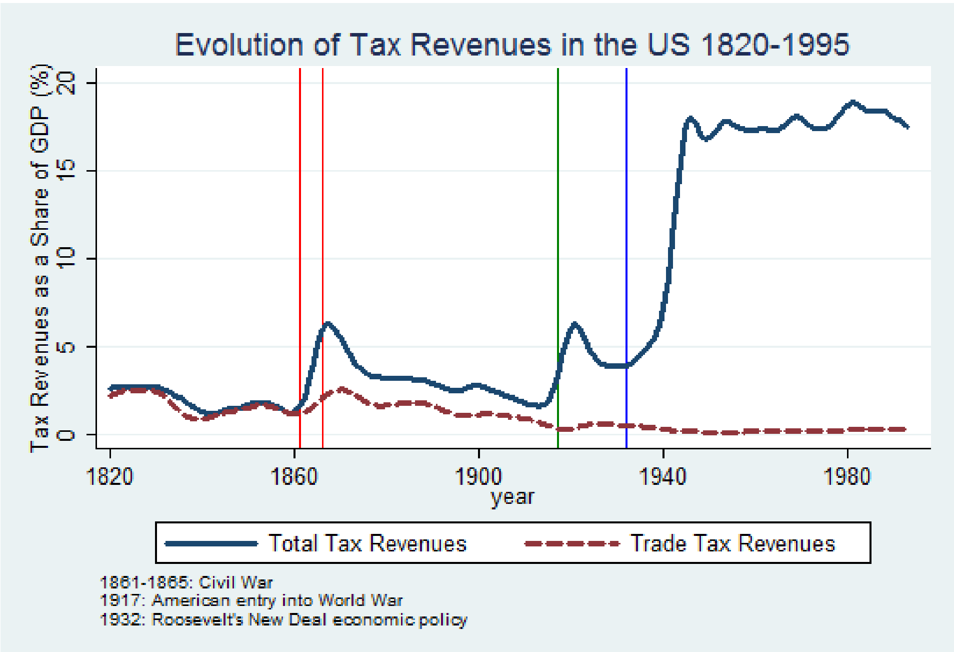


Figure 3.4: United States

modern tax administration made domestic taxation on a large scale possible and allowed governments to decrease tariffs, no longer needed as a source of revenue. There are several historical examples of investments in tax capacity which led to a fall in tariffs.

We describe in the introduction how the reintroduction of the income tax in the United Kingdom in 1842 raised enough revenue to allow for the repeal of the Corn Laws. The sharp fall in US tariff rates at the start of the First World War similarly followed the creation of the income tax system (after a temporary existence during the Civil War). The latter was explicitly designed to finance the fall in trade taxes. In 1913 president Woodrow Wilson made a call for revenue reform in his inaugural address with particular emphasis on lower import duties. Shortly afterwards a bill was passed that lowered tariffs from an average of 40% to 29% and included the creation of a federal income tax to compensate for the lost revenues. This change, like the creation of the income tax in the UK, required a large investment in the administrative capacity of the Bureau of Internal Revenue which did not immediately lead to an increase in tax revenues. During the first year of existence of the federal income tax no taxes were paid as taxpayers were only required to return their tax files, giving citizens and tax authorities the time to adjust to a new system. The bureau's staff doubled every year from 1917 to 1922 and still lagged behind its charges: when returns for 1918 arrived, the tax files for 1916 had not yet been audited (Witte, 1985).

More generally scholars of tax administrations have long pointed out that raising taxes on domestic income requires the development of large inventories and registers to determine a tax base. This often involves the participation of sophisticated techniques and highly skilled individuals. Ardant (1972) reports for example that in 1830 France the six most famous engineers of the time were asked to create new geometric instruments to help build a registry of property income. This historical evidence motivates our choice to model increases in tax capacity as requiring an investment: resources must be set aside to improve the tax administration, improvements in tax revenues take time to materialize.

The historical experience of now-developed countries teaches us two things. First, tariffs are an easy tax to levy relative to domestic forms of taxation. Second, achieving high levels (by international and historical standards) of domestic taxation is only possible when states have invested sufficiently in the creation of a modern tax administration. The latter idea is at the core of Besley and Persson (2009) who argue that fiscal capacity is a stock that governments decide to invest in. Our model adapts their framework by introducing the first lesson from historical experience – tariffs are easier to levy than domestic taxes – in a model of investment in tax capacity and trade.

4 A model of trade and tax capacity

In this section we develop a simple general-equilibrium model of trade with quasi-linear preferences in which a government decides on fiscal policy subject to a tax capacity constraint. Our baseline model assumes that the government is benevolent. We consider the case of a budget-maximizing government as an extension.

A Set-up

Production

Consider a small open economy which produces and trades three goods A, B and C a numeraire good. We assume that good A is its natural export while B is its natural import. More precisely, we assume that trade policy cannot revert natural comparative advantage patterns. For simplicity, only imports are taxed. Let p_i^W denote the world price of good $i = A, B, C$. The domestic price of good B is $p_B = p_B^W + t$ where t is the trade tax. The price of C is normalized to 1. We write $m(p_B)$ the demand for imports of good B.

The numeraire good C is produced using labor one for one, pinning down the wage rate to 1. Goods A and B are produced combining labor and sector-specific capital according to a constant returns to scale technology. Let Π_i^j be the aggregate rent accruing to sector i. Perfect competition in each sector ensures that:

$$\frac{\partial \Pi_i}{\partial p_i} = y_i \tag{4.1}$$

where y_i is the production of good i.

Consumption

The country is populated by a continuum of measure one of individuals with identical quasi-linear preferences:

$$U(c, G) = c_C + u_A(c_A) + u_B(c_B) + V(G), \tag{4.2}$$

where $u_i(\cdot)$ is increasing and concave and c_i denotes consumption of good i. In addition consumers receive utility $V(G)$ from the public good G provided by the government, with $V(\cdot)$ increasing and where we assume that the second derivative V_{GG} is negative and constant for simplicity. All individuals inelastically supply one unit of labor and capital is evenly distributed amongst workers. Aggregate income Y is therefore:

$$Y(p_A^W, p_B^W, t) = 1 + \Pi_A(p_A^W) + \Pi_B(p_B^W + t). \tag{4.3}$$

The representative consumer maximizes her utility under the following budget constraint:

$$c_0 + p_A^W c_A + (p_B^W + t)c_B \leq Y(p_A^W, p_B^W, t) - T \tag{4.4}$$

where T is the income tax.[6]

Consumer behavior satisfies the optimality condition:

$$u_i'(c_i) = p_i, \forall i = A, B$$

A convenient property of the quasilinear representation of preferences is that aggregate welfare in the country can be written as:

$$W(p, t, T, G) = Y(p_A^W, p_B^W, t) - T + S_A(p_A^W) + S_B(p_B^W + t) + V(G) \tag{4.5}$$

where $S_i(p_i)$ denotes the consumer surplus from consumption of good i.

Government

Each country has a government that produces a public good G out of taxes on imports t and a tax on income T. The government is benevolent, discounts future periods at rate β and chooses the trade tax rate freely in each period. We define $R(t) = tm(p_B^W + t)$ the tax revenue collected from trade tax t, with $R_t > 0$ and $R_{tt} < 0$.[7] The level of the income tax T is restricted by the total amount of tax capacity ($\bar{T}$) in the country: $T \leq \bar{T}$.

The government can choose to increase $\bar{T}$ in the future by investing I today from its tax revenues: at time s tax capacity is $\bar{T}_s = \bar{T}_{s-1} + f(I_{s-1})$.

[6] Writing T as total tax collection rather than considering the domestic tax *rate* simplifies the results by ruling out interactions between the tax bases of the income tax and the tariff but leaves the model's results unaffected.

[7] We assume that the import function $m(p)$ is not 'too' convex such that $tm_{pp} + m_p < 0$ to ensure that the second order conditions are respected.

The tax technology function $f(\cdot)$ captures the returns to fiscal investment, with $f_I > 0$ and $f_{II} < 0$. A higher f_I means it is easier for the government to increase tax capacity from a given level of investment. The government's budget constraint is therefore $G + I = T + R(t)$.

The government maximizes the indirect utility of the consumers (we drop the terms which are a function of the price of the exported good, which are irrelevant in the government's maximization program):

$$\max_{t_s, T_s, I_s} \sum_{s=0}^{\infty} \beta^s W(p, t_s, T_s, I_s) \tag{4.6}$$

subject to the constraints:

$$\begin{cases} T_s \leq \bar{T}_s \\ \bar{T}_{s+1} = \bar{T}_s + f(I_s) \\ I_s \geq 0 \\ T_s + t_s m_s - I_s \geq 0 \end{cases} .$$

Combining the first two constraints and assuming that public good provision is always strictly positive this can be rewritten as:

$$\begin{cases} T_s \leq \bar{T}_0 + \sum_{j=0}^{s-1} f(I_j) \\ I_s \geq 0 \\ T_s + t_s m_s - I_s > 0 \end{cases} .$$

B Equilibrium

Solving the government's program we obtain three types of equilibria: a 'full tax capacity equilibrium', in which the government's tax capacity is unconstrained, a 'low tax capacity trap' in which the government remains constrained over time and does not invest, and an 'investment equilibrium' in which the government is initially constrained but gradually increases its tax capacity.

The **full tax capacity equilibrium** occurs when the existing tax capacity $\bar{T}_s$ is enough to satisfy the Samuelson condition for efficient provision of the public good. Countries in this equilibrium have enough tax capacity to equalize the marginal value of the private good (equal to 1) and that of the public good. This case is therefore characterized by a $\bar{T}_s$ such that $V_G(\bar{T}_s) \leq 1$. The government can provide an optimal level of public good by using the domestic tax so it levies no trade tax. T_s^* is such that $V_G(T_s^*) = 1$ and the government does not invest in tax capacity ($I_s^* = 0$).

When the existing level of tax capacity does not suffice to provide an optimal level of public good ($V_G(\bar{T}_s) > 1$) the government levies a trade tax following:

$$\frac{t_s^*}{p_B^W + t_s^*} = \frac{V_{Gs}(G_s) - 1}{V_{Gs}(G_s)}(1/\epsilon) > 0 \tag{4.7}$$

where ϵ is the (absolute value of) the price elasticity of imports. This equation resembles the well-known inverse elasticity rule for the optimal tariff rate.

The government decides to invest in tax capacity if the marginal cost of investment (forgone public good today) is lower than its marginal return (more public good in future periods), i.e. if:

$$V_{Gs}(G_s) < \sum_{j=1}^{\infty} \beta^j f_I(0)(V_{Gs}(G_s) - 1) \Leftrightarrow \frac{V_{Gs}(G_s)}{V_{Gs(G_s)} - 1} < f_I(0)\frac{\beta}{1-\beta} \tag{4.8}$$

This condition will never be satisfied for countries in which:

$$f_I(0)\frac{\beta}{1-\beta} \leq 1 \tag{4.9}$$

Despite their low level of public good provision these countries will remain in a **low tax capacity trap** as the returns to investment are too small for them to ever choose to invest in tax capacity. Intuitively the quantity of public good forgone today as a result of an investment of 1 unit is higher than the (discounted) sum of increased tax revenues generated by this investment ($f_I(0)\sum_{j=1}^{\infty}\beta^j$). Investment cannot be worthwhile whatever the marginal value of the public good. Countries with worse tax technology (lower f_I) and less forward looking governments (lower β) are more likely to find themselves in this type of equilibria.

Countries for which returns to investment are high enough ($f_I(0)\frac{\beta}{1-\beta} > 1$) will invest in tax capacity as long as (4.8) is satisfied. These countries are in a **tax capacity investment equilibrium**. The optimal level of investment (I^*) is set by:

$$V_G(\bar{T}_s + R(t_s^*) - I_s^*) = \sum_{j=1}^{\infty} \beta^j f_I(I_s^*)(V_G(\bar{T}_s + f(I_s^*) + R(t_{s+j}^*)) - 1). \quad (4.10)$$

Better tax technology, higher demand for the public good and lower preference for the present lead to more investment as they increase returns. Countries stop investing when their existing level of tax capacity $\bar{T}^{max}$ allows them to reach a level of public good such that:

$$\frac{V_G(\bar{T}^{max} + R(t_s^*))}{V_G(\bar{T}^{max} + R(t_s^*)) - 1} = f_I(0)\frac{\beta}{1-\beta}. \quad (4.11)$$

Note that this level of tax capacity does not allow countries to reach the full tax capacity equilibrium where $V_G = 1$. When $\bar{T} = \bar{T}^{max}$ the marginal benefit of investing in tax capacity is no longer higher than the marginal cost so investment stops. The presence of an intertemporal cost to raising tax capacity implies that the Samuelson condition for provision of the public good ($V_G = 1$) will not be reached. Countries in an investment equilibrium will therefore continue to use the tax on imports as a source of revenues when they stop investing in tax capacity. We define this level of trade tax as t^{min}, defined by:

$$\frac{t^{min}}{p_B^W + t^{min}} = \frac{V_G(\bar{T}^{max} + R(t^{min})) - 1}{V_G(\bar{T}^{max} + R(t^{min}))}(1/\epsilon) > 0 \qquad (4.12)$$

C Implications

The model predicts the key stylized facts outlined in the previous section regarding the historical evolution of tax revenues in developing countries. First, countries experience a tax transition over time: they increase tax revenues from domestic sources and decrease tariffs (Hinrichs, 1966). This is clearly the evolution experienced by countries in a tax capacity investment equilibrium. They invest in tax capacity, domestic taxation increases and tariffs are lowered.

Second, the so-called 'Wagner's law' states that government size increases over time. This is also a clear prediction of the model for countries in a tax capacity investment equilibrium: as the share of tax revenues coming from domestic taxes increases so does the overall efficiency of the tax system, allowing for higher tax-to-GDP ratios. Rich OECD countries in which the level of taxation has stabilized over the last decades are likely to be in a full tax capacity equilibrium where the share of GDP extracted by the government has reached a long-run steady state level.

Our model can also accommodate the 'ratchet effect theory' (Peacock and Wiseman, 1961) whereby temporary shocks to the demand for the public good such as wars raise government expenditures permanently. To explain why expenditures do not fall back to their pre-shock level once the shock subsides this theory argues that social norms regarding the optimal level of public goods are permanently affected by the temporary shock. Our model offers an alternative explanation. A temporary jump in the marginal value of the public good (V_G) will make a country increase its tax capacity. This tax capacity will remain in place once V_G returns to its equilibrium value, leaving the country with permanently higher domestic taxes and lower tariffs. This is exactly what we observe in the evolution of tax revenues in the United States (Figure 3.4). Note that such a temporary jump in V_G can explain how countries shift from an equilibrium in which $\bar{T} = \bar{T}^{max}$ to a full tax capacity equilibrium.

Finally we offer a new explanation for the empirical relationship between trade openness and government size (Alesina and Wacziarg, 1998; Rodrik, 1998). In our model the causality stems from government size to trade liberalization. Investments in tax capacity lead to a bigger government that can afford to lower tariffs and therefore opens up to trade.

D Impact of an exogenous decrease in tariff revenues

In this section we consider the impact of an exogenous decrease in tariff revenues ($R(t)$) on total tax revenues. We assume that in most cases the type of decrease in tariff revenues presented in Section 1 cannot be the unconstrained decision of welfare-maximizing governments: the decrease in tariff revenues is exogenous to domestic determinants of public good provision and taxation levels. It could be the consequence of the government's wish to enter a free trade agreement irrespective of fiscal considerations or of external pressure from international institutions or large trade partners. Antrás and Padró i Miquel (2011) argue for example that powerful governments often attempt to change the tariff policies of their trade partners. Going back to the example we use in Section 2.2, a potential explanation for the change in trade policy in Guatemala in 1979 is that it requested an IMF Financial arrangement (a conditional Stand-By Arrangement was approved in November 1981) and that it had to lower its tariffs to meet the IMF's conditions[8]. Whether this fall will be compensated by an increase

[8] Information on the conditions attached to obtaining a loan from the IMF are not publicly available.

in domestic tax revenues depends on the type of equilibria the country is facing.

Proposition 1 *Consider an exogenous fall in tariff revenues of dR. (i) Countries in a low tax capacity trap will not recover any of the lost revenue through increased domestic taxation. (ii) Countries in an investment equilibria will invest more and recover at least part of the lost revenue. They will recover more when they have better tax technology and when their government is more forward looking.*[9]

Consider first the case of a country in a low tax capacity trap. Its decision not to invest is set by the condition $f_I(0)\frac{\beta}{1-\beta} \leq 1$ which is not affected by the decrease in tariff revenues. Its level of domestic taxation remains the same, so none of the lost revenue is recovered.

Countries which are in an investment equilibrium will on the contrary increase their level of investment when faced with a decrease in tariff revenues. Using equation (4.10) we find:

$$dI_s = dR \frac{V_{GG}(1 - f_I(I_s)\beta/(1-\beta))}{V_{GG}(1 + \beta/(1-\beta)f_I^2(I_s)) + \sum_{j=1}^{\infty} \beta^j f_{II}(I_s)(V_{G_{s+j}} - 1)} > 0 \text{ if } dR < 0 \tag{4.13}$$

Intuitively the decrease in tariff revenues hastens the tax transition by improving the government's incentives to invest because it lowers future tax revenues, making higher tax capacity tomorrow attractive. Similarly countries which had stopped investing before the fall in $R(t)$ will be made to invest again to compensate for the lost revenue. Rewriting (4.11) it is easy to show that for those countries $d\bar{T}^{max} = -dR$: the maximum level of tax capacity that countries will reach increases.[10]

[9] Countries in a full tax capacity equilibrium cannot by definition experience such a fall since for them $R(t) = 0$.

[10] This holds for any country for which the fall in $R(t)$ leads to a level of trade tax that is below that in equation (4.12) at which the country stops investing.

An exogenous decrease in tariff revenues thus hastens and furthers the tax transition of countries in an investment equilibrium. This comes at a cost however. Whilst tariff revenues fall by dR_t domestic revenues increase by $f_I(dI_t + I_t^*)$ in the first period after the shock, where I_t^* is the level of investment that would have occurred without the shock. The increase in the equilibrium level of investment due to the shock dI_t is not enough to compensate for the fall in tariff revenues. Rewriting equation (4.13) we find that:

$$f_I dI < -dR. \tag{4.14}$$

Intuitively the government seeks to spread the welfare cost of lower tariff revenues over the current and future periods, complete revenue recovery in the short-run is not guaranteed. The extent of revenue recovery will depend on the size of $f_I(dI_t + I_t^*)$ compared to dR_t: the country is more likely to recover the lost revenue the higher the tax technology (f_I) and the initial level of investment. Over time, as tax investments accumulate, the country becomes increasingly more likely to recover the lost tariff revenues. In the long-run all countries in an intermediate equilibrium recover. When the shock leads a to a new level of trade tax such that $t < t^{min}$ (equation (4.12)) the long run tax mix is more efficient (because more skewed towards domestic taxation) and allows for a higher overall level of taxation. As we show below the same long-run equilibrium can be obtained without the short-run welfare loss by raising tax capacity prior to lowering trade taxes.

E Increasing tax capacity leads to more trade openness

Consider now what happens if the country is given an amount X of public revenues to invest in tax capacity, for example through technical aid to improve its tax administration. This will lead to an increase in domestic taxes of $f(X)$ in countries which are in a low tax capacity trap. The increase will be smaller but positive in countries which are in a tax capacity investment equilibrium as they will lower the amount of investment in tax capacity that they themselves finance. Formally:

$$dI^* = -X \frac{f_I(I_s)V_{GG}(f_I\beta/(1-\beta)-1)}{\sum_{j=1}^{\infty}\beta^j f_{II}(I_s)(V_G(G_{s+j})-1)+V_{GG}(\beta/(1-\beta)-1)f_I^2+1} \tag{4.15}$$

where $0 > dI^*$ and $-dI^* < X$ so that tax capacity in the country increases.

In both cases the country will now endogenously lower its tax on imports as it has access to more capacity to levy domestic taxes:

$$dt^* = \frac{-V_{GG}f_I(I_s)R_t(X-dI^*)}{m_p(V_G-1)+V_G(G_s)(tm_{pp}+m_p)+V_{GG}R_t^2} < 0 \tag{4.16}$$

where $dI^* = 0$ for countries in a low tax capacity trap. Providing countries with funds to invest in tax capacity will yield a double dividend: more tax revenues, and a less distortive tax system. Note that this is true even in countries in low capacity traps in which the government itself may not find it optimal to invest in tax capacity. Our model does not include gains from trade liberalization beyond the increase in consumer surplus, but it suggests that such potential gains (higher growth, or positive externalities on trade partners) can be reached through investments in tax capacity.

F Extension: budget-maximizing government

We now consider what happens if the government maximizes its intertemporal budget $\sum_{s=0}^{\infty}\beta^s(T_s+t_s m_s-I_s)$ instead of welfare[11].

[11] This is an extreme case of a non-benevolent government. One could think instead of an intermediate case in which the government maximizes a weighted sum of the representative citizen's welfare and a share of the budget captured as a rent. As we will show however predictions of the model are very similar in the polar cases of benevolent and budget-maximizing governments – the recovery from an exogenous fall in tariff revenues is similar in both cases – though normative implications differ. Since what we are interested in here are the predictions regarding revenue recovery we focus on this simpler framework.

The government's budget maximization is subject to the constraints:

$$\begin{cases} T_s \leq \bar{T}_0 + \sum_{j=0}^{s-1} f(I_j) \\ I_s \geq 0 \\ T_s + t_s m_s - I_s > 0 \end{cases}.$$

This government places no weight on the welfare cost of using the trade tax. It will always choose the trade tax rate that maximizes trade tax revenues:

$$\frac{t_s^*}{p_B^W + t_s^*} = -1/\epsilon > 0 \tag{4.17}$$

It also sets $T^* = \bar{T}_s$ in all periods since not doing so leads to forgone revenues. There is therefore no 'high tax capacity equilibria' in which trade taxes are not used and the existing tax capacity is sufficient for the government to meet its objective. Neither does this version of the model predict that countries will choose to decrease trade taxes over time as they increase domestic tax.

The government invests in tax capacity if the marginal cost of investment (forgone revenues today) is lower than its marginal returns (more revenues in future periods), i.e. if:

$$f_I(0)\frac{\beta}{1-\beta} \geq 1 \tag{4.18}$$

A country in which condition (4.18) is not satisfied is thus in a **low tax capacity trap** regardless of whether its government maximizes welfare or its own budget.

When $f_I(0)\frac{\beta}{1-\beta} \geq 1$ the government will invest an amount I^* such that:

$$f_I\left(I^*\right)\frac{\beta}{1-\beta} = 1 \tag{4.19}$$

This optimal investment level does not depend on the existing level of tax capacity or the trade tax: the government will always invest the same (intertemporal) revenue-maximizing amount in tax capacity. All countries in which $f_I(0)\frac{\beta}{1-\beta} \geq 1$ are therefore in an investment equilibrium.

Budget-maximizing governments clearly invest more often in tax capacity than benevolent ones . They also tend to invest higher amounts in tax capacity: comparing (4.10) and (4.19) we see that for reasonable values of the marginal value of the public good (less than twice that of private consumption) benevolent governments choose lower equilibrium investment levels than their budget-maximizing counterparts as they do not take into account the (direct) cost of paying taxes.

Assuming that the government maximizes its budget rather than citizens' welfare leaves unchanged the impact of an exogenous decrease in trade tax revenues (Proposition 1). Countries in a low tax capacity trap will, by definition, recover none of the lost trade tax revenues through domestic taxation. Countries in an investment equilibria will recover some, thanks to the positive level of investment in tax capacity. Whether they will recover more or less than countries governed by benevolent governments is ambiguous. On the one hand, benevolent governments increase their investment when confronted to an exogenous decrease in tariff revenues. Budget-maximizing governments do not, as they always choose the revenue-maximizing level of investment. On the other hand, as explained above, a budget-maximizing government likely invests more in tax capacity than a benevolent one regardless of the decrease in trade tax revenues. As in the benevolent government case the speed of recovery will depend on the relative values of tax technology and the government's discount rate (f_I and β).

The testable predictions of the model are therefore unaffected by our assumption regarding the government's objective function. The welfare impact of a decrease in trade tax revenues is however very different. If we think the government is purely rent-taking and produces no public good, the decrease has a clear positive impact on citizens' welfare, increasing consumer surplus at no cost. Finally, note that the prediction that providing the country with funds to invest in tax capacity will lead to lower tariffs does not follow through in this extension of the model.

5 Why did some countries recover? Empirical evidence

A Data and empirical strategy

A first empirical validation of our model is found in Tables 3.1 and 3.2 which show that some countries did not immediately recover the lost revenues from trade taxes through increases in domestic taxes. This is in line with the prediction of the model that a country in a tax capacity investment equilibrium will suffer a short-run fall in total tax revenues following an exogenous decrease in trade taxes. The fact that some countries never recover in our sample also suggests that the low tax capacity trap equilibrium is empirically relevant. In this section we test the model's predictions regarding which country characteristics affect the probability of recovery.

The model predicts that countries with better returns to tax investments (higher f_I) are more likely to increase their domestic taxation after a fall in tariff revenues. There is no straightforward proxy for tax technology. The size of the informal sector is the ideal candidate as it is likely to be harder to increase domestic tax collection in a country where a large share of transactions are unobserved by the state. Information on the informal sector is however rarely available for recent years, let alone since 1945. We consider three variables that are likely correlants with returns to tax investment as they make collecting wide-based domestic taxes easier: the share of agriculture in GDP, population density and capital account openness. Controlling for the level of economic development, the share of agriculture in GDP is likely correlated with the size of the informal sector (Alm and Martinez-Vazquez, 2007). Historical evidence that low population densities make taxing domestic income more of a challenge is found in Irwin (2002) who argues that "in terms of public finance, import taxes made sense for countries with low population densities. Other means of raising revenue (...) were not as feasible or as enforceable in countries with a widely dispersed population." (p. 162) (see also Acemoglu et al. (2002)). Finally it has been argued that capital account openness lowers the capacity of countries to levy income taxes, particularly corporate income taxes, because it makes fighting tax avoidance and evasion harder (Devereux et al., 2003).

Besley and Persson (2009) study how political characteristics of a country affect investments in state capacity. They argue that countries that have inclusive political institutions are more likely to invest in tax capacity because their governments have more interest in increasing future public good provision. We follow them in proxying for political inclusiveness using the democracy variable from the Polity 4 dataset. We also consider their hypothesis that countries facing an external threat are more likely to construct state capacity. In our empirical setting this implies that countries experiencing a war at the time of the start of the episode or in the years following will invest more, and thus are more likely to recover the lost tax revenues. We use data from the Correlates of War database to create indicators of whether the country was in a war (excluding civil wars) at the time of the shock and in the 2 or 10 years following the shock. Both more democratic governments and wars are likely to increase the demand for public good provision. The inclusion of these variables as determinants of recovery is therefore also in line with the model's prediction that countries with a higher marginal value of the public good are likely to recover faster.[12]

[12]The theory also predicts that governments with higher discount rates will recover the lost tax revenues faster. There is however no clear empirical counterpart for this parameter – variables proxying for end of political terms are not available for our whole sample.

Formally, we estimate the following equation:

$$P_{is} = \alpha + X_{is}'\beta + Z_{is}'\delta + \epsilon_{is} \tag{5.1}$$

where i indexes countries and s years, P_{is} is an indicator equal to 1 if country i experiencing an episode starting in year s recovers the lost tariff revenues after 2 or 10 years. X_{is} is the set of determinants of recovery measured at the start of the episode and Z_{is} is a set of control variables. We allow for the possibility that economic development directly leads to higher tax to GDP ratios (as predicted for example by Kleven et al. (2009)) by including GDP per capita at the time of the shock. High GDP growth could lead to decreases in tax GDP ratios so we also control for average GDP growth between year s and year $s + 2$ (when P_{is} is recovery after 2 years) or year $s + 10$ (when P_{is} is recovery after 10 years).

Some of the episodes we identify may correspond to decreases in trade tax revenues that are not the consequence of a 'shock' exogenous of fiscal considerations but are part of the process of tax transition described by the model. In these cases recovery is immediate, as the fall in trade taxes is simultaneous to the increase in tax capacity. We expect these episodes to be characterized by smoother decreases in tariff revenues – smaller episode sizes, over longer periods. We therefore control throughout for the length and size of the episodes to help disentangle between the two types of episodes. Revenue recovery should occur faster for longer episodes of smaller size.

We use OLS as our baseline specification to estimate equation (5.1). Table 3.5 presents descriptive statistics for the potential determinants of recovery for the sample of episodes using both definitions described above. Strong multicollinearity between the variables is potentially a concern so we consider the impact of each variable on the probability of recovery separately and simultaneously.

Table 3.5: Descriptive Statistics

	Mean	SD	Nb obs
Density	1.2	4.1	107
Agr\ GDP	24.0	15.6	100
Capital openness	0.9	0.3	103
Democracy	-1.4	6.7	96
War this year or next	0.1	0.2	110
War in next 10 years	0.2	0.4	110
GDP per capita	22.3	30.4	107

See Appendix 3 for a description of the variables.

B Results

Table 3.6 considers the determinants of revenue recovery ten years after the start of the episode. All variables have the expected sign. Population density stands out as a key determinant of the probability of revenue recovery suggesting that countries facing a more 'tax friendly' environment find it easier to increase domestic taxes to respond to the revenue shock. Coefficients for the other two proxies for tax technology – share of agriculture in GDP and capital openness – are of the expected sign but not statistically significant when all coefficients are estimated simultaneously. More politically inclusive countries and those at war at some point in the 10 years following the shock are also more likely to recover in line with the predictions in Besley and Persson (2009). Finally, the coefficients for the magnitude and the length of the episodes are of the expected sign, though not statistically significant: the bigger the episode, the lower the probability of recovery, and the longer the episode, the higher this probability.

The estimation results in Table 3.7 for the probability of recovery in the short-run (two years) paint a similar picture. Population density and democracy again stand out as important determinants of recovery, but being at war seems to have no impact in the short-run.[13] The characteristics of the episodes (size and length) seem particularly important in determining

[13] Only six countries are at war in the two years following the start of the episode.

revenue recovery in the short-run. This is consistent with the idea that including those variables enables us to disentangle the episodes that are the consequence of shocks which are exogenous to fiscal considerations and those which are part of a smooth tax transition, as revenue recovery is immediate for the latter.

Table 3.6: Determinants of revenue recovery after 10 years

	1	2	3	4	5	6	7
Density	0.013**						0.012**
	(0.005)						(0.005)
Agr GDP		-0.006**					-0.002
		(0.003)					(0.004)
Capital openness			-0.052				-0.115
			(0.165)				(0.214)
Democracy				0.019**			0.027***
				(0.008)			(0.009)
War in next 10 years					0.253**		0.300**
					(0.118)		(0.133)
GDP per capita						0.003***	0.001
						(0.001)	(0.003)
Size of the episode (% GDP)	-0.005	-0.000	-0.003	-0.007	-0.011	-0.004	-0.005
	(0.018)	(0.017)	(0.018)	(0.018)	(0.018)	(0.018)	(0.019)
Length of the episode (years)	0.005	0.006	0.005	0.006	0.007	0.004	-0.000
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Observations	107	100	103	96	107	107	88

Robust standard errors in parentheses. All results are obtained using an OLS specification and controlling for GDP growth in the next 2 or 10 years. An observation is an episode, defined using the tax to GDP ratios as explained above. See Appendix 3 for a description of the variables.

The creation of a Value Added Tax (VAT) system may be an example of an investment in tax capacity. In Table 6.4 we consider whether having a VAT system at the start of the episode or creating one during the period under consideration affects the probability of recovery. We find no such impact (with or without additional controls). This is in line with the result in Baunsgaard and Keen (2010) that the presence of a VAT does not affect revenue recovery. This may be because the creation of a VAT, often recommended by international financial institutions to countries in a fiscal

Table 3.7: Determinants of revenue recovery after 2 years

	1	2	3	4	5	6	7
Density	0.008*						0.009*
	(0.004)						(0.005)
Agr\ GDP		-0.004					0.000
		(0.003)					(0.004)
Capital openness			-0.179				-0.147
			(0.162)				(0.190)
Democracy				0.013			0.016*
				(0.008)			(0.009)
War this year or next					-0.020		0.056
					(0.229)		(0.251)
GDP per capita						0.002	0.003
						(0.001)	(0.002)
Size of the episode (% GDP)	-0.028*	-0.025	-0.025*	-0.030*	-0.029*	-0.028*	-0.021
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.016)
Length of the episode (years)	0.020**	0.018*	0.019**	0.018*	0.021**	0.019**	0.009
	(0.010)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)
Observations	107	100	103	96	107	107	88

Robust standard errors in parentheses. All results are obtained using an OLS specification and controlling for GDP growth in the next 2 or 10 years. An observation is an episode, defined using the tax to GDP ratios as explained above. See Appendix 3 for a description of the variables.

crisis, is a complex undertaking that was not successful in increasing domestic taxation in the countries in our sample, or was undertaken precisely by the countries which faced the most severe fiscal constraints.

Table 3.8: VAT as a determinant of revenue recovery after 10 years

	1	2	3	4	5	6
VAT at time s	0.052	0.032				
	(0.126)	(0.132)				
VAT at time $s + 10$			0.018	-0.149		
			(0.102)	(0.112)		
VAT created					-0.019	-0.177
					(0.113)	(0.122)
Other determinants	No	Yes	No	Yes	No	Yes
Observations	107	88	107	88	107	88

Robust standard errors in parentheses. All results are obtained using an OLS specification and controlling for GDP growth in the next 2 or 10 years. The variable 'VAT at time s' is equal to 1 if the country has a VAT system at the start of the episode, 0 otherwise. The variable 'VAT at time $s + 10$' is equal to 1 if the country has a VAT system 10 years after the start of the episode, 0 otherwise. The variable 'VAT created' is equal to 1 if the country creates a VAT system in the 10 years following the start of the episode, 0 otherwise. An observation is an episode, defined using the tax to GDP ratios as explained above.

Robustness Checks

As explained above our method could miss-classify countries as having not recovered if they anticipated the shock by increasing domestic taxation before the decrease in tariffs. To deal with this potential concern we restrict the sample to only non-anticipated episodes using the definition described in Section 2: we drop the 7 cases in which we observe an increase in domestic taxes at least as large as the fall in trade taxes during the 5 years preceding the episode. Doing so leaves results unchanged (Table 3.9).

Episodes which are caused by a national crisis – for example a civil war – are unlikely to be associated with fast revenue recovery irrespective of the country's characteristics. In Table 3.10 we drop these episodes and only consider those which are associate with trade liberalization, a shock in exchange rates or a fall in trade volumes. We find similar results on this

Table 3.9: Determinants of revenue recovery after 10 years, non-anticipated episodes only

	1	2	3	4	5	6	7
Density	0.013**						0.011**
	(0.005)						(0.005)
Agr\ GDP		-0.006*					-0.002
		(0.003)					(0.004)
Capital openness			-0.062				-0.108
			(0.165)				(0.220)
Democracy				0.019**			0.027***
				(0.008)			(0.009)
War in next 10 years					0.247*		0.261*
					(0.125)		(0.139)
GDP per capita						0.003***	0.001
						(0.001)	(0.003)
Size of the episode (% GDP)	-0.002	0.003	-0.001	-0.004	-0.009	-0.002	-0.002
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.019)
Length of the episode (years)	0.005	0.005	0.005	0.005	0.007	0.004	-0.001
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Observations	100	93	97	89	100	100	82

Robust standard errors in parentheses. All results are obtained using an OLS specification and controlling for GDP growth in the next 2 or 10 years. An observation is an episode, defined using the tax to GDP ratios as explained above. See Appendix 3 for a description of the variables.

smaller sample though proxies for tax technology are no longer statistically significant determinants of revenue recovery. Controlling for decade fixed effects similarly does not affect the results, though some estimates loose statistical significance due to a lack of power (Table 3.11). This suggests that a general trend towards better managed tax transitions over time as macro-economic conditions change cannot explain our findings.

The Tables Appendix presents similar robustness checks for the probability of revenue recovery in the short-run which leave our main findings unchanged. We also estimate equation (5.1) on our sample of episodes of tariff revenue decreases defined using tax data normalized by population as explained above. Our findings are robust to using this alternative definition of episodes though most coefficients are not statistiscally significant when jointly estimated on this sample. Interestingly having a VAT system in place seems to decrease the probability of recovery in this sample, though this could be because countries adopt VAT systems when they are facing severe fiscal constraints. Finally results obtained when one changes the thresholds used to define episodes are in the paper's online Appendix. We consider episodes defined by a 2 GDP points fall in trade taxes or a 30% fall in trade taxes revenue per capita. These more conservatives definitions yield a smaller number of episodes and hence decrease the sample size and power of the estimation but the coefficients' estimated values are very similar in most cases.

Table 3.10: Determinants of revenue recovery after 10 years, episodes for which the cause is identified only

	1	2	3	4	5	6	7
Density	0.028						0.008
	(0.028)						(0.055)
Agr\ GDP		-0.005					0.000
		(0.004)					(0.005)
Capital openness			0.057				-0.014
			(0.225)				(0.288)
Democracy				0.018*			0.022**
				(0.009)			(0.010)
War in next 10 years					0.396***		0.422***
					(0.111)		(0.133)
GDP per capita						0.003***	0.003
						(0.001)	(0.002)
Size of the episode (% GDP)	0.004	0.004	0.008	0.006	-0.001	0.008	0.004
	(0.019)	(0.019)	(0.019)	(0.018)	(0.019)	(0.019)	(0.020)
Length of the episode (years)	0.004	0.003	0.002	0.003	0.005	0.002	-0.003
	(0.011)	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)	(0.012)
Observations	80	77	77	72	80	80	67

Robust standard errors in parentheses. All results are obtained using an OLS specification and controlling for GDP growth in the next 2 or 10 years. An observation is an episode, defined using the tax to GDP ratios as explained above. See Appendix 3 for a description of the variables.

Table 3.11: Determinants of revenue recovery after 10 years with decade fixed effects

	1	2	3	4	5	6	7
Density	0.016***						0.015**
	(0.005)						(0.006)
Agr\ GDP		-0.004					0.000
		(0.004)					(0.004)
Capital openness			-0.102				-0.144
			(0.174)				(0.225)
Democracy				0.013			0.021**
				(0.009)			(0.010)
War in next 10 years					0.226*		0.260*
					(0.120)		(0.156)
GDP per capita						0.003***	0.002
						(0.001)	(0.003)
Size of the episode (% GDP)	-0.001	0.003	0.001	-0.001	-0.008	-0.001	0.002
	(0.019)	(0.019)	(0.019)	(0.019)	(0.020)	(0.019)	(0.021)
Length of the episode (years)	0.008	0.009	0.006	0.006	0.011	0.008	-0.000
	(0.011)	(0.010)	(0.011)	(0.011)	(0.010)	(0.010)	(0.012)
Observations	107	100	103	96	107	107	88

Robust standard errors in parentheses. All results are obtained using an OLS specification and controlling for GDP growth in the next 2 or 10 years. An observation is an episode, defined using the tax to GDP ratios as explained above. See Appendix 3 for a description of the variables.

6 Conclusion

This paper provides new evidence on the fiscal cost of trade liberalization. Using a novel dataset covering 103 developing countries between 1945 and 2006 we identify 110 episodes of decreases in tariff revenues and show that on average the fall of trade taxes was of nearly 4 GDP points. Only 55% of the countries recover the lost revenue through other tax resources 10 years after the shock. The picture is similar when we consider government expenditures. We find evidence that, as predicted by our model, more inclusive political institutions and a more tax-friendly economic environment lead to a higher probability of revenue recovery.

Our argument is not that trade liberalization is bad *per se*. In the long run a fall in tariffs will in our model have a positive impact on welfare as it increases the efficiency of the tax system. However the model points out that the net effect will be always negative for countries which are trapped in a low tax capacity equilibrium. We indeed observe that nearly a third of countries which experience a fall in trade tax revenues never recover the lost revenues through other means. Other countries will suffer from a short-run loss, but will be better off in the long-run. Our model finally suggests that the gains from trade liberalization can be obtained by investing in tax capacity. Building more efficient tax administrations in developing countries may lead them to open up to trade as they will no longer need to levy tariffs to raise revenue, though other protectionist motives for raising tariffs may be at play.

Chapter 4

A Tale of Cyclicality, Aid Flows, and Debt: Government Spending in Sub-Saharan Africa

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Previously, a history of fiscal indiscipline had often yielded high inflation, depleted foreign exchange reserves, a private sector starved of credit, a flight from domestic currency, foreign exchange rationing, and an overvalued exchange rate (...) Fiscal policy had simply become a matter of progressively lowering the deficit, and there was little scope for discretion. In effect, governments had placed themselves at a boundary of the possible policy space; they were at a corner solution. Post-stabilisation, they are once again in the interior of the viable policy space, and can exercise choice.

Adam and Bevan (2004)

Abstract

This paper documents cyclical patterns of government expenditures in sub-Saharan Africa since 1970 and explains variation between countries and over time. Controlling for endogeneity and applying dynamic GMM techniques, it finds that government expenditures are slightly more procyclical in sub-Saharan Africa than in other developing countries and some evidence that procyclicality in Africa has declined in recent years after a period of high procyclicality during the 1980s and 1990s. We find suggestive evidence that greater fiscal space, proxied by lower external debt, and better access to concessional financing, proxied by larger aid flows, contributed to diminishing procyclicality in the region. We do not find, however, any evidence that political institutions affect fiscal procyclicality in sub-Saharan Africa.

JEL classifications: E62, E32, H30, O5

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1 Introduction

Fiscal policy in sub-Saharan Africa (SSA) has often been perceived more as a contributor to than a cure for the excessive macroeconomic volatility in the region. A number of studies have attributed that to the fact that fiscal policy is on average procyclical in the region (Thornton, 2008; Diallo, 2009; Carmignani, 2010). However, most studies have stopped short of benchmarking the degree of procyclicality in SSA against that observed in other regions, an important starting point to determine the contribution that such fiscal-policy-induced shocks may have on exacerbating rather than smoothing business cycle fluctuations. Moreover, many econometric studies of the reaction of fiscal policy to the business cycle in the region have also ignored the possibility of reverse causality, undermining the reliability of fiscal procyclicality estimates.

Cyclical fiscal patterns in (SSA) also appear to be changing. Preliminary evidence indicates that about two-thirds of countries in this region experiencing below-trend growth in 2009 implemented counter-cyclical fiscal policies (International Monetary Fund, 2009, 2010). This contrasts sharply with regional fiscal policy responses following the last global recession in 1991, when almost three-fifths of the countries growing below trend implemented procyclical fiscal policies (International Monetary Fund, 2010). This shift towards countercyclical, or at least less procyclical, fiscal policies has been mainly attributed to steady improvements in macroeconomic performance and structural reforms in developing countries, including SSA, during the last three decades (International Monetary Fund, 2009, 2010).[1] Available evidence, however, has so far been mostly anecdotal.

This paper closes these gaps by (i) documenting the magnitude and

[1] Since the late 1990s, such improvements led most SSA countries to what is commonly referred to as the "post-post-stabilization phase" (Adam and Bevan, 2004). Countries reaching this phase have been characterized by sustainable fiscal and external positions, single-digit inflation, deeper domestic financial markets, and better institutions.

evolution of cyclical patterns in government expenditures in SSA since 1970, correcting for possible bias owing to endogeneity by applying Generalized Method of Moment (GMM) techniques; and (ii) making a first attempt to identify factors underlying changes in cyclicality over time in the region, with reference mainly to macroeconomic and institutional conditions.

Section 2 reviews the literature on facts and factors related to fiscal cyclicality in sub-Saharan Africa since 1970. Section 3 discusses our empirical strategy. Section 4 summarizes the empirical estimation results for the magnitude and evolution of fiscal cyclicality in SSA. Section 5 provides policy recommendations.

2 Literature Review

The cyclicality of fiscal policy in developing countries is the focus of a large and growing literature. Studies have shown that fiscal policy in developing countries is generally procyclical, whereas in developed countries it is acyclical (Lane, 2003; Kaminsky et al., 2004; Alesina et al., 2008; Ilzetzki and Vegh, 2008). This is also true for sub-Saharan Africa: Thornton (2008), Diallo (2009), and Carmignani (2010) find that fiscal policy is on average very procyclical in the region.

The literature on the evolution of cyclical fiscal behaviour in developing countries, as opposed to static cyclical characteristics, is much smaller and less conclusive. Kaminsky et al. (2004) provide some evidence that the procyclicality of fiscal policy in developing countries declined after 1980, but Alesina et al. (2008) do not find such evidence. This contrasts with more compelling evidence showing that fiscal policy has recently become less countercyclical in more advanced economies (Gali, 2004; Aghion and Marinescu, 2007; Strawczynski and Zeira, 2007). Evidence on the evolution of cyclical fiscal patterns in sub-Saharan Africa is mostly anecdotal or based on case studies (O'Connell, 1988; World Bank, 2009b; International Monetary Fund, 2010). Regression-based analysis is limited to South Africa, where procyclicality has increased since 1994 (Du Plessis et al., 2007; Du Plessis and Boshoff, 2007).

The literature has identified two groups of factors that explain why fiscal policy has often been procyclical in developing countries: political and institutional factors, and financing constraints.[2]

A growing literature on the political economy of fiscal cyclicality looks at the role of political and institutional factors that encourage or fail to prevent fiscal profligacy and rent-seeking activities in good times. Tornell and Lane (1999) argue that resource windfalls in good times cause intensified competition for the increased public revenue. If there are no institutional controls to limit policy discretion, this brings about a more than proportional redistribution of these revenues and eventually leads governments to overspend. Such patterns, and the resulting fiscal procyclicality, have been more pervasive in developing countries, which have more volatile tax bases (Talvi and Vegh, 2005), more corruption (Alesina et al., 2008), worse institutions, and fewer checks on the executive (Calderon et al., 2004; Akitoby et al., 2006). Using samples of SSA countries, Thornton (2008) finds a similar impact for corruption and Diallo (2009) corroborates the results related to institutional constraints on the executive.

Limited access both to external and domestic sources of finance is another factor that induces procyclical fiscal behaviour, if countries cannot finance deficits during bad times. Gavin and Perotti (1997), for example, show that developing countries find it hard to access international capital

[2]Technical, structural, and administrative constraints have also been commonly invoked in more policy-oriented papers to explain procyclical fiscal responses in developing countries (Balassone and Kumar, 2007; International Monetary Fund, 2008). They arise from difficulties in identifying downturns and recoveries in real time, limited capacity to appraise and realize new projects, and, in the case of low-income countries, the need to comply with multiple, sometimes conflicting, donor procedures. The small size of automatic stabilizers lengthens implementation lags in these countries.

markets during recessions. Financing constraints become more binding the more procyclical the source of financing (Kaminsky et al., 2004) and the more debt sustainability perceptions worsen (Alberola and Montero, 2006). The evidence of the impact on procyclicality of aid flows – a major source of government finance in SSA-is inconclusive. Akitoby et al. (2006) find no evidence that aid dependency leads to more procyclical spending, but Thornton (2008), using a sample of SSA countries, arrives at the opposite conclusion.

Building from this literature, this paper considers which changes in the institutional, financial, and macroeconomic environments of SSA countries may have relaxed the conditions that make procyclicality the preferred option and allowed fiscal policy to play a more stabilizing role during the business cycle.

3 Empirical Strategy

A Empirical Model and Identification

We perform our empirical analysis in two stages. We first estimate the cyclicality of fiscal policy and then look at how cyclicality is affected by different factors.

In the first stage we use the following model to estimate the cyclicality of fiscal policy:

$$F_{i,t} = \alpha + \beta Y_{i,t} + \theta Z_{i,t} + \mu_i + \epsilon_{i,t} \tag{3.1}$$

where F measures growth in real central government expenditures (the fiscal variable used here) and Y measures growth in output; i denotes the country and t the time period, Z is a set of control variables, and μ is a country-level fixed effect. The cyclicality of fiscal policy is determined by looking at the sign and size of coefficient β: if $\beta < 0$, fiscal policy is countercyclical; if $\beta = 0$ it is acyclical; and if $\beta > 0$ it is procyclical.

There are several reasons to expect an ordinary least squares (OLS) estimate of β to be biased. The first is the reverse causality problem pervasive in any attempt to estimate cyclicality of fiscal policy: the growth in government spending is likely to affect output growth. Another problem is the possible correlation of our regressors with the country fixed effect . Finally, our estimate of β may capture both the short-run reaction of fiscal policy to the business cycle and a long-run trend common to both variables.

We address these problems with dynamic panel GMM estimators (Arellano and Bond, 1991). By taking the first difference of the data, this estimator takes out the fixed effect from the estimated equation, and allows the use of internal instruments for the endogenous regressor. This estimation strategy is particularly appropriate in cases where no external instruments are available Roodman (2009a). Though the literature has identified several plausible exogenous instruments for GDP growth, we find that none of these are particularly satisfactory for sub-Saharan Africa. We find, for example, that the instrument used by Jaimovich and Panizza (2007) and Ilzetzki and Vegh (2008), a weighted average of the growth of major trading partners, is relatively weak and potentially endogenous for sub-Saharan Africa. Nevertheless, we report two-stage least square (2SLS) estimates using this instrument to benchmark our results with those in the literature and compare them to our preferred method. Two dynamic GMM methods are available: difference (Diff-) GMM and system (Sys-) GMM. They yield similar results, but we report mostly Diff-GMM results because this method imposes fewer restrictions on the correlation between the instruments and the error term (see Roodman (2009b) for a discussion).[3]

Another concern is that β may be capturing common growth trends as

[3]We show below that the additional identifying assumption necessary for Sys-GMM to be valid (that past changes in the instruments be uncorrelated to the fixed effect) does not hold well in our sample.

well as the cyclical relationship.[4] The vast literature on "Wagner's Law" suggests that government activity increases as economies grow (see Akitoby et al. (2006) for a discussion of the distinction between the long-run trend and the cyclical behaviour of fiscal policy). By taking the first difference of the data, we are in effect using deviations from fixed long-run trends of our variables, ruling out any structural relationship between F and Y which is linear and time invariant.[5] We include long-run determinants of government spending possibly correlated with output growth in our robustness checks to control for possible changes in this effect during the period.

In our second stage we estimate the following equation:

$$F_{i,t} = \alpha + \beta_0 Y_{i,t} + \beta_1 X_{i,t} * Y_{i,t} + \theta Z_{i,t} + \mu_i + \epsilon_{i,t} \tag{3.2}$$

This enables us to look at how our estimated cyclicality coefficient is affected by different factors X, as $\beta = \beta_0 + \beta_1 X_{i,t}$. Therefore $\beta_1 < 0$ means that higher values of X make fiscal policy less procyclical (or more countercyclical). On the contrary $\beta_1 > 0$ means that higher values of X contribute to making fiscal policy more procyclical (or less countercyclical).

[4] We explain below why we do not filter out the trend from GDP growth and our fiscal variable.

[5] $F_{i,t}$ in (1) can be decomposed into a fixed long-run trend F^*, which is a function of the GDP trend growth ($F_t^* = \lambda_t Y_t^*$), and a cyclical component, which responds to the output cycle, $F_{i,t} - F_t^* = \beta(Y_{i,t} - Y_t^*)$. Taking first differences of (1) including this decomposition (but excluding the vector of controls) gives us $\Delta F_{i,t} = \beta \Delta Y_{i,t} + \Delta\epsilon_{i,t}$ as long as long-term growth trends are differenced out. Cyclicality is thus defined as deviations from fixed long run growth trends.

B Data, Measurement, and Specification

We use an unbalanced panel covering 39 years[6] (1970-2008) and 166 countries, of which 42 are in SSA, 32 are advanced economies, and 92 are non-SSA developing countries. Appendix Tables 8.1 and 8.2 provide more details on the countries in our sample and the variables used. Our dependent variable is the growth in real central government spending and our key explanatory variable is growth in real GDP.[7] Our focus on government spending is consistent with the argument developed by Kaminsky et al. (2004) that policy instrument variables, rather than policy outcome or target variables, are a more appropriate way to measure the cyclicality of fiscal policy. One additional policy instrument that could serve this purpose is government tax rates, but data limitations for our sample prevent us from using tax rates as dependent variables. We follow Ilzetzki and Vegh (2008) in not attempting to differentiate between discretionary and automatic (likely very small in SSA) government spending because we want to capture the overall cyclical behaviour of fiscal policy regardless of whether it is a consequence of discretionary measures or of legal constraints (unemployment benefits, for example) that systematically increase government spending in bad times.

An alternative approach would be to measure GDP and government spending as deviations from their long-run trends by using the Hodrik-Prescott filter to detrend the original series, but the shortcomings of such a filter to approximate potential output are well known, particularly in de-

[6]Ilzetzki and Vegh (2008) argue that quarterly data is more appropriate for tackling the issue of reverse causality, particularly because it allows the use of lagged GDP as the key explanatory variable. Whilst quarterly fiscal data are available for some SSA countries, quarterly GDP data is not available for most. We follow the existing literature based on annual data and consider fiscal policy reaction to contemporaneous output growth. The alternative -using GDP in the previous year as the main explanatory variable-does not seem appropriate as the position of the economy in the cycle can change substantially over a year.

[7]Using real primary spending -available for a much smaller set of countries - instead does not qualitatively affect our results, though some of the factors we consider lose statistical significance.

veloping countries. We prefer to take away the trends using first-difference rather than to use a de-trending technique which requires slightly more opaque assumptions.

We look at the role of political institutions in cyclical fiscal behaviour using the Polity IV dataset on political regimes and focus on variables identified as relevant in the literature, namely the degree of democracy, constraints on the executive branch, and political competition. Domestic financial restrictions are measured by the share in GDP of credit to the private sector, as a proxy for the depth of the domestic financial sector, and the real central bank interest rate, to reflect the cost of domestic financing. Access to international finance is measured by the ratios of net capital flows to GDP and of official development aid to GDP. We use the debt-to-GDP ratio, inflation, and a dummy equal to 1 if the country has reached the decision point to be considered for HIPC initiative assistance to proxy for macroeconomic policy sustainability and stabilization concerns. When estimating how these factors affect cyclicality, all our specifications include these variables interacted with GDP growth and as controls. Reverse causality is a concern for many variables because they could be affected by the growth rate of government spending; we therefore take lags of the factor of interest whenever appropriate.

All our specifications include growth in terms of trade to control for common fiscal shocks. Other controls in our robustness checks are growth in oil prices and commodity prices, as an alternative way to capture common shocks to government spending, and a set of variables identified in the literature as long-run determinants of fiscal spending: trade openness, a measure of democracy, the ratio of dependent to working age population, and the degree of urbanization.

Table 4.1 presents descriptive statistics for our sample of sub-Saharan African countries and other developing countries. It shows that our two key variables (GDP growth and growth in central government spending) are similar for both regions throughout the period, suggesting no strikingly different long-run trends. However, SSA countries show lower levels of political and financial development (the median level of private credit to GDP is twice as high in other developing countries), and higher reliance on concessional financing – the median aid to GDP ratio is four times higher in SSA – than in other developing countries. Inflation levels throughout the period seem comparable, but SSA stands out with much higher public external debt-to-GDP ratios throughout the period, suggesting that debt sustainability may have been a concern for fiscal policy.

Table 4.1: Descriptive statistics, 1970-2008

	Sub-Saharan Africa			Other Developing Countries		
	Mean	Median	SD	Mean	Median	SD
Real GDP growth	3.39	3.61	6.8	3.78	4.4	6.3
Real growth in central government spending	4.15	3.89	45	4.29	4.27	20.3
Real GDP growth of main trading partners	1.11	0.85	0.89	1.43	1.2	1.23
Growth in terms of trade	-0.48	0	20.7	0.09	0	18.6
Democracy	-2.4	-5	5.9	-0.4	-2	7.35
Constraints on the executive	2.9	3	1.9	3.89	3	2.25
Political competition	3.8	2	3.2	4.8	6	3.5
Private credit to GDP	33	20.8	71	48.1	41.2	35.8
Real central bank interest rate	-42.8	1.29	749.8	-20.8	1.96	386.9
Net foreign capital flows to GDP	2.97	2.09	13.7	3.32	2.22	43.3
Aid to GDP	11.02	8.16	11.14	6.3	2	13.4
Public external debt to GDP	58.7	48.1	50	42.9	29.1	66.4
Inflation	50.7	9.27	678.2	57.5	7.9	500.7

4 Results

A Key Facts

Our estimates indicate that fiscal policy was procyclical in SSA during 1970-2008. Table 4.2 shows that regardless of the specification used, our estimate of the cyclicality coefficient β in equation (3.1) is always positive and significant for all developing countries. Procyclicality is more pronounced for SSA than for other developing countries[8]. We cannot, however, reject the null hypothesis that the coefficients for SSA and for other developing countries are not significantly different. Consistent with previous studies, we also find no evidence of procyclical fiscal behaviour in advanced economies.

Table 4.2: Cyclical Properties of Government Spending, 1970-2008

Dependent variable : growth in central government expenditures			
	OLS (1)	2SLS (2)	Diff-GMM (3)
Sub-Saharan Africa	0.89***	1.94*	1.76***
	(5.2)	(1.67)	(3.58)
Other Developing Countries	0.70***	1.29**	1.09**
	(5.3)	(2.5)	(2.32)
Advanced Economies	-0.15	-1.64	-0.36
	(0.25)	(0.83)	(0.69)

$*$ significant at 10% level; $**$ significant at 5% level; $***$ significant at 1% level. Absolute values of T statistics in parentheses, using Windmeijer (2005)'s finite sample correction for standard errors for two-step GMM in column (3). Standards errors are clustered at the country level. The country classification comes from the World Economic Outlook (IMF). All regressions include country fixed effects and a control for terms of trade growth. In column (2) GDP growth is instrumented using the growth of trading partners weighted by exports. Instruments in column (3) are past values of real GDP growth.

We first estimate equation 1 using fixed effects OLS (Table 4.2, column 1), which is likely to yield biased estimates due to the endogeneity concerns outlined above[9]. Estimates in the second column address those concerns us-

[8]All regressions in Tables 4.2, 4.3, and 4.5 are run on three different country samples: SSA countries, other developing countries, and advanced economies. We run the regressions on a sample consisting of all three country groups only to test whether the coefficient for cyclicality for SSA is significantly different from the one for other developing countries.

[9]Hausman tests always favour the fixed-effects over the random-effects estimator, so the latter are not reported.

ing the growth of major trading partners as an instrument. Though we find that this instrument is relatively weak and potentially endogenous for our region, it is reassuring to see that the estimates are close to those obtained with our preferred estimation method in column (3)[10]. Unlike Jaimovich and Panizza (2007) but like Ilzetzki and Vegh (2008), who use the same instrument, we find that coefficients obtained using 2SLS or Diff-GMM are larger than the OLS coefficients for both developing countries and SSA, but as expected lower for advanced economies. Our preferred estimation method – (two-step) Diff-GMM – yields results that are more precise (column 3).

We run a series of tests to address the potential pitfalls with Diff-GMM, namely instrument proliferation and serial correlation in the error term (see Roodman (2009a)). Table 4.3 presents the results of those tests. The Arellano-Bond (1991) tests for first- and second-order serial correlation in the first difference in the error term are satisfactory; they suggest that the former is present but the latter is not, which is consistent with the identifying assumption of no serial correlation of the underlying error terms in equation 1.[11] Instrument proliferation can lead to implausibly high p-values of the Hansen statistics, so is it reassuring that the p-values are high enough to reject endogeneity but generally below 0.8. We also report the Sargan test, which is less vulnerable to instrument proliferation but is not robust to heteroskedasticity. Though the p-values are too low for other developing countries, they are large enough to confirm that our specification for SSA is appropriate.

Our results may be affected by inclusion of control variables known to af-

[10]The Kleibergen Paap Wald F statistics (not reported) for the 2SLS estimates are low with respect to Stock and Yogo's (2005) critical values for weak instruments, for sub-Saharan Africa only. Another cause for concern is the potential endogeneity of this instrument in sub-Saharan Africa if the growth of donor countries-also major trading partners-is related to the changes in aid flows, an important source of public resources and one that we show affects procyclicality.

[11]The dynamic structure of the data suggests the inclusion of the lagged dependent variable (appropriately instrumented for using past lags) as a control variable might be appropriate. All our results are unchanged when we use this specification.

fect government spending and potentially correlated to GDP growth through channels other than the cyclicality of public spending. The computation of standard errors in our preferred estimation method is also vulnerable to correlation of the error terms between countries, for example, correlation owing to common shocks to government spending. Table 3, columns 2, 5, and 8, presents results obtained by including control variables for common shocks (changes in oil and commodity prices) and long-term determinants of growth in government spending (all other additional controls). The coefficients for these variables are of the expected sign but hardly ever statistically significant. This suggests that taking differences does take out the long-term relationship between output and government spending and that common shocks do not undermine the validity of our specification. The estimated cyclicality coefficients change a little but stay in the 1.5-2 range for SSA and the 1-1.5 range for other developing countries.

Finally we report Sys-GMM estimates in Table 3, columns 3, 6, and 9. This method combines differenced and levels equations to obtain more efficient estimates than Diff-GMM, at the price of an additional assumption: past changes in the instruments must be uncorrelated with the fixed effect. It is therefore reassuring to obtain similar results to the Diff-GMM estimates, though not particularly more precisely estimated. The Difference in Hansen test (not reported) for sub-Saharan Africa, however, rejects the additional assumption required by Sys-GMM, validating our choice to concentrate on Diff-GMM.

We find that for all developing countries the estimated elasticity of government spending with respect to output growth is higher than 1, though the estimate is significantly higher than 1 for sub-Saharan Africa only, and only when we include more controls in our robustness checks. We find that a 1 percentage point increase in the rate of real GDP growth raises the growth rate of real government spending by about 1.8 points in SSA countries and

Table 4.3: Robustness checks

Dependent variable : growth in central government expenditures									
	Sub-Saharan Africa			**Other Developing Countries**			**Advanced Economies**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Diff-GMM	Diff-GMM	Sys-GMM	Diff-GMM	Diff-GMM	Sys-GMM	Diff-GMM	Diff-GMM	Sys-GMM
GDP growth	1.76***	1.88***	1.57***	1.09**	1.49**	1.07**	-0.36	2.12	-0.39
	(3.58)	(2.77)	(2.91)	(2.32)	(2.6)	(2.27)	(0.69)	(0.94)	(0.77)
Terms of trade growth	0.31	0.64**	0.3	-0.22	-0.12	-0.26	-0.36	-2.81	-0.47
	(1.25)	(2.35)	(1.47)	(0.92)	(0.91)	(1.13)	(0.69)	(0.83)	(0.79)
Growth in the price of oil		-0.06			-0.08			-0.21*	
		(0.03)			(0.79)			(1.73)	
Growth in commodity prices		-0.52			0.08			-0.53	
		(1.31)			(0.67)			(1.1)	
Democracy		0.03**			0.04			0.26	
		(2.28)			(1.3)			(1.06)	
Trade openness		-0.04			0.2			-0.4	
		(0.12)			(0.89)			(0.38)	
Dependency ratio		1.3			-0.82			17.4	
		(1.14)			(0.7)			[1.53)	
Urban population ratio		2.14			-3.67*			16.2	
		(1.36)			(1.67)			(1.15)	
Observations	1464	938	1507	2782	1562	0.000	1088	670	1120
Arrelano-Bond test for AR(1)	0.000	0.001	0.000	0.000	0.013	0.338	0.249	0.306	0.243
Arrelano-Bond test for AR(2)	0.480	0.328	0.328	0.297	0.582	0.770	0.278	0.358	0.272
Hansen test	0.774	0.707	0.378	0.134	0.884	0.172	0.535	0.806	0.815
Sargan test	0.332	0.981	0.756	0.001	0.009	0.003	0.617	0.161	0.243

$*$ significant at 10% level; $**$ significant at 5% level; $***$ significant at 1% level. Absolute values of T statistics in parentheses, using Windmeijer (2005)'s finite sample correction for standard errors for two-step GMM. Standards errors are clustered at the country level. The country classification comes from the World Economic Outlook (IMF). We report the p-values for the Hansen test of overidentifying restrictions and the Arellano-Bond test for AR(1) and AR(2) in first differences. All regressions include country fixed effects and a control for terms of trade growth. Instruments are past values of real GDP growth . See data appendix for variable description.

1.1 points in other developing countries; it does not affect the growth of real government expenditure in advanced economies.

Table 4.5 presents the evolution of procyclicality by decade for the three country groups. There is a clear trend for SSA countries: we cannot reject the hypothesis that fiscal policy was countercyclical for the 1970s, but in the 1980s and 1990s the coefficients are positive and statistically higher than zero at the 1 percent significance level. For 2000-08 this coefficient falls below that for other developing countries and is not statistically different from zero. This suggests fiscal policy in the region has become less procyclical in recent years. However, given large standard deviations in the procyclicality coefficient, the decline is not statistically significant.

Table 4.5: Cyclical Properties of Government Spending by decade

Dependent variable : growth in central government expenditures				
Two step Diff-GMM estimates				
	1970-1979	1980-1989	1990-1999	2000-2008
Sub Saharan Africa	-1.55*	1.88***	1.69***	1.14
Other developing countries	1.06*	-0.03	1.03	1.46***
Advanced economies	-0.29	0.14	-0.41	-0.43

∗ significant at 10% level; ∗∗ significant at 5% level; ∗ ∗ ∗ significant at 1% level. Standard errors are computed using Windmeijer (2005)'s finite sample correction for two-step GMM.The coutry classification comes from the World Economic Outlook (IMF). All regressions include country fixed effects and a control for terms of trade growth. Instruments are past values of real GDP growth .

Fiscal policy in advanced economies was acyclical throughout the period and we find no evidence of a shift towards more countercyclicality, unlike Aghion and Marinescu (2007), who concentrate on a smaller sample of OECD countries. We also find there is no clear trend in non-SSA developing countries, in particular there is no decline in procyclicality towards the end of the period: the trend we identify is clearly SSA-specific.[12] Our analysis in the next section is restricted to the sub-Saharan African sample. We look beyond decade effects and search for changes in specific factors over time that may explain the SSA trend towards less procyclical fiscal policies.

[12]Splitting the sample into different time periods does not affect the results substantially.

B Factors

This section presents our results on the determinants of cyclical fiscal behaviour focusing on SSA between 1970 and 2008. We look at political economy factors, financial restrictions, and macroeconomic and fiscal space.

B.1 Political Economics and Political Institutions

We find no evidence that political institutions affect the cyclical behaviour of fiscal policy (Table 4.6, columns 1-3). Nor do we find any impact of other measures of institutional quality, such as those compiled by the International Country Risk Group or the World Bank's Database on Political Institutions, which are available for a shorter period of time.[13] Alesina et al. (2008) point out that political economy explanations of procyclicality should play a bigger role during good times, whilst financing constraints should matter more in bad times. We therefore look at the impact of political variables on procyclicality during good times, and the results remain the same (see Appendix Table 8.3).[14] This may be because those political variables do not vary much over time or because they do not adequately reflect de facto institutional change in SSA. Restricting the sample to the years after 1990, during which there has arguably been considerable political change in SSA (Bratton and de Walle, 1997) does not affect the results.

B.2 Financing Restrictions

One reason for the procyclicality of fiscal policy may be that it is difficult for SSA countries to access financial markets to borrow during downturns. Table 4.7 investigates the role of restrictions on both domestic (columns 1 and 2)

[13] These results, as well as those obtained restricting the sample to the years after 1990, are available from the authors upon request.

[14] This was done by interacting GDP growth and the respective political variable with a dummy that equals one when GDP growth is above median growth, consistent with the definition of 'good times' in Kaminsky et al. (2004).

Table 4.6: Political factors, impact on procyclicality, 1970-2008

Dependent variable : Growth in central government expenditures			
Two-step difference-GMM estimates			
	(1)	(2)	(3)
GDP Growth	2.25***	1.64	1.58
	(315)	(0.65)	(1.4)
All variables below are interacted with GDP growth			
Democracy	0.08		
	(0.54)		
Degree of constraints on the executive		0.07	
		(0.63)	
Degree of political competition			0.06
			(0.2)
Observations	1295	1205	1205

∗ significant at 10% level; ∗∗ significant at 5% level; ∗ ∗ ∗ significant at 1% level. Absolute values of T statistics using Windmeijer (2005)'s finite sample correction for standard errors in parentheses. All regressions include country fixed effects, a control for terms of trade growth, and the factor under consideration as a control variable. Instruments are past values of real GDP growth. See data appendix for variable description.

and international (columns 3 and 4) financing in the cyclical behaviour of fiscal policy. It appears that characteristics of the domestic debt market are irrelevant for cyclicality; coefficients on the variables proxying for the depth of financial markets and the cost of domestic credit are both very close to zero. This is also true when we restrict the sample to years during which GDP growth is below the median (bad times) when financing constraints are expected to be more binding (Appendix Table 8.3). This may reflect the underdeveloped nature of SSA domestic financial markets, which restricts government financing independently of the business cycle. Capital flows, although not significant, come out with a large and negative coefficient. This seems to corroborate the hypothesis that in low-income countries, because they tend to be less integrated into global financial markets, larger capital inflows may help to decrease procyclicality by relaxing financing constraints (Kaminsky et al., 2004).

In Table 4.7, columns 4 and 5 show that a larger share of aid in GDP decreases procyclicality. Because official aid flows include debt relief we con-

Table 4.7: Financing constraints, impact on procyclicality, 1970-2008

Dependent variable : Growth in central government expenditures					
Two-step difference-GMM estimates					
	(1)	(2)	(3)	(4)	(5)
GDP Growth	2.79*	2.28***	2.76***	2.82***	3.1***
	(1.82)	(4.08)	(4.11)	(3.11)	(5.14)
All variables below are interacted with GDP growth					
Private credit to GDP ratio	-0.01				
	(0.29)				
Lagged real central bank interest rate		-0.00			
		(0.1)			
Lagged net capital flows to GDP ratio			-1.78		
			(1.61)		
Lagged aid to GDP ratio				-8.04*	-8.36*
				(1.93)	(1.9)
HIPC decision point reached					2.13
					(0.66)
Observations	1196	1147	1428	1387	1387

$*$ significant at 10% level; $**$ significant at 5% level; $***$ significant at 1% level. Absolute values of T statistics using Windmeijer (2005)'s finite sample correction for standard errors in parentheses. All regressions include country fixed effects, a control for terms of trade growth, and the factor under consideration as a control variable. Instruments are past values of real GDP growth. See data appendix for variable description.

trol for the impact of reaching the Highly Indebted Poor Country (HIPC) decision point in column 5.[15] The estimated coefficient for the aid variable is affected very little: aid leads to less procyclicality because it provides countries with concessional financing, not because it lowers debt levels. Previous studies have found that aid flows are weakly procyclical (Bulir and Hamman, 2008) and, given the high share of aid in total government spending in most of the countries we are considering (see Table 1), it is perhaps surprising to find a negative and large estimate of the impact of the aid-to-GDP ratio on procyclicality. It suggests that an increase in the aid-to-GDP ratio from the median level in our sample to the average for the country which received the most aid throughout the period (8.2 percent to 28 percent), leads to a fall in the procyclicality coefficient from 2.2 to around 0.6. This contrasts with the findings in Thornton (2008) that countries receiving more foreign

[15]Countries reaching the HIPC decision point may immediately begin receiving interim relief on debt service coming due; they also typically begin to receive significant increases in aid inflows. To untangle both effects on changes in fiscal procyclicality, we created a dummy that equals 1 at or after the year the country reached the HIPC decision point, which, together with aid to GPD, interacts with GDP growth.

aid are more procyclical, but it is consistent with the results in Chauvet and Guillaumont (2009) who find that the procyclicality of aid flows has declined since the 1990s, particularly in SSA. Our results are also in line with recent findings by Dabla-Norris et al. (2010), who argue that the cyclical properties of aid may depend on the nature and magnitude of the shocks driving the cycle.[16]

B.3 Macroeconomic Stability and Fiscal Space

We now turn to the role of key macroeconomic variables in SSA countries since 1970. At independence these countries inherited low public debt burdens, thanks to the prohibition on budget deficits imposed by colonizers, but also fragile systems of public finance and heavy pressures to increase public spending Siebrits and Calitz (2007). Mounting debt during the 1970s was mitigated by high growth and commodity export booms, but in the 1980s the combination of a global economic slowdown, a decline in the terms of trade, and higher interest rates lead to mushrooming debt, chronic fiscal deficits, and hyperinflation. This triggered-in SSA as elsewhere in the developing world-a series of stabilization reforms, often characterized on the fiscal side by the cutting back of expenditure and subordination of fiscal policy to the overarching priorities of deficit and inflation reduction.

Many countries in SSA have since the early 2000s entered what Adam and Bevan (2004) call the 'post-post-stabilization' phase: they have had an extended period of adjustment following stabilization reforms without any fiscal or inflation crises, and today key macroeconomic indicators (deficit and debt levels but also exchange rates and stocks of reserves) are at sustainable levels (see Table 4.1). The average share of public external debt to GDP in the region mirrors this evolution strikingly: it was at 18 percent in 1970 and

[16] Dabla-Norris et al. (2010) find that aid flows between 1970 and 2005 are on average procyclical but that they become countercyclical when countries face large adverse shocks to the terms-of-trade or growth collapses, especially since the end of the Cold War.

40 percent at the start of the debt crisis (1982), reached 80 percent in 1996 when the HIPC initiative was launched, and in 2007 had come back down to 40 percent.

Why should we expect this macroeconomic evolution to have affected the procyclicality of fiscal policy? High inflation and debt can affect a government's ability to adjust to the economic cycle because fiscal policy is subordinated to the aims of keeping price increases in check and reassuring creditors – avoiding hyperinflation and default. More generally the constraints governments face in setting macroeconomic policies have loosened in recent years thanks to successful stabilization; in other words, countries now have more fiscal space, which Heller (2005) understands as the availability of budgetary room that allows a government to provide resources for a desired purpose without prejudicing the sustainability of its fiscal position.

Table 4.8: Macroeconomic stability and fiscal space, impact on procyclicality, 1970-2008

Dependent variable : Growth in central government expenditures				
Two-step difference-GMM estimates				
	(1)	(2)	(3)	(4)
GDP Growth	1.68***	0.04	2.34***	0.16
	(3.4)	(0.02)	(3.18)	(0.05)
All variables below are interacted with GDP growth				
Lagged inflation	0.00			
	(0.35)			
Lagged public external debt to GDP ratio		3.23		3.29
		(1.13)		(1.49)
HIPC decision point reached			-3.13*	2.52
			(1.73)	(0.73)
Lagged net capital flows to GDP ratio				8.1
				(1.02)
Lagged aid to GDP ratio				-8.67
				(0.79)
Observations	1291	1464	1464	1291

$*$ significant at 10% level; $**$ significant at 5% level; $***$ significant at 1% level. Absolute values of T statistics using Windmeijer (2005)'s finite sample correction for standard errors in parentheses. All regressions include country fixed effects, a control for terms of trade growth, and the factor under consideration as a control variable. Instruments are past values of real GDP growth. See data appendix for variable description.

Table 4.8 shows the impact of inflation and debt – proxies for macroeconomic stability and fiscal space.[17], respectively-on procyclicality. Lagged inflation does not seem to affect fiscal cyclicality (column 1) We find some suggestive evidence, however, that a smaller (lagged) external debt-to-GDP ratio may diminish procyclicality (column 2) though the coefficient falls short of statistical significance. Focusing on the HIPC countries where debt distress was more acute we find that debt relief for HIPC countries significantly decreased procyclicality (column 3). This is consistent with the idea that countries can only smooth out fiscal policy over the cycle when debt sustainability concerns do not overwhelm all other policy concerns, constraining the choices available to policymakers. Amongst the variables we consider, the debt ratio best mirrors the evolution of procyclicality during the period. It is also the only factor whose evolution over the period could explain the observed recent fall in procyclicality: the predicted procyclicality coefficient, obtained using the estimates from column 2, is only 0.5 for the 1970s when the average debt ratio was 15 percent, rises to 2.5 percent for the 1990s when the debt ratio was more than 75 percent of GDP, and falls to 2 for 2000-2008, with a debt ratio of 62 percent.

Public debt is not a perfect measure of fiscal space as it is also an indicator of a country's ability to access international financing. It is well known, for example, that countries can be shut out of international financial markets because of a recent history of default or high debt (see, for example, Reinhart et al. (2003) so that no external credit is available to smooth fiscal policy during the cycle. Therefore, to untangle the fiscal space effect from financing constraints, we run a regression with proxies for both fiscal space and external financial conditions. We find (Table 4.8, column 4) that the coefficient on public external debt is affected very little but those for the remaining factors become very imprecisely estimated. This seems to suggest

[17] Following Heller (2005), we define fiscal space as the availability of budgetary resources that can be used by the fiscal authorities for a desired purpose without compromising its fiscal sustainability.

that even for a given level of access to international financial resources and aids, including debt relief, countries with less debt are more likely to have fewer procyclical fiscal policies. The lack of precision of all our estimates, however, means we must treat those results with caution, as evidence suggesting more attention should be paid to the role of fiscal space in affecting the choices made by fiscal policymakers.

5 Conclusions and Policy Implications

This paper documents the cyclical behaviour of government spending in sub-Saharan Africa since the 1970s and examines institutional and macroeconomic variables that may explain variations in cyclicality across countries and over time. It finds that in SSA fiscal policy is procyclical, with an elasticity of government spending to output growth close to or above 1. We also provide some limited evidence that procyclicality declined during the last decade. The results are consistent with the idea that countries tend to be procyclical when they lack access to sources of financing, because we find that more aid leads to less procyclicality; there is no evidence, however, that political institutions affect the degree of procyclicality. Our findings also suggest that less procyclical trends in recent years in SSA may be partly explained by the fact that lower debt levels have allowed countries more flexibility in setting fiscal policy objectives and have created fiscal space.

One policy implication of our results is that higher flows of aid to SSA do help by making countries less procyclical. This is of particular importance with respect to recent debates about the destabilizing potential of volatility in flows of official development aid. Whilst this volatility is a concern in its own right, we find that more aid to the region could reinforce recent less procyclical trends. Of more relevance to domestic policymaking is our finding that efforts to stabilize debt levels seem to be paying off and should be furthered by countries that wish to use fiscal policy as a stabilizing tool. Finally, and extrapolating somewhat from the results, the fact that procyclicality is higher in SSA than in other developing countries over the period suggests that factors unique to the region could be of importance in determining a country's capacity for less procyclical fiscal policy. It is well known that weak automatic stabilizers and fragile revenue mobilization characterize the countries in our study, and both can be expected to increase procyclicality compared to that in other developing countries. Expanding the base of taxes like the VAT or the corporation tax could make revenue collection more responsive to the cycle, and reinforcing automatic stabilizers with more comprehensive social safety nets would make spending more responsive by explicitly minimizing the welfare costs of downturns.

Chapter 5

Tax Me, But Spend Wisely: The Political Economy of Taxation, Evidence from Brazil

Creio que precisamos, sim, de Estado no Brasil, mas de um Estado que seja controlado pela sociedade(...) E o Estado que tenha condição de cobrar de maneira justa, ao mesmo tempo devolvendo esses tributos com qualidade na prestação de serviços públicos, e sem desperdícios.

Celso Daniel, Mayor of Santo Andre[a]

[a]Statement during a meeting of the *PMAT* program at the BNDES in 2002.

I believe that we do need a State in Brazil, but a State controlled by society(...) A State which has the means to collect taxes in an equitable way, and which uses these taxes to provide good quality public services without waste.

Translation (approximate) by the author.

Abstract

This paper shows that local governments are more accountable when a larger fraction of their resources comes from local taxes. I construct a principal-agent model of public finance in which public revenues come from taxes and inter-governmental transfers. An increase in taxes changes the equilibrium allocation of public revenues towards more public goods and less political rents because citizens have better information on taxes than on transfers. I then compare how local governments in Brazil spend increases in tax and transfer revenues. Variations in tax revenues are created by a program that seeks to increase local tax capacity. Using a difference-in-differences methodology and quasi-exogenous variations in the timing of program take-up I find that the program increases tax collection of local governments by 11% after four years. I use several discontinuities in the rule allocating federal transfers to local governments to consider the impact on local public spending outcomes of an exogenous increase in transfers. Results show, in line with the model's predictions, that an increase in local tax revenues leads to a bigger increase in local public services (health and education) than an increase in transfers of the same amount. Moreover extra transfer revenues lead to more corruption, extra tax revenues do not.

JEL classifications: D72, D73, H20, H71, H77

1 Introduction

There is a growing body of evidence that governments in developing countries waste or divert a substantial share of public revenues. This literature typically focuses on local governments which decentralization policies are increasingly putting in charge of the provision of key public services, like primary education and healthcare (Bardhan and Mookherjee, 2006). Many economists and policy makers are consequently skeptical that making more funds available to these governments would lead to better development outcomes (Easterly, 2008).

One common feature of the studies in this literature is that they all consider how local governments spend non-tax revenues (inter-governmental transfers, oil royalties, or aid). Tracking funds disbursed from the central government to school districts in Uganda, Reinikka and Svensson (2005) find that schools receive only 13% of the official spending on the program. Olken (2007) similarly estimates that 20 to 30% of grants that local governments in Indonesia receive to finance road projects are diverted. In Brazil, Caselli and Michaels (2011) and Ferraz and Monteiro (2010) show that windfalls from oil royalties lead to no improvement in local public good provision. Similarly Brollo et al. (2010) find that local governments that receive higher grants from the federal government become more corrupt.[1] Svensson (2000) finds some evidence that aid increases corruption in politically divided countries. These papers are silent on whether their results would generalize for increases in these governments' tax revenues. There is however a long history to the idea of a strong and consistent connection between how governments are financed and how they spend their revenues, starting with Schumpeter (1918).[2]

[1] A more optimistic result is found in Litschig (2011) who finds that these same grants also lead to better education outcomes.

[2] This idea is central to interpretations of the emergence of representative governments and democracy in OECD countries. See for example North and Weingast (1989) for an

In this paper I argue that the extent to which local governments are financed by tax revenues they collect as opposed to intra-governmental transfers affects the quality of their public spending. The more they rely on tax collection, the more local politicians have to respond to their constituents' demands when allocating public spending and the less rents they extract for their private use. I construct a theoretical framework that predicts that marginal increases in taxes will be more *accountability-inducing* than marginal increases in transfers based on standard political economy mechanisms. Evidence supporting this prediction is found by comparing the marginal propensity to spend from tax and transfer revenues of local governments in Brazil on local health and education infrastructure and corruption.

My theoretical framework consists of a political agency model of public finance in which public revenues come from endogenous local taxes and exogenous transfers. A rent-seeking incumbent politician decides how to allocate the public budget between public good provision and diversion of funds for his private use (corruption). The key assumption is that tax revenues are perfectly observed by all players but transfers are a random variable whose realization is only fully observed by the politician. Information asymmetries lead to a difference in citizens' capacity to control the allocation of tax and transfer revenues. The model's key prediction is that increasing the government's capacity to tax its citizens makes it more accountable as it leads to an allocation of public revenues towards more expenditures that benefit citizens, at the expense of corruption expenditures which only benefit the incumbent politician.

I test the model's predictions by comparing how local governments in Brazil (municipalities) spend increases in tax and non-tax revenues. I con-

account of how the economic elites in 17th Britain century obtained what they wanted (secure property rights and political representation) from the Stuart dynasty in exchange for larger taxation and borrowing opportunities.

sider increases in tax revenues generated by a program that improves municipalities' capacity to raise taxes. Selection in the program is voluntary. The challenge to identification is thus that governments' choice to participate may not be orthogonal to unobservable factors that also affect tax collection and/or the allocation of public revenues. The richness of the data and specificities of the program's institutional design however allow me to explore and rule out the most likely alternative explanations for the empirical results. To study increases in transfers received by municipalities I consider variations in federal transfers municipalities receive that are created by a rule which specifies that transfers increase discontinuously in population size, replicating the identification strategy in Brollo et al. (2010); Litschig and Morrison (2010) and Litschig (2011).

My empirical strategy relies on a difference-in-differences estimator and 11 years of panel data on municipal tax and transfer revenues, quantity and quality of municipal health and education infrastructure, corruption of local politicians, and a large set of local economic, demographic and political characteristics. Data on corruption comes from the randomized audits of Brazilian local governments since 2003. A key characteristic of the program is that municipalities decide when to *apply* to the program but the date at which they *start* one is determined by constraints faced by the supplier of the program. These create variations in the timing of program take-up that are unrelated to local characteristics. This specificity allows me to disentangle the impact of the program on tax revenues and public spending outcomes from that of (potential) time-varying determinants of selection that are unobserved. I also present propensity-score weighted estimates that restrict the analysis to comparable municipalities and are robust to the existence of unbalanced pre-treatment characteristics.

Results show that the tax modernization program raises local tax revenues by 11% after four years and that this increase persists over time. The cost of the investments in tax administration are on average recovered after two years in the program. The rise in taxes is used to finance a 6% increase in municipal education infrastructure, an increase in school quality, and a 7% increase in municipal health infrastructure. There is no increase in corruption. Comparing the impact of this increase in taxes to that of an increase in transfers of the same amount I find that an extra 10 Reais per capita of public revenues increases municipal health and education infrastructure significantly more when it comes from local taxes than when it comes from federal transfers. Such an increase in transfer revenues leads a rise in the occurrence of corrupt practices as a share of revenues whereas higher taxes lead to a decrease in corruption, as predicted by the model.

The impacts of taxes and of transfers on public spending outcomes are estimated on different sub-populations of Brazilian municipalities. The observed differences between the marginal propensity to spend on taxes and transfers could therefore be due to differences in propensities to spend out of any type of revenue between these populations. The strategy used to identify the impact of transfers allows me to rule out this explanation with reasonable confidence. The transfer allocation rule creates 15 population thresholds at which the amount of transfers jumps discontinuously. I therefore estimate 15 local treatment effects on different sub-population of municipalities, some of which look extremely similar to the municipalities that increase their taxes thanks to the program. These 15 estimates provide plausible bounds for the size of the effect of transfers, which are always below the estimated impact of taxes.

To the best of my knowledge this paper is the first that considers the effect of increases in tax revenues on public spending outcomes and to compare how two different sources of revenues are spent by the same government units. Several authors argue that there is a causal relation between the extent to which governments are financed by taxation and how accountable their are (see in particular Moore (2007) and Brautigam et al. (2008)). Evidence in line with this idea has been found, based on case studies (Gervasoni, 2010), correlations across countries (Ross, 2004) or lab in the field experiments (Paler, 2012). Closely related to this paper, Fisman and Gatti (2002) establish a positive relationship between the proportion of US states' revenues derived from federal transfers and the number of convictions of public employees for abuse of public office.[3] Similarly Zhuravskaya (2000) provides evidence that Russian cities that keep more of the tax revenues they collect provide more public goods.

This paper builds on these previous results in several ways. First, it relies on using variations in tax and transfer revenues that stem from clearly identified sources. Second, the wealth of data at the local level in Brazil allows me to consider the marginal propensity to spend on several types of local public spending outcomes: the quality and quantity of education infrastructure, health infrastructure, and corruption. Third, it offers a simple theoretical mechanism to explain why taxes and transfers are spent differently and some evidence that this mechanism plays a role in the Brazilian context.

This paper's theoretical contribution is a model based on a fairly standard assumption in the political economy literature (asymmetries of information) which predicts that increases in tax capacity will make governments more accountable. The idea that relying on local taxes affects political officials' incentives dates back to at least Tiebout (1956). The more recent literature on market-preserving fiscal federalism argues that the more politicians depend on locally generated revenue the more they will invest in public goods that increase their local tax base (see Weingast (2009)). This paper differs by relying on an explicit political economy mechanism to explain why

[3]As the authors point out the causal interpretation of this relationship is limited by potential endogeneity problems. These problems are mitigated in this paper by the use of variations within municipalities over time and corruption indexes from randomized audits.

taxes lead to more spending on public goods and less corruption than transfers. The mechanism outlined here will hold even if local governments cannot finance growth-enhancing local public goods and taxpayers are not mobile.[4] The model is also closely related to previous political agency models which argue that information asymmetries lead to more rent-taking opportunities by politicians (in particular Besley and Smart (2007)). Those do not however explore the possibility that public revenues are more or less well observed depending on their source and that this will affect elected officials' accountability to their constituents.[5]

By estimating the returns to investments in tax capacity this paper contributes to the growing literature on state capacity and development.[6] This literature argues that governments' investment in their capacity to tax constitutes an important covariate of economic development (Besley and Persson, 2009, 2010; Cagé and Gadenne, 2012). Widely optimistic prognoses regarding the efficiency of investments in developing countries' tax administrations abound: the President of the African Tax Administration Forum, Oupa Magashula, for example claimed that investing in public resource mobilization can have up to '*a tenfold multiplier effect on states' resources*'(OECD, 2010b). I find an annual multiplier effect of just over one (a one Real investment in tax administration leads to an extra one Real in tax revenue every year), far from tenfold but still very cost-effective.

This paper also contributes to the larger literature on the political economy of public good provision and corruption (see Banerjee et al. (2009) and

[4]The type of public good provision this paper considers is unlikely to have the type of short-run growth effect required for the mechanism outlined in Weingast (2009) and Zhuravskaya (2000) to be relevant amongst Brazilian local governments. I provide some evidence that this theory cannot explain the results found in this paper.

[5]See Besley (2006) for a review of political agency models. One exception is Strumpf (1998) who builds on the idea that citizens may have different information on different sources of local public funds to explain the fly-paper effect

[6]Recent papers have studied policies that seek to increase tax collection. Pomeranz (2010) considers audits of VAT declarations in Chile and Monteiro and Assuno (2011) a federal simplification of taxes paid by small firms in Brazil. Neither estimates the impact of these policies on tax collection.

Olken and Pande (2012) for recent reviews of this literature). It focuses on the impact on local government accountability of one institutional characteristic – tax capacity – which has so far not been studied. It is finally related to the literature on the 'natural resource curse' that argues that governments become less accountable when they receive revenues from natural resources.[7] This issue is in many respect the flip side of the theory developed here: one can argue that the central political pathology of states rich in natural revenues is that they do not need to tax.

The outline of the paper is as follows. Section 2 provides an agency model of public finance that relates how governments are financed to how they allocate their budget between private rents and public good provision. Section 3 presents the institutional and economic context of the tax modernization program in Brazil and explains why some municipalities choose to join the program. Section 4 evaluates the impact of the program on local tax collection whilst Section 5 compares the marginal propensity to spend on health and education infrastructure and corruption from higher taxes thanks to the program to that from increase in transfers. I conclude with Section 6.

2 Model

A Set-Up

Structure

This model follows the political agency framework of Besley and Smart (2007) in which a representative citizen decides whether to re-elect an incumbent politician without observing part of this politician's actions. The budget of the government is representative of that of local governments

[7]See Van der Ploeg (2011) for a review.

throughout the world: public resources R come from local taxes T, endogenously determined, and intergovernmental-transfers F which are a exogenous and subject to some random variation. Transfers can take two values : F is equal to $F_H = \bar{F}(1+u)$ in the high state H with probability q and $F_L = \bar{F}(1-u)$ in the low state L, where $u,\ q \in [0,1]$[8].

The incumbent politician faces a budget constraint $T + F = R = G + S$, with G the level of public good and S the rents he diverts for himself ($S \geq 0$). He maximizes the sum of rents extracted from being in office $S + \sigma Z$, where Z is the exogenous value of re-election and σ the probability of re-election. He can choose to divert all public resources and forgoe re-election but institutional constraints limit maximal rent taking to $\bar{S} = \alpha R$ where $\alpha < 1$. Challengers in the election would behave in the same way as the incumbent once elected; the election is a way for the citizen to discipline the incumbent, not to choose the best type of candidate.

The representative citizen derives utility from the provision of public good net of taxes. Her welfare is $W(G,T) = G - \phi C(T)$ where ϕ indexes the marginal utility cost to the citizen of paying taxes and $C(.)$ is increasing and strictly convex with $C(0) = C'(0) = 0$. I define $h(\cdot) = C'^{-1}(\cdot)$.

Full information equilibrium

The citizen chooses for each state $i = H, L$ the reelection rule $\sigma(G_i, T_i) = \sigma_i$ that will induce the politician to provide the policy menu (G_i, T_i) that maximizes her welfare. The maximum level of public good G_i she can obtain from the government when paying taxes T_i must be so that it leaves the government with enough rents today to make abiding by the re-election

[8] One can alternatively think of F as any source of public revenues that is not directly extracted from citizens, such as revenues coming from the government's sale of natural resources, profits of public monopolies or development aid. The predictions of the model are thus also relevant at the level of federal government.

rule more attractive than running away with maximum rents and forgoing re-election. This *fiscal restraint* constraint takes the form:

$$T_i + F_i - G_i + \sigma_i Z \geq \alpha(T_i + F_i), \forall i = H, L \tag{2.1}$$

Re-electing the incumbent leads to an increase in the public good at no cost to the citizen so in equilibrium she sets $\sigma_i^* = 1$ in each state i as long as the government provides the menu (G_i^*, T_i^*) such that:

$$G_i^* = (T_i^* + F_i)(1 - \alpha) + Z. \tag{2.2}$$

T_i^* is set such that the marginal value of the public good is equal to the marginal cost of taxation : $T_i^* = h(\frac{1-\alpha}{\phi})$. Local taxes are decreasing in the marginal cost of paying taxes ϕ and decreasing in α which proxies for the ease with which the politician can run away with public resources.

When the citizen fully observes all public revenues the way in which in the local government is financed does not matter. The marginal effect of an increase in taxes or transfers is to increase the public good by $(1 - \alpha)$ and rents by α.

B Equilibrium with asymmetric information

Assume now that the citizen does not perfectly observe transfer revenues: the realized value of F is known only to the incumbent[9]. The citizen perfectly observes the taxes she pays. Asymmetries of information increase the incumbent's capacity to extract rents from the public budget as he can now pretend to be in the low state when he receives high transfer revenues to capture the difference in revenues between the high and the low states to

[9] This assumption is grounded in empirical evidence: Reinikka and Svensson (2005) for example show that local public funds coming from transfers are badly observed by citizens in Uganda and that improving information leads to less capture by local officials. What's new to this paper is the idea that taxes are better observed (here they are perfectly observed) because they come directly from the citizens' resources.

himself. A formal proof of this result is given in the paper's theoretical appendix, I sketch the intuition below.

To deter the incumbent in state H from implementing the L state menu the menus offered by the citizen must now also respect the incentive constraint:

$$S_H + \sigma_H Z = T_H + \bar{F}(1+u) - G_H + \sigma_H Z \geq T_L + \bar{F}(1+u) - G_L + \sigma_L Z \quad (2.3)$$

And similarly for the incumbent in state L:

$$T_L + \bar{F}(1-u) - G_L + \sigma_L Z \geq T_H + \bar{F}(1-u) - G_H + \sigma_H Z \quad (2.4)$$

Putting together (2.3) and(2.4) there is only one situation in which both constraints are satisfied simultaneously : $G_H = G_L + T_H - T_L + Z(\sigma_H - \sigma_L)$.

Intuitively it is still optimal for the citizen to ask the incumbent in the low state to provide the maximal amount of public good given the amount of taxes paid: state L's *fiscal restraint* constraint – equation (2.1) – is binding. This implies the following equilibrium levels of public good provision:

$$G^*_L = (T^*_L + \bar{F}(1-u))(1-\alpha) + \sigma^*_L\ Z \quad (2.5)$$

and

$$G^*_H = (T^*_H + \bar{F}((1-u))(1-\alpha) + \sigma^*_H Z + \alpha(T_H - T_L) \quad (2.6)$$

Re-election leads to an increase in the public good at no cost to the citizen whatever the state, so $\sigma^*_H = \sigma^*_L = 1$. Maximizing $W(G_H, G_L, T_H, T_L; q)$ subject to (2.5) and (2.6) determines the level of taxation in both states :

$$T^*_H = h(1/\phi) \quad (2.7)$$

and

$$T_L^* = \max\{0; h((1-q-\alpha)/\phi(1-q))\} \quad (2.8)$$

It is optimal for the citizen to pay less taxes in the low state as any increase in the level of taxes offered in the low state menu makes mimicking the low state equilibrium more attractive to the incumbent in the high state. This comes at the cost of less public good in the low state. The less likely the low state (the higher q) the more the citizen is willing to incur this cost, and the lower T_L^*.[10] The asymmetry of information leads to an equilibrium with lower public good provision (on average) than in the full information equilibrium due to the increase in rent-seeking obtained by the incumbent in state H.

The structure of public finance now affects the way in which the incumbent allocates the budget. Using equations (2.5) and (2.6) we can write the average level of the public good as:

$$E(G^*) = (1-\alpha)(E(T^*) + \bar{F})) - \bar{F}u(1-\alpha) + Z + (1-q)\alpha(T_H^* - T_L^*) \quad (2.9)$$

The term $u(1-\alpha)\bar{F}$ corresponds to the informational rents the incumbent can appropriate in state H by 'hiding away' the extra transfer revenues. The last term in equation (2.9) simply says that the more the citizen can provide the incumbent in the high state with high powered incentives relative to the low state (the bigger the difference between taxes in both states) the lower the informational rents. A marginal increase in taxes still increases public good provision by $(1-\alpha)$, assuming for simplicity that the increase does not affect the spread $T_H^* - T_L^*$. A marginal increase in average transfers has a smaller impact of $(1-\alpha)(1-u)$.[11]. Finally, note that the higher

[10] For high values of q the theoretical appendix shows that it will be optimal for the citizen to pay no taxes in the L state.

[11] I assume throughout that any increase in transfers *ceteris paribus* comes from an increase in $\bar{F}$ and not a change in the probability q of the high state. This is consistent with the type of increase in transfers considered in the empirical strategy which are a

the asymmetry of information (higher u) the bigger the difference between the marginal impact of taxes and transfers. At the limit when $u = 1$ any increase in transfers is spent fully on rents, and when $u = 0$ the equilibrium is a full information one.

The equilibrium share of rents in public revenues s^* is increasing in the share of transfers in the budget proxied by $\bar{f}^* = \bar{F}/E(R)$:

$$E(s^*) = \alpha + E(\bar{f}^*)2u(1-\alpha)(1-q) - Z/E(R) - (1-q)\alpha(T_H^* - T_L^*)/E(R) \quad (2.10)$$

Equations (2.9) and (2.10) summarize the *accountability effect of taxes on the allocation of public spending*: they show that as the share of taxes in revenue increases, so does the share of revenues that is spent towards public good provisions. Intuitively increasing the share of taxes increases the amount of information the citizen has on her government's budget and thus limits the extent to which a rent-seeking politician can capture public funds by 'hiding' them. This leads to an allocation of the budget that is more favorable to the citizen.

C Impact of a tax capacity program

Consider now the impact of a program that makes the tax administration more efficient. This takes the form of a smaller difference between the cost of taxation borne by taxpayers $\phi C(T)$ and how much taxes go in the government budget T: the program decreases ϕ.[12] This makes the citizen more willing to pay taxes in order to get more public good. Using equations (2.7) and (2.8) the impact of a program that lowers the efficiency cost by $d\phi < 0$

consequence of a local government moving to a higher transfer bracket, not a random shock to transfers.

[12] One could also model the efficiency of the tax administration by introducing a cost to the government of levying taxes. The reform would then lower that cost, leaving the results of this model unaffected. I explain in Appendix 5 that the program I consider does decrease the cost of paying taxes.

on taxes is given by :

$$\frac{\partial E(T^*)}{\partial \phi} d\phi > 0 \tag{2.11}$$

The program will also lead to an increase in public good provision proportional to the increase in taxes :

$$\frac{\partial E(G^*)}{\partial \phi} d\phi = (1-\alpha)\frac{\partial E(T^*)}{\partial \phi} d\phi + (1-q)\alpha\frac{\partial (T_H^* - T_L^*)}{\partial \phi} d\phi > 0. \tag{2.12}$$

Because it decreases the share of transfers in total revenues f^* the reform also lowers the share of rents s^* (equation (2.10)). This leads to a first testable proposition regarding the impact of a tax administration reform:

Proposition 2 *A tax capacity program leads to an increase in taxes, an increase in public good provision and a decrease in the share of rents in total public revenues.*

Two other propositions follow from comparing the marginal propensity to spend from extra taxes thanks to the program or from an increase in the average value of transfer revenues($E(F)$):

Proposition 3 *The rise in taxes due to the reform leads to more increase in public good provision than a rise in transfer revenues of the same amount* $\frac{\partial G^*}{\partial E(T^*)} > \frac{\partial G^*}{\partial E(F)}$.

Proposition 4 *The rise in taxes due to the reform leads to a fall in the share of rents in public revenues. An increase in transfer revenues increases the share of rents in public revenues :* $\frac{\partial s^*}{\partial E(T^*)} < 0 < \frac{\partial s^*}{\partial E(F)}$.

A final proposition comes from observing that an increase in the information the citizen has on the budget lowers the equilibrium information rents and thus mitigates the relative accountability effect of taxes and the difference between taxes and transfers:

Proposition 5 *The higher the information the citizen has on the level of transfers (the lower the u) the more similar the impact of an increase in taxes thanks to the program and the impact of an equivalent increase in transfers:* $\frac{\partial G^*}{\partial E(T^*)} - \frac{\partial G^*}{\partial E(F)}$ *and* $\frac{\partial s^*}{\partial E(T^*)} - \frac{\partial s^*}{\partial E(F)}$ *are increasing in u.*

Formal proofs of these propositions and all the results in this section are in the theoretical appendix.

The first part of the empirical section of this paper offers a test of proposition 1 by evaluating the impact of a tax modernization program on public good provision and the share of rents (corruption) diverted by politicians in total public revenues. The second part tests propositions 2 and 3 by comparing the marginal propensity to spend on public goods and corruption from an increase in taxes thanks to the tax modernization program and from an increase in transfers. It then provides some evidence regarding proposition 4 by considering how these impacts vary when citizens have better access to information about the budget.

3 Context : Brazilian local governments and the *PMAT* tax capacity program

A Local public finances and the *PMAT* program

The 1988 Brazilian constitution devolves substantial expenditure responsibility and tax autonomy to the country's more than 5000 local governments.[13] The rates and bases of three main local taxes (a service tax, a

[13] Bardhan and Mookherjee (2006) classify Brazil as one of the few developing countries in which local governments have been given substantial tax autonomy.

property tax and a property sales tax) as well as the method of tax assessment and collection are decided by local elected officials.

Municipalities' *de facto* tax collection is small. They collect less than 13% of their total revenue themselves (roughly 2% of GDP). The spiralling of local debts in the early 1990s has directed much policy attention in Brazil towards the low tax efforts of local governments with commentators pointing out the poor quality of local tax administrations (Afonso, 2005). The few studies of Brazilian tax administrations available paint a picture of unskilled and overworked staff with outdated tax registers, no institutional memory and a lack of methods to accurately assess tax liabilities.[14] High costs of understanding and paying taxes likely push many citizens into non-compliance and in the early 2000s some local officials publicly admitted to tolerating a situation of ongoing tax amnesty where tax arrears are rarely recovered (Afonso and Araujo (2006), BNDES (2002)).

The *Programa de Modernizacao de Administracao Tributaria* (*PMAT*) was launched in 1998 by the Brazilian Development Bank (*BNDES*) to increase municipalities' capacity to tax their citizens. It provides all local governments that apply with subsidized loans to invest in modernizing their tax administration. To apply local administrations must prepare a detailed tax modernization project which is then assessed by the BNDES to check it qualifies with the program's requirement – in practice the *BNDES* accepts all projects.[15] 331 municipalities started a program between 1998 and 2008, covering 40% of the Brazilian population.

The program's loans can only be used to fund investment expenses related to the tax administration, other budget items are explicitly not eligible. The *BNDES* staff checks the receipts for all expenditures made in relation

[14] An extensive study of the property tax collection in Brazil's largest metropolitan areas estimates that less than 60% of urban property is registered on any tax administration's files (de Carvalho Jr. (2006)).

[15] Lack of proof of compliance to some federal regulations (for example the existence of overdue debt payments to a federal agency) did make some local governments ineligible.

to the program but otherwise exerts no control on the public finance processes of participating municipalities. Each local government is left free to choose the type of actions to take to modernize its tax administration but the same firms or civil servants were involved in the development of several *PMAT* projects. Appendix 5 describes the context of the program's creation and the type of investments in tax capacity it funded in more details.[16] Overall the program consists mostly in 1)the creation or updating of tax registers 2)decreasing the costs of paying taxes through the multiplication of tax offices, means and frequency of payments 3) facilitating controls of tax payers through the recovery of tax arrears or the development of build-in cross-checking mechanisms. Nearly all participants launched their *PMAT* program with a change in their tax registers. Table 5.2 shows that in 2003 municipalities that had already started a *PMAT* program were much more likely to have updated their property tax register since 1998 than both the average municipality and municipalities that joined *PMAT* since.

Table 5.1: Update of tax registers

	% updated 1998-2003	Number municipalities
Control	72%	4723
Started after 2003	70%	122
Started before 2003	85%	146

Source: *Perfil dos Municipios Brasileiros, 1998, 2004*. % of municipalities which have updated their property tax registers between 1998 and 2003 in the first column (% of those that respond to the question), number of municipalities in the second column.

The timing of application to and entry in the *PMAT* program is of particular interest. Municipalities typically apply to the program by submitting a first tax modernization project, then wait between one and four years before they actually start the program, ie receive their first loan. Table 5.6 shows that the time between applying and starting a program varied over the period. This is due to the changing situation of the suppliers of the

[16] For more on the program and the context of its creation see also Santos et al. (2008), BNDES (2002) and Afonso and Serra (1999).

program. The *BNDES* processed all applications itself for the first three years of the program's existence, this took it more than two years and a half on average. It contracted the public bank *Banco do Brasil* in 2002 to take in charge most of the application process.[17] *Banco do Brasil*'s involvement initially accelerated the application process until the bank decided to cut down the resources allocated to *PMAT* in 2006. It administered most of the projects from 2002 to 2005, and substantially shortened the waiting period. In 2007 the *BNDES* signed a similar agreement with another public bank, the *Caixa General* and we see another decrease in waiting time for the 2007 cohort. The *BNDES*' own devotion of resources to the program varied over the years: the federal government's initial push for the policy was short-lived and in 2001-2002 only one *BNDES* official was working on *PMAT*, the idea being that *Banco do Brasil* would take charge of most of the administrative work. The swearing into office of a new President in 2003 put the project back up high on the *BNDES* agenda and today the staff team has stabilized to around 12 individuals

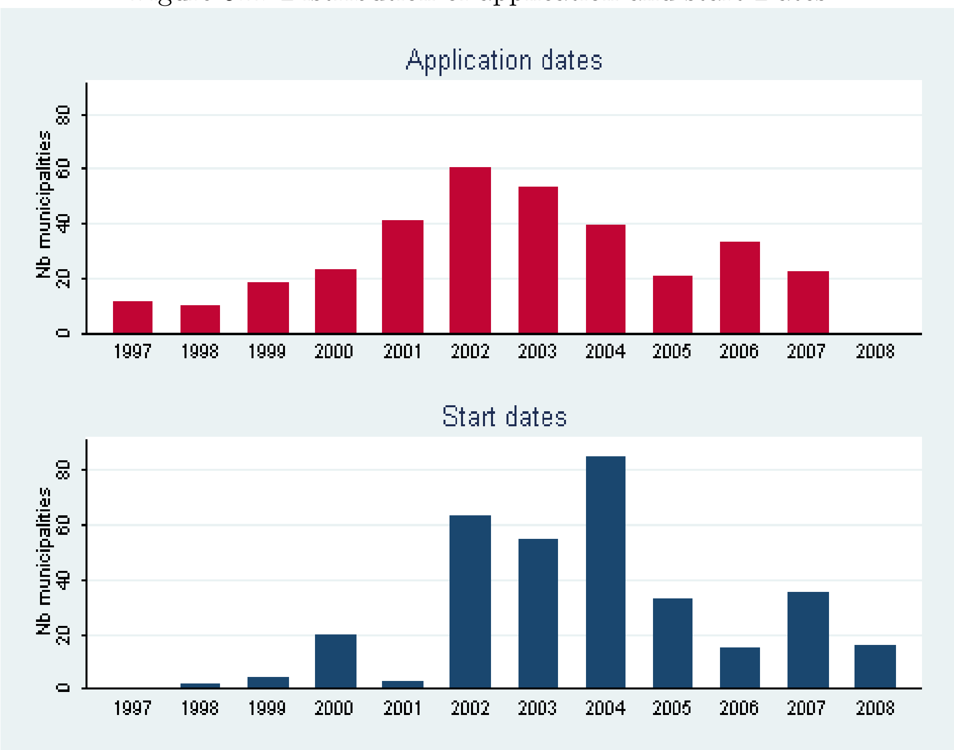
Table 5.2: Average time between program application and program start

Application Year	Years to Program Start	Nb Municipalities
1997	2.6	11
1998	2.7	8
1999	2.5	18
2000	2.3	21
2001	1.5	41
2002	1.1	60
2003	1	55
2004	0.7	40
2005	1.4	20
2006	1.8	36
2007	0.7	22
All	1.2	331

[17] The *BNDES* is based in Rio de Janeiro but the *Banco do Brasil* has branches around the country, allowing for more geographic outreach. The contract stipulates that *Banco do Brasil* help municipalities design a project that respects legal and financial rules and then transmit the application to the BNDES which is the only institution that can decide to start a program.

The possibility that the most eager municipalities pressure the *BNDES* to start the program soon after applying cannot be ruled out. However, in the overwhelming majority of cases (95%) the order in which municipalities apply to the program corresponds to the order in which they start a program. This particularity of the program's timing suggests that whilst municipalities choose when to apply the precise date at which they start a program is out of their control: we see in Figure 5.6 that the distribution of application dates over time is relatively smooth while that of start dates displays clear bunching for the years 2002-2004. It also provides, for each municipalities, two dates of interest for identifying the program's impact which I return to below.

Figure 5.1: Distribution of application and start Dates



Local revenues which are not locally levied come from transfers from the state or federal governments. The largest transfer is the *Fundo de Participacao dos Municipios* (FPM) federal transfer which is constitutionally mandated and the largest single source of local revenues (40%). This transfer has attracted the attention of researchers in the past because of non-linearities in the rule allocating the distribution of *FPM* resources which can be used to identify the impact of an increase in transfers. Using it is not a novely of this paper. I describe this rule in section 5 below and refer the interested reader to this paper's appendix and Brollo et al. (2010); Litschig and Morrison (2010) and Litschig (2011) for more details.

What is novel to this study is the comparison of how local tax revenues and transfers are spent. In this respect the key advantage of considering *FPM* transfers is the fact that, unlike all other transfers received by municipalities, their use is virtually unrestricted.[18] Local politicians therefore have the same discretion in deciding how to spend tax and *FPM* revenues.

Data on participation to the *PMAT* program, date of application, program start, and amount borrowed through the program have been collected by the author at the *BNDES*. I use public finance data for the years 1999-2009 from the FINBRA dataset of the *Tesouro Nacional* to find local tax collection in each year, and official data on *FPM* transfers from the *Tesouro Nacional*. All revenue variables used in the analysis are per capita and in 2000 Reais.[19]

B Local expenditure responsibilities

I focus on two potential uses of local public budgets: municipal health and education infrastructure and diversion of public revenues by the administration. Health and education are the main public services provided by municipal governments and therefore a good measure of the variable pub-

[18] Brazilian law requires that 15% of *FPM* revenues be spent on education and health. It is highly unlikely that this rule ever binds however, given the importance of education and health as a share of total public budgets and the fact that there is no federal guidelines regarding what expenditure items can be labeled as health or education.

[19] Per capita variables are computed using annual population estimates provided by the Brazilian statistical institute *IBGE* and deflated using the GDP deflator.

lic good provision (G) in the model. The measure of diversion of public revenues proxies for the share of rents in public revenues s.

The Brazilian constitution stipulates that states and municipal governments share the responsibility for the provision of primary and secondary education. In practice state governments manage secondary schools and municipal governments are mostly in charge of primary schools (*ensino fundamental*)[20]: they provide infrastructure, school lunches and transportation and hire and pay teachers. Education is the largest budget item of local governments, representing roughly a third of expenditures. Health is their second largest budget item (see Table 5.4). Brazil has substantially decentralized its health system since the early 1990s and most of the responsibility for administering primary health care is today in the hands of local governments through the Family Health Program (*Programa Saude de Familia*). Municipalities are in charge of hiring, paying and supervising medical teams and providing the infrastructure for the primary and preventive health units (see Rocha and Soares (2010) for details on local provision of basic health care).

I use panel data on municipal education inputs from the annual census (*Censos Escolar*) of all Brazilian schools to measure the quality and quantity of municipal education infrastructure. To measure quantity I consider the number of classrooms in use in municipal schools per thousand inhabitants. Classrooms are a component of school infrastructure which municipalities can easily adjust if they choose to spend more on education by furbishing existing unused rooms or renting extra space. Local governments receive substantial federal transfers directed towards education expenditure but those generally come with rules specifying that they must be spent on staff, school lunches or school transport and not on physical teaching infrastructure.[21]

[20] By 2005, approximately 85% of all grade 1 to 4 schools were run by local governments,the remainder being private or state primary schools (Ferraz et al., 2012).

[21] For example 60% of the largest of those education transfers, *FUNDEB*, must fund

Classrooms are therefore the education input most likely to be under-funded. Several variables are available to proxy for the quality of municipal education infrastructure: the number of schools with computers, with internet, with a sports facility, a library, television/video equipment and connected to the sewage and electricity systems. I use principal components analysis (PCA) to combine these seven measures into an index of infrastructure quality. The first principal component explains 60% of the variation in the data; this suggests that using PCA reduces the dimensionality of the data with little loss of information.

Data on municipal health infrastructure comes from the *Pesquisa Assistência Médico Sanitária*, a comprehensive survey of the Brazilian health system carried out by the Ministry of Health and available in 1999, 2002, 2005 and 2009. It documents the number of health units (hospitals and clinics) in each municipality and whether they are private or administered by the federal, state or municipal government. I use the number of municipal health establishments per 100,000 inhabitants to measure the quantity of municipal health infrastructure.

The last public spending outcome this paper considers is corruption. There is considerable information on how local governments divert public resources away from public uses in Brazil thanks to a federal anti-corruption program. Since 2003 over 1800 local governments have been randomly chosen by lottery to be audited by staff of the independent audit agency *Corregedoria Geral da União* (*CGU*). These staff audit the use of discretionary federal transfers by local governments over the last two years by collecting administrative documents and interviewing citizens and administrative staff.[22] They check for example whether spending can be accounted for

teacher's salaries. The *PNAE* transfer funds school lunches. All my results are unaffected when I control for the amount of education-specific transfers received by the municipality.

[22]The utilization of the two types of local revenues considered in this paper- taxes and *FPM* transfers - is not directly audited. Most discretionary federal transfers require that municipalities contribute some of their 'own revenues' (defined as *FPM* transfers or taxes)

by receipts, whether program rules are met, and whether procurement of public works is done competitively. The results of those audits are publicly available records. Ferraz and Finan (2011) estimate using this data that approximately 550 million US dollars per year were diverted in the period 2001-2003, or 8% of audited transfer revenues.[23]

The corruption data I use comes from the coding of the *CGU* audits for the years 2003-2006 provided by Litschig and Zamboni (2008). It is available for a small sample of 971 municipalities, 54 of which join the program. Following the existing literature I construct a corruption index from this data by scaling the number of irregularities by the number of civil servants in the local government administration[24] and the total amount of government revenue audited. This provides a proxy for the share of diverted revenues in the total public budget, the theoretical outcome considered in the model above.

C Why did municipalities join the program?

331 municipalities join the *PMAT* program between 1998 and 2008. Interviews conducted with *BNDES* staff and local officials suggest the program is of no interest to those local governments whose small economic and population size make for a weak tax base and very low potential returns to investments in tax capacity. Participants often say that they joined the program because they were dissatisfied with their current level of tax collection compared to what they thought was their tax potential. There was very little advertising for the program, most participants said they heard about it because they knew someone who worked at *BNDES*, or because one of

on the programs they fund so we can think of the audits as reflecting the overall quality of government spending.

[23] For more on the anti-corruption program and analysis using data from the audits see Ferraz and Finan (2008a), Ferraz and Finan (2011), Ferraz et al. (2012),Litschig and Zamboni (2008) and Brollo et al. (2010).

[24] This is obtained from the dataset *Perfil dos Municipios Brasileiros* 1998, published by the *IBGE*.

the municipalities in their neighborhood had already joined.

Given the large number of municipalities that did not join the program I choose to exclude from my analysis those which fieldwork and inspection of summary statistics suggest have no interest in the program and constitute a very poor counterfactual for the evolution of outcomes in treated municipalities. Those municipalities are those whose population or GDP are below the minimum value of those variables amongst the sample of treated municipalities. More specifically I take out municipalities with a population of less than 3,500 (10% of municipalities which did not join the program) or income per capita below 790 Rs (9%). Over 3,000 control municipalities remain to be included in the analysis.[25]

To better understand why some local governments choose to join the program I estimate a discrete time hazard model of the probability that a given municipality at a given period of time applies to the program as a function of both pre-treatment characteristics of municipalities and time-varying covariates.[26] I consider the role played by pre-treatment values of GDP per capita, population (both estimated annually by the Brazilian statistical institute *IBGE*), and tax revenues and consider key demographic characteristics (median education, inequality and share of urban population, all from the 2000 Census) which could affect local political economy outcomes. The possibility that municipalities hear about the program from their participating neighbors is considered by including the average distance between a municipality and its 5 closest neighbors which have already joined a *PMAT* program and allowing for time dependence. Mayors with specific political ideologies and political ties may be more likely to join the program, so I include political party affiliation, alignment with the state governor's

[25]I present results obtained using all municipalities that never join the program as a control group as a robustness check below.

[26]See Jenkins (1995) for a description of the method and Galiani et al. (2005) for a similar application to privatization of local water provision in Argentina.

party and a measure of political competition to proxy for the type of political context mayors face.[27] I test the hypothesis that political or economic shocks influenced program uptake by including lagged changes in GDP per capita, tax revenues and whether a new mayor was elected in the previous election.

Results confirm the intuition gathered from field interviews: municipalities that join the program richer and more population than the average Brazilian municipality but once these variables are controlled for they collect less taxes in 1998. They are also more educated, less agricultural and more politically competitive – all these characteristics are highly serially correlated so the identifying variation used for these estimates is mostly cross-sectional. Political characteristics of the mayor do not play a role (a full set of 26 dummies for political parties do not come out as jointly or individually significant) and neither does alignment with the governor's party. This provides some reassurance that the program's loans were not directed towards politically favored mayors. Municipalities with neighbors that have already joined the program are more likely to apply, possibly because they hear about the program from them.

In the second column I consider whether past shocks determined program uptake, and find no evidence of an 'Ashenfelter dip' in tax revenues or that selection in the program is driven by specific economic, demographic or political shocks. Results in the third column suggest that treated municipalities followed similar trends to the control ones in the 1996-1999 period. The fact that no observable shocks determine selection in the program motivates the use of the difference-in-differences methodology described in the next section.

[27] All political variables are from the *Tribunal Superior Eleitoral*.

Table 5.3: Determinants of program take-up

	(1)	(2)	(3)
Income	0.1252***	0.1203***	0.1435***
	(0.0406)	(0.0454)	(0.0465)
Population	0.2141	0.2852	0.2164
	(0.1973)	(0.2431)	(0.2151)
Taxes	-0.4123*	-0.5924*	-0.2544
	(0.2466)	(0.3275)	(0.2530)
Agr\ GDP	-0.0873***	-0.1087***	-0.1104***
	(0.0211)	(0.0235)	(0.0250)
Serv\ GDP	-0.0005	0.0048	-0.0090
	(0.0146)	(0.0168)	(0.0177)
Education	0.9979**	1.1272**	0.7256
	(0.4659)	(0.5188)	(0.5423)
Urban pop.	0.0058***	0.0063***	0.0063***
	(0.0017)	(0.0019)	(0.0020)
Inequality	0.0028	0.0052	0.0038
	(0.0044)	(0.0051)	(0.0050)
Distance to closest *PMAT*	-0.0032**	-0.0032*	-0.0035**
	(0.0015)	(0.0019)	(0.0017)
Time	0.0020**	0.0066***	0.0023**
	(0.0010)	(0.0011)	(0.0011)
Time^2	-0.0003***	-0.0006***	-0.0003***
	(0.0001)	(0.0001)	(0.0001)
Governor's party	-0.0003	-0.0005	-0.0004
	(0.0006)	(0.0006)	(0.0006)
Pol. competition	0.0048**	0.0050**	0.0052**
	(0.0020)	(0.0023)	(0.0023)
Lagged growth in GDP		0.0303	
		(0.0873)	
Lagged growth in population		-5.7851	
		(5.7434)	
Lagged growth in taxes		-0.0000	
		(0.0000)	
Change in mayor	-0.0012	-0.0008	
	(0.0008)	(0.0011)	
Growth in GDP 96-99			-0.7615
			(0.5008)
Growth in population 96-99			-0.3873
			(2.3233)
Growth in taxes 96-99			-0.4153
			(0.2858)
Observations	27845	23721	25040
Municipalities	3370	3349	3043

Cluster-robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Hazard model of the probability of applying to the program: observations corresponding to municipalities which have applied to the program at least a year ago are dropped from the sample. The dependent variable is a dummy equal to 0 for municipalities which have not applied to the program yet and 1 the year in which they apply. Municipalities which joined in the first two years and observations for 1999 are excluded because the variable 'distance to the 5 closest municipalities which have already joined a *PMAT* program' is not available for those. Results are very similar when that variable is taken out of the specification and the sample is not restricted.

4 Impact of the tax modernization program on local tax revenues

This section evaluates the impact of the tax modernization program on local tax collection. In principle one would like to randomly assign treatment (program participation) to some municipalities and compare the average outcomes in the treated and control groups. Tax policies are hardly ever the subject of randomized trials so I turn to non-experimental methods that create a credible counterfactual from the control municipalities under a reasonable set of assumptions.

A Empirical Strategy

The biggest identification concern is that treated and control municipalities could be different along dimensions which correlate with outcomes. Many of the unobservable characteristics that may confound identification are however likely to be fixed over time; I estimate a difference-in-differences model to control for such time-invariant unobserved heterogeneity.

Formally, I estimate the model :

$$Y_{i,t} = \beta P_{i,t} + \delta X_{i,t} + \gamma_t + \mu_i + \epsilon_{i,t} \tag{4.1}$$

where $Y_{i,t}$ is tax collected per capita in municipality i in year t, $P_{i,t}$ is a dummy equal to 1 if municipality i started a program in a year $s \leq t$ and γ_t and μ_i a set of year and municipality fixed effect. Time-varying controls in $X_{i,t}$ are GDP per capita, population, and political characteristics of the municipality (competitiveness of the last election, political party of the mayor, term limit).All specifications allow for arbitrary covariance structure within municipalities by computing standard errors clustered at the municipality level.[28]

The key identifying assumption required for the interpretation of β in (4.1) as the average effect of the *PMAT* program is that the evolution of tax collection in treated municipalities would have been the same in the absence of the program as the evolution in control municipalities once the impact of time-varying covariates is controlled for (common trend assumption conditional on X). One can use variations in outcomes in the pre-treatment period to get a sense of whether this assumption is likely to hold. If treated and control municipalities are not following similar trends before the program starts it is unlikely that they would have in the absence of the program. Table 5.3 already suggests that treated municipalities had been following trends similar to control ones before 1999, and that they did not experience shocks before applying to the program.

Another way to detect pre-treatment trends is to take an event-study approach and examine differences between treated and control municipalities before the onset of the program. I also estimate a more flexible version of equation (4.1):

$$Y_{i,t} = \sum_{j=-9}^{9} \beta_j P_{jit} + \delta X_{i,t} + \gamma_t + \mu_i + \epsilon_{i,t}. \tag{4.2}$$

Here P_{jit} is equal to 1 if municipality i is in the jth year of the program in year t if $j \geq 0$, or if the municipality will sign a program contract in j years if $j < 0$. The β_j estimates are of interest for two reasons. First, when $j > 0$ they can be interpreted as estimates of the impact of the program in the jth year and measure to what extent effects are sustainable over time. Second, testing for pre-treatment trend is equivalent to a test that the β_j

[28]Error correlation in the cross-section dimension of the panel could also be a concern if local governments adjust their tax policies to the actions taken by neighboring governments. Clustering at the state-year level to allow for such correlation however hardly affects the standard errors. Results are available from the author upon request.

are equal to zero for $j < 0$. The omitted dummy is the dummy for starting a program in two years. The program's rules specify that expenditures on tax administration undertaken up to six months before the contract is signed are eligible for reimbursement so we could see a small impact of the program the year before its official start.

A final concern arises if pre-treatment characteristics potentially associated with the dynamics of the outcome variable are unbalanced between treated and control municipalities. Convergence in tax revenues over time may, for example, lead to different dynamics between the two groups.[29] In this case difference-in-differences estimates may suffer from two additional sources of bias (Heckman et al. (1998)). The first occurs when there are no comparable control municipalities for some of the municipalities that join the program. The second arises from different distributions of observable covariates in the control and treated groups. Treated municipalities are different from control ones along several observable dimensions so both these types of bias are here a concern.

I therefore complement my empirical analysis by estimating a propensity score-weighted version of equation (4.1) following Hirano and Imbens (2001) (see also Hirano et al. (2003)). Propensity score-weighted regression methods eliminate both sources of bias by 1) restricting the sample to observations in the common support in the distribution of covariates, and 2) obtaining balance of covariates by re-weighting the control group observations. In practice this is done by estimating a model of the probability that a municipality joins the program as a function of the set of covariates W used in Table 5.3, obtaining the predicted probability $\hat{P}(W)$ and then estimating (4.1) with weights equal to unity for the treated and $\hat{P}(W)/(1 - \hat{P}(W))$ for the controls. Hirano et al. (2003) show that this estimator is efficient.

[29]This could be addressed by interacting pre-treatment covariates with a time trend, but restricting their effect to be linear may not be suitable if the treatment effect is heterogenous (Meyer (1995))

Wooldridge (2007) shows that ignoring the first-stage estimation of the selection probabilities when performing inference yields conservative standard errors. All results below present standard-errors non-adjusted for first stage estimation, as bootstrapping procedures suggest there is little efficiency lost in doing so.[30] More details on the construction of the weights and the common support sample is found in the Appendix.

B Summary statistics

Table 5.4 presents summary statistics of key characteristics of treated and control municipalities, on the whole sample (column 2) and the weighted common support sample (column 3). I consider pre-treatment values whenever possible. Municipalities that eventually join the program are different from the average municipality when we consider the outcome variables of interest: they already levy more taxes prior to the start of the program, have much more municipal health infrastructure (number of health establishments per 100,000 inhabitants managed by the municipal government), less school infrastructure (number of classrooms in use in municipal schools) but of better quality. They are also found to be less corrupt over the three years for which there is data available from the audits. The last column shows that restricting and weighting the sample of control municipalities leads to a reasonable balance in pre-treatment characteristics, both those included in the selection equation (such as initial level of taxes per capita, population, GDP) and those that are not (corruption, municipal education and health infrastructure).

The complete distribution of covariates in treated and control groups is also of interest. Appendix Figures 9.6, 9.7 and 9.8 compare the distribution of characteristics of control and treated municipalities. They show that weighting and restricting the sample to the common support shifts the entire

[30]Results available from the author upon request.

distributions of pre-treatment covariates in control municipalities closer to that of the treated ones.

C Results : Impact of the program

Figure 5.2 presents a graphical representation of the results from the estimation of equation (4.2). Each point on the solid lines summarizes the effect of having been in the program for j years (for j positive ordinate values) or of starting the program in j years (for j negative ordinate values) compared to the year just before the program started. The excluded dummy is that for 2 years prior to the onset of the program. We see that there is no evidence of different trends prior to the onset of the program

Figure 5.2: Year by year impact of the program

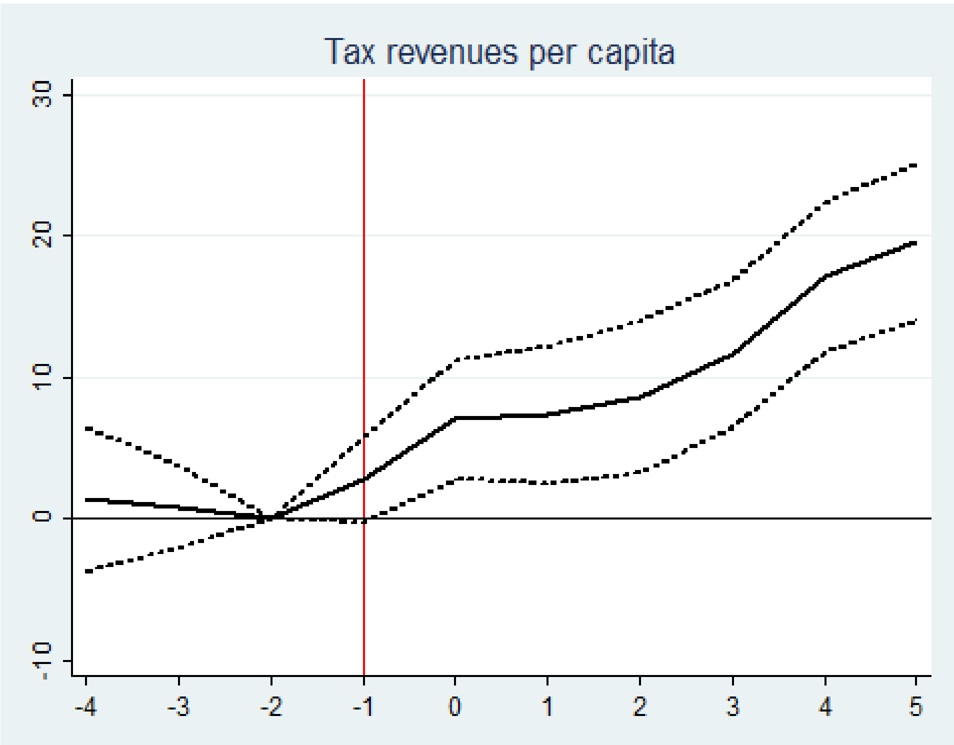


Table 5.5 reports results from the estimation of equations (4.1) and (4.2). The first two columns presents results for a model estimated on the whole

Table 5.4: Descriptive statistics

	Treated	Controls	Controls, weighted
Taxes per capita (1998)	85.43	58.61	78.08
	(89.79)	(113.4)	(113.1)
FPM transfers per capita (1998)	82.03	103.1	83.87
	(43.37)	(113.4)	(51.15)
Education expenditures (% total, 1998)	30.5	32.7	29.1
	(7.66)	(7.53)	(9.79)
Health expenditures (% total, 1998)	18.9	18	20.1
	(6.63)	(6.81)	(9.54)
Quantity of education infrastructure (1998)	2.996	3.860	2.928
	(1.493)	(2.017)	(1.398)
Quality of education infrastructure (1998)	-0.217	-0.715	-0.723
	(1.311)	(1.314)	(1.204)
Health infrastructure (1999)	12.61	6.396	13.38
	(11.23)	(7.060)	(22.19)
Corruption index (all years)	57.23	184.60	46.88
	(12.2)	(432.66)	(85.21)
Public revenues per capita (1998)	394.1	415.1	394.9
	(171.0)	(205.8)	(201.2)
Population (1998)	74714.8	28457.5	82409.8
	(104565.4)	(58798.4)	(175336.4)
GDP per capita in (1999)	5972.4	4916.4	5144.9
	(4771.8)	(4114.6)	(4325.2)
Agriculture (% GDP) (1999)	11.83	22.25	21.35
	(12.54)	(15.53)	(18.70)
Services (% GDP) (1999)	62.13	59.25	61.17
	(12.24)	(13.77)	(15.57)
Income per capita (2000)	3.280	2.541	2.836
	(1.166)	(1.067)	(1.672)
Gini (2000)	0.547	0.553	0.564
	(0.0528)	(0.0563)	(0.0656)
Median education level (2000)	5.410	4.605	4.790
	(1.046)	(1.139)	(1.679)
Life expectancy (2000)	71.16	69.68	69.13
	(3.254)	(3.930)	(4.685)
Has a local radio station (1998)	0.622	0.317	0.356
	(0.486)	(0.465)	(0.479)
Has internet (1998)	0.590	0.242	0.344
	(0.493)	(0.429)	(0.475)
Has judiciary branch (1998)	0.771	0.588	0.428
	(0.421)	(0.492)	(0.495)

The first column presents averages for all treated municipalities, the second averages for all control municipalities, the third averages for all control municipalities in the common support sample, where each municipality is assigned a weight proportional to its estimated probability of joining the program. The main sample includes 331 treated municipalities (279 in the common support sample) and 4450 control municipalities (2341 in the common support). The sample for the corruption index includes 54 treated municipalities (49 in the common support sample) and 851 control municipalities (477 in the common support).

sample, the third and fourth columns results obtained on the common support sample and the last two columns results from the specification using weights based on the estimated propensity score. Estimates of equation (4.2) in columns 2, 4, 6 and 7 are estimated on the sample of control municipalities and treated municipalities that start a program in 2003 and 2004 only to obtain estimates of the dynamic impact of the program that cover four years before the start of the program and 5 years after.[31] Finally column 7 presents estimates of the impact of the program interacted with the per capita amount lent through the program to estimate the returns to investment in tax capacity.

The estimates suggest the program increases tax revenues by 9 to 10 Rs per capita on average, a 11% increase with respect to the baseline level. We see no different trend prior to the onset of the program. Estimates from the preferred weighted difference-in-differences specification in column 6 show a small increase in tax collection the year just before the start of the program. This may be due to actions undertaken siw months before the contract was signed and eligible for reimbursement by the program's loans. It takes four years for tax revenues to increase by 10 Rs and it seems the long-run effect of the program on tax collection may be substantially larger as it keeps increasing after 4 years. The estimates of the impact of 1 Rs lent through the program in column 6 suggests it is very cost-effective: after three years in the program one Rs lent leads to more than one extra Rs in tax revenues every year.

These estimates are obtained using as a counterfactual the evolution of outcomes in municipalities that have not joined the program yet including those that never join. An alternative is to use only the evolution of outcomes in municipalities who have not joined at time t but will later at a time

[31] The specifications include the full set of β_j in equation (4.2) so that the only excluded dummy is that for two years before the start of the program.

Table 5.5: Impact of the program on tax revenues

	DiD		DiD on common support		Weighted DiD		Amount Paid	Treated only
All years	10.284***		9.464***		9.906***			5.353**
	(2.174)		(2.771)		(1.929)			(2.732)
4 years before		-0.952		-0.111		1.341	0.097	
		(2.966)		(3.535)		(3.098)	(0.288)	
3 years before		-1.050		0.982		0.828	0.026	
		(1.762)		(2.073)		(1.771)	(0.188)	
1 year before		-1.371		1.030		1.733	0.262	
		(1.538)		(1.668)		(1.830)	(0.191)	
1st year		3.454		4.226		3.983*	0.783***	
		(2.669)		(2.914)		(2.258)	(0.308)	
2nd year		5.229		6.521*		6.307**	0.880***	
		(3.162)		(3.383)		(2.136)	(0.304)	
3rd year		6.375*		7.023*		8.574***	1.076***	
		(3.429)		(3.638)		(3.267)	(0.359)	
4th year		10.397***		9.523**		11.644***	1.316***	
		(3.550)		(3.731)		(3.150)	(0.349)	
5th year		13.622***		14.174***		15.053***	1.754***	
		(3.681)		(3.863)		(3.213)	(0.359)	
Observations	40268	38560	28132	26818	28112	26798	26798	1614

Cluster-robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variables is real tax revenues per capita. All regressions include municipality and year fixed effects and controls for GDP per capita, population size, share of agriculture and services in GDP, political competition in the previous election, mayor's party affiliation and whether the mayor is a facing a term limit.

$t + s$, as those are arguably very similar to the municipalities who have already joined at time t. Unfortunately the bunching of municipalities' program start date around a few main years makes it impossible to estimate equation (4.1) on a sample consisting only of the 331 municipalities who enter the program before 2009 and identify separately year fixed effects and the program's impact. The last column of Table 5.5 approximates what one would ideally like to do using the sample of treated municipalities only. It presents the coefficient from equation (4.1) estimated on the sample of treated municipalities only and over the years 1999 to 2003. In this sample the 183 municipalities which start the program after 2003 are never in the program, and are therefore used as control municipalities for the 148 which are treated up to 2003. Treated municipalities in this sample have been in the program on average only 1.7 years. The coefficient for the program is close to the estimated impact of having been 1 or 2 years in the program using the preferred specification.

D Selection and treatment effects

One concern remains regarding the interpretation of the estimates above as the impact of the program, that of an unobservable shock occurring at the same time as the program and affecting tax collection. Municipalities that join the program signal an increased willingness to increase their tax collection, it could be that this willingness it enough to increase tax revenues with or without the program's help. The assumption that this is not the case is essential to my identification strategy and cannot be tested. I can however use the arguably exogenous time lag between program application and program start to offer some evidence that such unobservable shocks do not explain the observed changes in outcomes after the start of the program. If municipalities apply to the program when local officials become more efficient at collecting taxes we should see a change in tax revenues at the time a municipality applies *even if the program itself does not start for a couple of years*. Table 5.6 presents estimates of the average impact of the program and changes during the 3 years prior to the start of the program for municipalities which apply and start a program in the same year (column 1) or wait one year (column 2) or wait 2 or 3 years (column 3).

Tax revenues do not increase before the start of the program in any of the groups. In particular they do not increase more for municipalities which signal their willingness to invest in their tax administration a couple of years before they start the program. The size of the coefficients suggests a (statistically insignificant impact) of the program the year before it starts in municipalities that had already applied at that time (third line of columns 2 and 3), those municipalities may have anticipated the start of their contract. Table 5.6 also suggests that the lag between application and start dates was not affected by municipalities' eagerness to increase their tax collection. If this were true we would expect a higher impact of the program amongst those that started immediately.

Table 5.6: Impact of the Program by Time between Application and Program Start

Time between application and program start	0 year	1 year	2-3 years
3 years before	4.298	-0.540	-1.149
	(3.314)	(2.782)	(2.367)
2 years before	-1.994	-2.675	-0.955
	(3.572)	(3.210)	(3.269)
1 year before	0.361	0.994	1.557
	(4.049)	(3.918)	(3.415)
Program : all years	8.019*	10.248**	10.251***
	(4.581)	(4.634)	(3.816)
Observations	25436	26584	25593
Clusters	2374	2480	2389

Cluster-robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variables is real tax revenues per capita. All regressions include municipality and year fixed effects and controls for GDP per capita, population size, share of agriculture and services in GDP, political competition in the previous election, mayor's party affiliation and whether the mayor is a facing a term limit.

Finally Appendix Table 9.5 presents results for the dynamic impact of the program using different specifications and sample size (results for tax revenues are in the first two columns). When the whole control group is used the program seems to have a larger impact on tax revenues. Though estimates remain close to the ones obtained using the preferred specification this confirms that restricting the sample to construct a more credible counterfactual matters. A recurring criticism of the difference-in-differences methodology is that it is strongly functional form dependent (Heckman (1996)). I present results for the natural logarithm of the dependent variables using the preferred propensity-score weighted method. The results are similar to what we obtain with the main specification.

This last set of results suggest that increased motivation of the local government (signalled by the timing of application to the program) is not a sufficient condition for the observed change in outcomes. However confidence with respect to its causal impact does not imply that the program would lead to such outcomes if applied to all Brazilian municipalities. Local motivation is likely to be a necessary condition for the program to increase tax revenues: imposing the program on municipalities in which local officials are not interested in increasing tax collections probably would not work. We should interpret the 11% increase in tax collection as the program's average treatment effect on the treated (ATT), and keep this distinction in mind when comparing how municipalities spend increases in tax and transfer revenues in the next section.[32]

[32] The weights used in the weighted difference-in-differences specification are appropriate to compute the average treatment on the treated effect only (Hirano and Imbens, 2001). It seems fallacious to try to estimate an average treatment effect for the whole population of Brazilian municipalities given that motivation of local governments is a likely necessary condition for the program to work.

5 Are tax revenues better spent than transfer revenues?

This section compares the impact on municipal public spending outcomes of an increase in tax revenues thanks to the program to the impact of an exogenous increase in transfer revenues. It directly tests propositions 1 to 4 of the model which predict that an increase in taxes thanks to the program will lead to a higher increase in public good provision and a smaller increase in corruption than an increase in transfers of the same amount. I start by explaining the strategy used to identify the marginal propensity to spend out of tax and transfer revenues on local public spending outcomes and then present result.

A Empirical strategy and validity checks

I evaluate the impact of an increase in taxes thanks to the program or an increase in transfer revenues on public spending outcomes by estimating the following equations :

$$G_{i,t} = \pi_R R_{it} + \eta X_{i,t} + \gamma_t + \mu_i + \epsilon_{i,t}, R = F, T \tag{5.1}$$

and

$$C_{i,t} = \phi_R R_{it} + \eta X_{i,t} + \eta_2 Z_i + \eta_3 S_i + \gamma_t + \epsilon_{i,t}, R = F, T \tag{5.2}$$

where $R_{i,t}$ is 1) tax revenues per capita ($T_{i,t}$) or 2) transfer revenues per capita ($F_{i,t}$), $G_{i,t}$ are measures of municipal health and education infrastructure, $C_{i,t}$ the corruption index and $X_{i,t}$ a set of time-varying covariates are as above. The corruption data is a repeated cross-section and not a panel, so specification (5.2) controls for an indicator of whether the municipality joins the program in the period 1998-2009 S_i and a set of time invariant covariates Z_i that includes state fixed effects and a municipal characteristics from the 2000 census (median education level, inequality, life expectancy), whether the municipality is a state capital, whether tourism is a major industry, and existence of a local radio stations and local judiciary presence from the dataset *Perfil dos Municipios Brasileiros*.

Different of assumptions are necessary to interpret the comparison of π_T and π_F and ϕ_T and ϕ_F in equations (5.1) and (5.2) as a test of the model's predictions. The first set of assumptions insures that we can interpret coefficients π and ϕ as the causal impact of taxes or transfers on public spending outcomes. Another assumption is required to interpret the difference between the estimated impact of taxes and transfers on spending outcomes as an estimate of the differences between the marginal propensities to spend out of both types of revenues predicted by the model.

Identification: impact of taxes

The instrument used for tax revenues is program participation. The previous section has shown that this has an economically meaningful and statistically significant impact on tax collection per capita. The exclusion restriction requires two things. First, there must be no unobserved time-varying municipal characteristics that affect spending outcomes in treated municipalities differentially. I replicate the methods used above to test the validity of this assumption with respect to tax revenues in Table 5.7. The tables presents results from estimating equations (4.1) and (4.2) using public spending outcomes as dependent variables. Figure 5.3 is a graphical representation of the estimates in Table 5.7.

We see no different trend in treated municipalities prior to the start of the program for the quality and quantity of education infrastructure.A detailed analysis of pre-treatment trends cannot be done for health infrastructure and the corruption outcomes because I do not have long panel data for these variables, but I present estimates from running specification (4.2) for health infrastructure restricting all pre-treatment dummies to be equal in column 6. There is no difference between treated and control municipalities prior to the start of the program. Results in Table 5.7 correspond to the reduced form estimates of specifications 5.1 and 5.2. They suggest that the program has a positive impact on municipal health and education infrastructure and a negative impact on the corruption index. This is in line with proposition 1 above.[33] One can similarly consider pre-treatment trends separately for municipalities that entered the program the year in which they applied and for those that had to wait before they received the funds. Appendix Table 9.6 shows that having applied to the program but not started one yet has no impact on the quantity and quality of municipal education infrastructure.

Second, the exclusion restriction requires that the program must not have a direct impact on public spending outcomes beyond increasing tax revenues. The program's funds cannot be spent on anything but modernizing the tax administration. Even assuming municipalities manage to bend this rule and spend the funds on education and health infrastructure it is highly unlikely that the program's small loans was sufficient to finance an increase in infrastructure such as that observed in Table 5.7. Treated municipalities had roughly 400 Rs per capita of total public revenues in 1998 and 3 classrooms in use per 1000 inhabitants. Using the average propensity to spend on classrooms these municipalities would need an extra 70 Rs to open 0.2 new classrooms, the estimated effect of the program. The average loan amount, 9 Rs per capita, seems way too small to finance such an increase. The cumulated increase in tax revenues after 4 years in the program, nearly 40 Rs, plausibly can if we assume that the marginal propensity to spend on classrooms is slightly higher than the average. The same logic applies to the

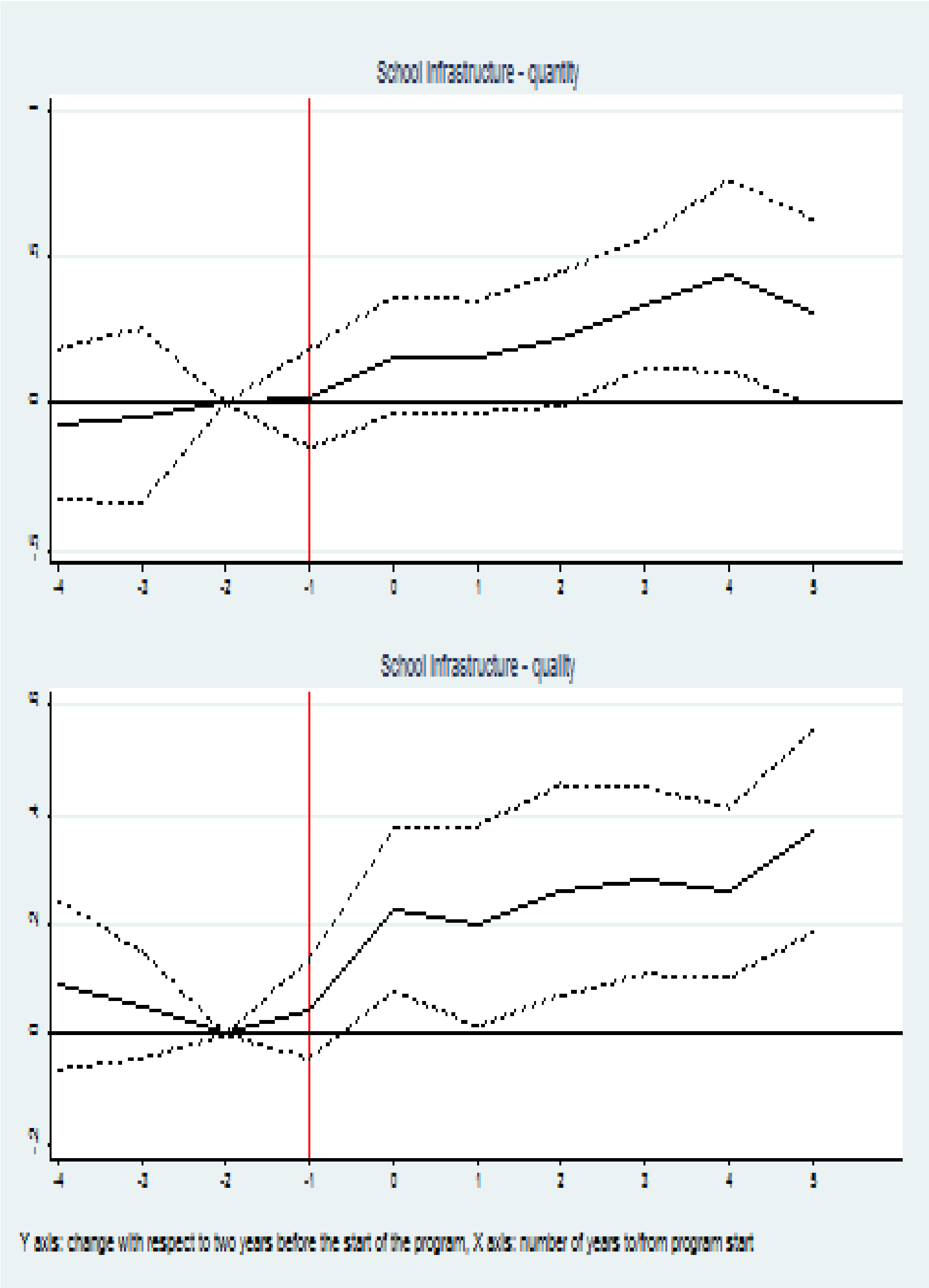
[33] Appendix Table 9.5 presents reduced form results obtained on the whole sample or using a log specification. Results are very close to what we obtain in Table 5.7.

Table 5.7: Reduced form impact of the program on spending outcomes

	Educ. infrastructure: quantity		Educ. infrastructure:quality		Health infrastructure		Corruption
All years($1 \leq j \leq 11$)	0.222***		0.224***		1.137*	1.209	-9.114*
	(0.079)		(0.062)		(0.647)	(1.367)	(5.205)
4 years before ($j = -4$)		-0.070		0.089			
		(0.156)		(0.093)			
3 years before ($j = -3$)		-0.043		0.054			
		(0.182)		(0.059)			
1 year before ($j = -2$)		0.017		0.046			
		(0.102)		(0.055)			
1st year ($j = 1$)		0.163		0.227**			
		(0.121)		(0.090)			
2nd year ($j = 2$)		0.161		0.197*			
		(0.117)		(0.111)			
3d year ($j = 3$)		0.220		0.263**			
		(0.140)		(0.117)			
4th year ($j = 4$)		0.282**		0.280***			
		(0.135)		(0.103)			
5th year ($j = 5$)		0.335**		0.258***			
		(0.199)		(0.094)			
Before $PMAT$ ($-10 \leq j \leq 2$)						0.059	
						(1.294)	
Ever-treated ($-10 \leq j \leq 11$)							11.452
							(8.499)
Observations	28215	26899	28182	26866	9999	9999	526

Cluster-robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. All specifications include year fixed effects and time-varying controls (GDP per capita, population size, the shares of agriculture and services in GDP, whether the mayor is in his second term, and political competition in the last election). Municipal fixed effects are included in all but the last column. Specifications without fixed effects (last column) include state fixed effects and as controls a indicator of whether the municipality joins a $PMAT$ program between 1998 and 2008 and municipal characteristics (income per capita, inequality, median education, life expectancy, population density, all in 2000, and whether the municipality has a local radio station in 1998 and a seat of the judiciary branch in 1998). The quantity of education infrastructure is the number of classrooms in use in municipal schools per 1000 inhabitants, the quality of education infrastructure is a municipal school quality index constructed as explained above, health infrastructure is the number of municipal health establishments per 100,000 inhabitants, and corruption is the corruption index described above.

Figure 5.3: Year by year impact of the program



The graphs plot the coefficients from estimating equation (4.2) on a sample of control municipalities and municipalities treated in 2003, 2004 and 2005. The dependent variable is the number of classrooms in use in municipal schools per 1000 inhabitants in the top panel and the index of municipal school quality in the bottom panel.

increase in health infrastructure. The time profile of the program's impact on infrastructure in Figure 5.3 also mirrors its impact on tax revenues (Figure 5.2). This provides further reassurance that it is the extra tax revenues that allowed for the increase, and not the program's own funds (disbursed over the first two years of the program).

Identification: impact of transfers

I use the fact that the largest intergovernmental transfer in Brazil is redistributed on the basis of population via a formula based on cutoffs to address the likely endogeneity of central government funding to municipalities. This rule specifies that all municipalities in the same state and in a given population bracket receive the same amount of *FPM* transfers, the main transfer received by Brazilian municipalities. The revenue sharing mechanism determining the amount $FPM_{i,t}^{s}$ received by government i in state s is

$$FPM_{i,t}^{s} = \frac{f(pop_{i,t})}{\sum_{j \in s} f(pop_{j,t})} FPM^{s} \tag{5.3}$$

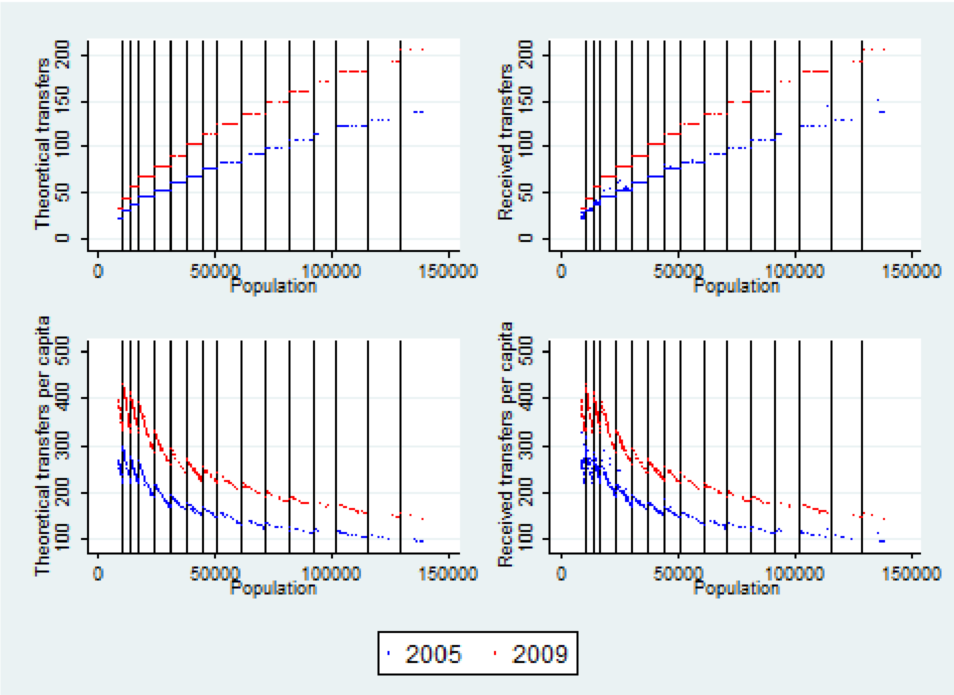
where $f(pop_{i,t})$ is the coefficient corresponding to the population bracket in which the local government's population is found. Municipalities with more than 142,633 inhabitants (3% of the sample) receive an amount of FPM transfers based on a slightly different rule and are therefore excluded from the analysis of the impact of transfers.

Appendix Appendix Table 9.1 presents the population brackets and associated coefficients. I construct the amounts of theoretical FPM grants each municipality should receive according to the above rule based on its state and population size for each year.[34] Figure 5.4 displays the scatterplot of received and theoretical *FPM* transfers as a function of population size in the state of Sao Paulo in 2005 and 2009 to illustrate the rule. The vertical lines represent the population thresholds. We see that, although there are multiple cases of mis-assignments around the population thresholds, the amount of *FPM* transfers received by municipal governments displays clear

[34] Coefficients are set by Decree No. 1881/81 and do not change over the period considered. The share of each state in the total amount of federal funds allocated to *FPM* transfers is specified each year in the *Boletim do Tribunal de Contas da União*. Appendix Table 9.1 reports the average of those theoretical grants as well as the average actual grants received by municipalities in each population bracket.

jumps at each threshold. Following Brollo et al. (2010) I therefore use the amount that the rule predicts each municipality should receive (theoretical transfers) as an instrument for the transfer actually received.

Figure 5.4: The transfer allocation rule



Graphs on the left present the amount of transfers the FPM allocation rule predicts each municipality will get in year t as a function of its estimated population size released on the 1st of July by the IBGE in the year $t-1$. Graphs on the right present the amount of transfers effectively received by the municipality as declared by the *Tesouro Nacional*. The top panel shows nominal total transfers, the bottom panel nominal transfer per capita. The blue dots (the lowest series) are for the year 2005, the red dots (the highest series) for the year 2009.

Previous papers have used the transfer allocation rule to implement a regression-discontinuity design strategy, comparing municipalities just below and just above thresholds (see Brollo et al. (2010); Litschig and Morrison (2010); Litschig (2011)). An alternative is to consider only within-municipality variations, ie to estimate the impact of transfers using municipalities which pass from one population bracket to the next over time. This is my preferred strategy as my identification strategy for taxes relies on using only within-municipality variations (or within group variations over time when the outcome variable is corruption) and I wish to compare the impact of taxes and transfers. There is no a priori reason for within municipality and between municipalities estimates to differ.[35] I show that the results I obtain are very similar to what one would obtain using both within and between municipalities variations.

This identification strategy is valid if 1) there are no other policies that are discontinuous at the same population thresholds and 2) population estimates used to define the instrument are not manipulated by local governments to sort above the threshold. One other policy is discontinuous in municipal population size: the wage of local councillors is capped and increases discontinuously when the population reaches 10,000 50,000 and 100,000 inhabitants (see Ferraz and Finan (2008b)).[36] Three *FPM* thresholds are close to those (thresholds at 10,188 50,940 and 101,880 inhabitants), I show that my results hold even if we exclude these thresholds.

The population variable I use as an instrument comes from annual estimates by the Brazilian statistical agency (*IBGE*). The Appendix describes how these estimates are obtained and why it is very unlikely that municipalities could manipulate them[37]. Appendix Figure 9.1 checks visually for evidence of manipulation of the running variable by showing the frequency of municipalities with less than 142,633 and more than 8490 inhabitants.[38] A formal McCrary test for the presence of a density discontinuity is in appendix Figure 9.2 which plots the estimates of kernel local linear regressions of the log of the density separately on both sides of the thresholds (see

[35] Nearly half of the municipalities change population bracket between 1999 and 2009.

[36] Two other population thresholds (300,000 and 500,000) exist but they are not relevant for our analysis as the *FPM* rule only applies for municipalities of less than 142,633 inhabitants.

[37] These estimates are used by the *Tribunal de Contas União* to determine how much each municipality will receive. The *IBGE* estimates and the population numbers used by the *TCU* do no however perfectly coincide. Manipulation probably happens at this stage.

[38] Municipalities with less than 8490 inhabitants are excluded from the analysis because they are more than 1698 inhabitants away from the first threshold, half the size of the population brackets in between the first thresholds.

McCrary (2008)). I perform the tests on all thresholds simultaneously by normalizing population size as the distance from the closest threshold (with symmetric intervals around each threshold so that no municipality belongs to more than one interval). There is no sign that municipalities manipulate the population estimates: the log-difference between the frequency to the right and to the left of all thresholds on average is not statistically significant.[39] Appendix Figure 9.3 presents the same test for each individual threshold separately. Again, the log-difference between the frequency to the right and to the left of each threshold is never statistically significant, despite some (visual) suspicion of a little sorting around thresholds 4 and 14. The use of within municipalities variations suggests another test of manipulation of the running variable. Municipalities have a greater incentive to manipulate their estimated population size next year when they are currently close to, but below, a threshold. Appendix Figure 9.4 plots average population growth between years $t + 1$ and t as a function of population size in year t. There is no evidence of this type of manipulation either.

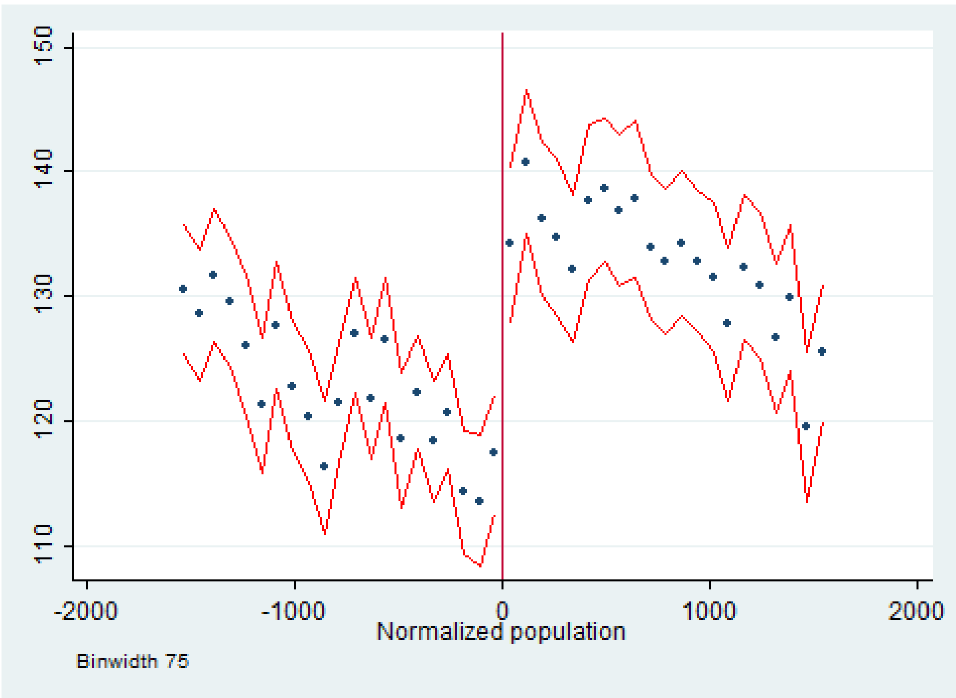
Figure 5.5 plots average *FPM* transfers per capita received as a function of (normalized) population size. We see a clear jump of 10-20 Rs at the threshold, roughly 15% of the pre-treatment amount. Table 5.8 presents the impact of the population discontinuity on the pooled sample and for each individual threshold, using a second order spline polynomial.[40] The first column presents results obtained by using both within and between municipalities variations the second and third using only variations within municipalities. The third column restricts the sample to the common support sample and weights municipalities by a function of their propensity score.

Transfers per capita increase by 14 Rs on average in the pooled sample.

[39] The point estimate (standard errors) for the test in Figure 9.2 is 0.0509 (0.0607).

[40] This specification includes a different second order polynomial on each side of each threshold.

Figure 5.5: The population discontinuity and *FPM* transfers



The graph plots average *FPM* transfers per capita as a function of normalized population size (population size minus the nearest threshold value). Scatter points are averaged over 75 inhabitants intervals. The solid lines are the 95% confidence interval of the means.

Results are extremely similar with and without municipality fixed effects. As in Figure 5.4 the jump is decreasing in population size, from more than 20 Rs at the first threshold, to 3 Rs at the last threshold. Note that at threshold 5 transfers per capita increase by 9.5 Rs, an amount similar to the increase in taxes per capita thanks to the *PMAT* program. Finally the estimate in column three is smaller, because it gives more weight to non-*PMAT* municipalities that are similar to the ones who joined the program. Those are on larger than the average municipality. The average effect of the discontinuity on this re-weighted sample is close to 9 Rs, again similar to the impact of the program on tax revenues.

Table 5.8: First stage: impact of the population discontinuity on FPM transfers

	No fixed effects		Fixed effects		Fixed effects + weights	
	All thresholds					
Discontinuity	14.375***	(0.620)	14.495***	(0.624)	8.751***	(2.041)
Observations	27459		27459		20556	
	Threshold 1					
Discontinuity	23.030***	(1.851)	23.258***	(1.889)		
Observations	5737		5737			
	Threshold 2					
Discontinuity	19.248***	(1.527)	19.531***	(1.564)		
Observations	4484		4484			
	Threshold 3					
Discontinuity	15.569***	(1.434)	15.770***	(1.466)		
Observations	4735		4735			
	Threshold 4					
Discontinuity	13.924***	(1.059)	14.294***	(1.063)		
Observations	3744		3744			
	Threshold 5					
Discontinuity	9.475***	(1.118)	9.548***	(1.140)		
Observations	2408		2408			
	Threshold 6					
Discontinuity	6.637***	(1.353)	6.258***	(1.356)		
Observations	1372		1372			
	Threshold 7					
Discontinuity	5.728***	(1.141)	6.186***	(1.127)		
Observations	1008		1008			
	Threshold 8					
Discontinuity	7.711***	(1.206)	7.899***	(1.171)		
Observations	824		824			
	Threshold 9					
Discontinuity	3.266***	(1.103)	3.081***	(1.174)		
Observations	824		824			
	Threshold 10					
Discontinuity	5.079***	(0.932)	5.338***	(0.925)		
Observations	615		615			
	Threshold 11					
Discontinuity	4.752***	(1.543)	4.740***	(1.385)		
Observations	478		478			
	Threshold 12					
Discontinuity	4.037***	(0.713)	3.875***	(0.627)		
Observations	373		373			
	Threshold 13					
Discontinuity	2.727**	(1.095)	2.785**	(1.156)		
Observations	338		338			
	Threshold 14					
Discontinuity	5.313***	(1.882)	4.338***	(1.270)		
Observations	255		255			
	Threshold 15					
Discontinuity	1.432	(1.202)	3.337***	(0.890)		
Observations	264		264			

The specification in the first column includes state and year fixed effects, the specification in the second and third columns municipality and year fixed effects. All specifications include a second order spline polynomial in population size. Observations in the third column are weighted by a function of their estimated probability of joining the program (weights are equal to 1 for municipalities that join the program). The interval around a threshold is plus or minus 1698 inhabitants for thresholds 1 to 3, plus or minus 3396 for thresholds 4 to 8, plus or minus 5094 for thresholds 9 to 13 and plus or minus 6792 for thresholds 14 and 15. Each interval is constructed so that each municipality with population size between 8490 and 143'633 is in one and one only interval around a threshold.

Comparing taxes and transfers

These assumptions ensure that the interpretation of the coefficients in equations (5.1) and (5.2) as causal effects is correct. To interpret any difference between them as validation of the structural difference predicted by the model requires making an additional assumption regarding the heterogeneity of the effects. The estimates are local average treatment effects (LATE): they represent the average marginal propensity to spend out of taxes (transfers) amongst municipalities that are affected by the instrument for tax (transfer) revenues. There could therefore be two reasons for differences between π_T and π_F and between ϕ_T and ϕ_F. The first is the one predicted by the model: local governments have to spend increases in taxes better than increases in transfers. But we could also see a difference if all municipalities spend taxes and transfers in the same way, but have different marginal propensities to spend out of increases in (all types of) revenues and estimates of the impact of taxes are obtained on the sample of those with higher marginal propensities to spend. It is for example plausible that, all else equal, the marginal propensity to spend public revenues on infrastructure is higher in municipalities that have less public revenues to start with and less health and education infrastructures.

We know which sample is affected by the tax instrument: it is the sample of municipalities that join the program[41]. We also know which samples are affected by the transfer instrument: all municipalities located around the 15 population thresholds defined by the formula. The fact that we have 15 different local effects of an increase in transfers is particularly useful in this

[41]Note that this is a consequence of our assumption that the first stage equation - the impact of the program on tax revenues - estimates an average effect for treated municipalities only. If we think the first stage estimates the average effect for all municipalities in Brazil the sample of municipalities affected by the tax instrument is all those that would increase taxes if they joined the program. This difference does not alter the interpretation of the results substantially.

context as it can be used to assess whether this marginal propensity does vary a lot in our sample. Moreover we can 'choose' from these 15 estimates the ones obtained from subgroups that look more similar to the population affected by the tax instrument.

The use of weights based on the estimated probability of joining the program for non-program municipalities is one way to select the most appropriate comparison group. It ensures that more weight is given to municipalities that are similar to the ones affected by the tax instrument along observable characteristics (see Table 5.4). This implies that the average estimated impact of transfers on public spending outcomes will give more weight to municipalities that have levels of public revenues per capita and health and education infrastructure that are similar to those in program municipalities. Appendix Table 9.2 presents descriptive statistics for each subgroup of the population affected by each particular threshold, as well as the average weight it is given in the weighted specifications. We see that municipalities affected by the thresholds 5 to 11 are given a higher weight in the estimation (average weight higher than 1). Threshold 5 is of particular interest as it experiences an increase in transfers that is of roughly the same size as the increase in taxes. Municipalities affected by thresholds 8,9 and 10 look particularly similar to municipalities that join the program in terms of revenue per capita and municipal infrastructure. I present results for each individual threshold separately in what follows and discuss the observed heterogeneity in marginal propensity to spend out of transfers.

B Results

Table 5.9 presents estimates of the impact of a 10 Rs increase in taxes and transfers on municipal public spending outcomes. The first column presents results for the impact of transfers in a specification without municipality fixed effects but with the full set of time-invariant controls. Estimates in

Table 5.9: Marginal propensity to spend out of a 10 Rs increase in taxes or transfer revenues

	No fixed effects	Fixed effects		Fixed effects + weights	
Dependent variable: quantity of municipal education infrastructure					
Transfers per capita	0.023**	0.004		0.003	
	(0.012)	(0.013)		(0.030)	
Taxes per capita			0.161***		0.180***
			(0.050)		(0.053)
Observations	27438	27393	40373	20544	28214
Dependent variable: quality of municipal education infrastructure					
Transfers per capita	0.034***	0.055***		0.007	
	(0.008)	(0.008)		(0.023)	
Taxes per capita			0.228***		0.222**
			(0.071)		(0.113)
Observations	27420	27375	40335	20526	28182
Dependent variable: quantity of municipal health infrastructure					
Transfers per capita	-0.137	-0.100		-0.168	
	(0.111)	(0.168)		(0.179)	
Taxes per capita			1.085**		1.219*
			(0.519)		(0.641)
Observations	9697	9579	14255	7226	9999
Dependent variable: corruption index (no fixed effects)					
Transfers per capita	10.751***	12.832***			
	(3.693)	(4.490)			
Taxes per capita		-10.158			
		(9.607)			
Observations	424	509			

Cluster-robust standard errors in parentheses. All specifications include year fixed effects and time-varying controls (GDP per capita, population size, the shares of agriculture and services in GDP, whether the mayor is in his second term, and political competition in the last election). Specifications without fixed effects (first column and last panel) include state fixed effects and as controls a indicator of whether the municipality joins a *PMAT* program between 1998 and 2008 and municipal characteristics (income per capita, inequality, median education, life expectancy, population density, all in 2000, and whether the municipality has a local radio station in 1998 and a seat of the judiciary branch in 1998). When transfers per capita are the main explanatory variable the sample includes only municipalities with more than 8400 and less than 143000 inhabitants and the specification includes a second order spline polynomial.

the second and third columns are obtained from running specification (5.1) and (5.2) in the full sample.[42] The last two columns present estimates obtained from running these specifications on the weighted sample.

An increase in transfers leads to a small improvement in both the quantity and quality of municipal education infrastructure in the unweighted sample, but this effect is much smaller than the impact of an increase in taxes. Higher transfers lead to a large increase in the corruption index of 10 to 12 (6% compared to the unweighted average, 23% compared to the weighted average). This is in line with the results in Brollo et al. (2010) that a 10% increase in transfers leads to a 17% increase in corruption. The coefficients for tax revenues are the ratios from the estimated impact of the program on spending outcomes (Table 5.7) and on taxes (Table 5.5). An increase of 10 Rs in tax revenues thanks to the program leads to an extra 0.18 classrooms per thousand inhabitants, a nearly 6% increase compared to an average 3.1 classrooms in treated municipalities the year before the program starts. It increases the school quality index by 0.2, a small amount corresponding roughly to one-fifth of a standard deviation. The impact on the number of health establishments per 100,000 inhabitants is more substantial, it increases by nearly 7% compared to its pre-program level. Finally, we see a large, but not statistically significant, impact on the corruption index, which decreases by 10 to 15% compared to its pre-program level in the 20 municipalities audited before they started a program. The results are therefore in line with the predictions of the model.

The coefficients for transfer revenue in Table 5.9 are averaged over 15 local effects of an increase in transfers at a population threshold. Appendix Table 9.3 shows the impact of extra transfers on health and education in-

[42] When transfers are the main explanatory variable the sample includes only municipalities with more than 8400 and less than 142'633 inhabitants and the specification includes a spline polynomial.

frastructure for each threshold separately.[43] We see that these impacts vary at each threshold, but always remain lower than the average impact of an increase in taxes thanks to the program. The increase in transfers has a larger impact on the quantity of school infrastructure in smaller municipalities: 0.07 to 0.1 extra classrooms at thresholds 1 to 4. This is coherent with the results in Litschig (2008) that an increase in transfers leads to better education outcomes amongst small municipalities.[44] The largest point estimate (not statistically significant) is found at threshold 7: at 0.145 it is still 20% smaller than the estimated impact of tax revenues. The estimated impact on the quality of education infrastructure similarly varies between -0.16 and 0.16 and is statistically significant in some smaller municipalities (thresholds 1 2 and 3) as well as some bigger ones (thresholds 7,9 and 12). Finally there seems to be no impact of higher transfers on municipal health infrastructures at any of the population thresholds - coefficients tend to be negative.

One cannot completely rule out the possibility that municipalities affected by the instrument for tax revenues (those that join the program) have higher marginal propensity to spend on municipal infrastructure out of all revenues - taxes or transfers - than the average municipality in Brazil. However the 15 different estimates of the propensity to spend out of transfer revenues available provide potential bounds for the variations of this parameter in the population. The upper bounds are always below the observed propensity to spend out of taxes. We can also rule out the possibility that program municipalities have higher propensities to spend out of extra public revenues because they have different baseline levels of revenues or needs as municipalities around thresholds 8 to 10 look very similar to program municipalities in all these respects.

[43]I cannot repeat the exercise using the corruption index as the sample size is too small.
[44]Litschig (2008) looks at small municipalities in 1980s Brazil.

C Discussion

Why are tax revenues spent more towards municipal infrastructure and less on corruption than transfer revenues? The model above suggests that increases in tax revenues are better observed than increase in transfer revenues by citizens, and hence better spent. Table 5.10 offers a test of this mechanism. Following Ferraz and Finan (2011) I use the presence of a local radio station as a proxy for how much information citizens can access about local public budgets. If the presence of a local radio station decreases information asymmetries between citizens and elected officials (lower u in the above model) we expect transfers to be spent better when there is a local radio station, and no change in the impact of taxes. This is a test of Proposition 4 above.

The time-invariant municipal characteristic 'has a local radio station' in the last two columns has a negative impact on corruption, in line with Ferraz and Finan (2011). The coefficients for the interaction term between the radio variable and transfers per capita are in line with the model's predictions: transfers are better spent when there is a local media. Results in the last column are however surprising as they suggest that all the negative impact of tax revenues on the corruption index comes from municipalities which have a radio station (60% of municipalities in the *PMAT* program).

Appendix Tables 9.7 and 9.8 explore two alternative mechanisms which could lead to a difference in how increases in tax and transfer revenues are spent. Governments which rely more on local tax revenues may have better incentives to invest in public goods if this increases the local tax base, as suggested by Tiebout (1956). The program has however no impact on local GDP or population, suggesting this mechanism is not relevant in the context of Brazilian local governments. This could be because the types of investments local governments can make in Brazil are unlikely to affect local

Table 5.10: Marginal propensity to spend out of taxes and transfers with and without a local radio station

	Educ. infrastructure: quantity		Educ. infrastructure: quality		Health infrastructure		Corruption	
Transfers per capita	-0.007		0.010		-0.179		10.851***	
	(0.030)		(0.013)		(0.191)		(3.657)	
Transfers*Radio	0.009		0.028*		0.112*		-1.015	
	(0.006)		(0.015)		(0.059)		(2.015)	
Taxes per capita		0.217		0.232*		1.101***		1.761
		(0.135)		(0.117)		(0.314)		(11.210)
Taxes*Radio		-0.011		-0.003		0.046		-11.108
		(0.092)		(0.021)		(0.103)		(20.162)
Radio							-8.581	-7.627
							(21.754)	(12.684)
Observations	20544	28214	20526	28182	7226	9999	424	526

Cluster-robust standard errors in parentheses. All specifications include year fixed effects and time-varying controls (GDP per capita, population size, the shares of agriculture and services in GDP, whether the mayor is in his second term, and political competition in the last election). Specifications without fixed effects (last two columns) include state fixed effects and as controls a indicator of whether the municipality joins a *PMAT* program between 1998 and 2008 and municipal characteristics (income per capita, inequality, median education, life expectancy, population density, all in 2000, and whether the municipality has a local radio station in 1998 and a seat of the judiciary branch in 1998). When transfers per capita are the main explanatory variable the sample includes only municipalities with more than 8400 and less than 143000 inhabitants and the specification includes a second order spline polynomial.

growth fast enough to be a relevant factor for politicians (and detected in my sample). Another difference between taxes and transfers could be that tax revenues are more stable than transfer revenues. This could explain the results in Table 5.9 if local governments only invest in infrastructure when they experience an increase in revenues that they believe is stable over time, and divert increases in revenues that are short lived. The within-municipality standard deviation is however always smaller relative to the mean for transfer revenues than for tax revenues. This is unsurprising given that the transfers considered only vary if the total amount allocated to *FPM* transfers at the federal level changes or if the municipality's population reaches a threshold. This mechanism could be relevant if one considered discretionary transfers which are more volatile.

6 Conclusion

This paper shows that a local tax modernization program in Brazil leads to a permanent 11% increase in taxes per capita, an increase in municipal health and education infrastructure, and no increase in the incidence of a broad measure of corruption. I take advantage of the variation in taxes induced by the program and discontinuities in the rule allocating federal transfers to test a theoretical prediction that taxes are more *accountability inducing* than transfers. Results show that local governments use the increase in taxes thanks to the program to provide more health and education infrastructure than they do when faced with an increase in transfer revenues of the same amount. More transfers lead to more corruption, more taxes do not.

These results speak directly to debates about the right form of decentralization. The existence of a large 'fiscal gap' between local expenditure responsibilities and local tax revenues is an ubiquitous characteristic of local governments around the world. In developing countries in particular these governments have been granted substantial expenditure responsibilities, but local capacity to tax generally lags behind. My results suggest that narrowing this fiscal gap by empowering local governments to levy more tax revenue will make them more accountable to their constituents. Substantial local tax collection – complemented by intergovernmental transfers for revenue equalization purposes – is a necessary feature of successful decentralization.

Moving up from the local government level the mechanisms explored in this paper also contribute to debates on how to finance development. One of the recommendation of the 2005 report on achievement of the Millenium Development Goals is that developing countries should increased domestic resources by up to four percentage points by 2015 (Sachs et al., 2005). There is however very little research on how this aim could be achieved. Moreover, technical aid on public sector financial management has always been the poor parent of official development aid.[45] This paper shows that one type of resource mobilization program in place in Brazil for more than a decade has been successful in providing long term sources of funds to local governments. Moreover, the theoretical argument developed in this paper also applies to a federal government financed by tax and non-tax revenues (such as aid or revenues from natural resources). It suggests that technical help in tax capacity building may lead to an increase in public resources which is more conducive to the type of public spending that benefits citizens than traditional development aid.

[45] See OECD (2010a) for a discussion of the different forms of aid in public sector financial management.

Chapter 6

Conclusion

What's next?

This thesis' introductory chapter has summarized the key contributions of my research. Each subsequent chapter has its own concluding section. The purpose of this chapter is to discuss questions which I believe are interesting avenues for future work on public finances and development.

1 Why invest in tax capacity?

Chapters 3 and 5 stress the importance of governments' capacity to tax. Both end with the recommendation that more attention should be paid to how tax capacity can be increased. This is not a straightforward policy recommendation: tax policy and administration are country prerogatives donors typically cannot influence much. Understanding why some governments choose to invest in tax capacity is crucial to understanding how it can be increased. Moreover, I agree with Besley and Persson (2011) who argue that understanding what forces shape the building of well-functioning state capacities will greatly contribute to understand the process of economic development, as one typically cannot be found without the other. These authors have constructed a theoretical framework that yields predictions regarding which types of governments will choose to invest in state capacity and present some cross-country correlations that are in line with these predictions. No rigorous empirical investigation of the determinants of investments in tax capacity is however available today.

In Chapter 5 I discuss why some local governments in Brazil have chosen to take part in a tax capacity program. I cast the question aside fairly quickly because the lack of publicity for the program implies that one key unobserved variable (information about its existence) is probably driving most of the selection. Other types of investments in tax capacity may suit themselves more to the study of their determinants. In Brazil for example, the *Perfil dos Municipios Brasileiros* survey provides information on the last date at which local governments chose to update their tax registers. Appendix 5 discusses this particular type of investment at length, it is probably the most common and easy to implement type of investment in tax capacity that occurs at the local level in Brazil.

Can the predictions of Besley and Persson (2011) be taken to this data? Considering variations across different government units in the same political and economic context of Brazil presents several advantages and one key inconvenient. The first advantage is the plausible homogeneity of the outcome of interest. Chapter 3 is confronted with the impossibility of finding clear proxies for investments in tax capacity that are available across countries. The creation of a VAT system seems like a good candidate, but may turn out to be a poor measure of tax capacity (more on this below). On the contrary the outcome 'updating tax registers' is well defined and arguably fairly homogenous amongst Brazilian local governments: all use the same tax instruments on a similar scale, and we know what updating tax registers consists in. A second advantage is that determinants of tax capacity that are hard to measure (and thus a source of omitted variable bias) not vary much across local governments. Variations in the willingness to pay taxes, institutional systems or political culture are smaller between Brazilian municipalities than between countries. This limited variation is also an inconvenient: all municipalities face the same likelihood of external war or of being a parliamentary democracy, two of the variables that Besley and Persson (2011) present as positively influencing the decision to invest in tax capacity. Nevertheless one could study for example how the level of inequality – a potential proxy for how divided citizens are on their preferences for public good provision – affects the decision to invest. Political competition and term limits affect the incumbent's probability of reaping future benefits from increased tax capacity; both these characteristics vary at the local level. Returns to tax capacity, which chapter 3 argue determine a government's willingness to invest, also likely differ across municipalities in ways that are observable[1]. Investigating why some local governments in Brazil decide to invest in their capacity to tax is a logical complement to the analysis in Chapter 5 that I intend to pursue in the future.

2 Decentralization and political participation

Chapter 5 discusses briefly the potential merits of decentralization. Many countries in the developing world have decentralized expenditure responsabilities to lower levels of government over the past three decades. These changes were often encouraged by international institutions and donors who argue that decentralization is one way to bring governments 'closer to the people', to paraphrase the 1997 World Development Report, *The State in a Changing World*. The gist of their argument is that local governments have an informational, an accountability and a mobilization advantage over federal governments (Bardhan and Mookherjee, 2006). They know more about local contexts and needs for public goods and so should be better able to design policies that meet these needs and adapt to these contexts. They can be held accountable by voters for local outcomes in a way national politicians typically cannot (for a theoretical version of this argument see Seabright (1996)). Finally, decentralization advocates believe that it is at the local level, where both issues and office holders are more salient to voters, that citizens' motivation to participate in politics is the greatest[2].

The idea that decentralizing government will increase citizens' engagements with politics and policy issues may seem strange to readers in the developed world. These readers are likely to have witnessed low levels of political participation during local elections, lower than those observed dur-

[1] Municipalities in which tourism is a major activity for example have more to gain from increasing their capacity to raise a tax on services.

[2] This argument dates back to the classic Dalh and Tufte (1973) study on community size and democracy.

ing national elections – a potential sign that citizens engage less with their local governments. This turnout differential between local and national elections has indeed become a stylized fact in political sciences since Morlan (1984) who first presented evidence that this differential holds across Western Europe and the United States for comparable elections. This literature points out the risk of 'voter fatigue' occasioned by a multiplicity of elections (Rallings et al., 2003). Does this question one of the alleged merits of decentralization in developing countries?

Explaining differences in the size of the turnout differential between national and local elections is one way to start answering the question. A natural hypothesis is that citizens vote less in local elections because their stakes are less high. Even when they are in charge of providing salient public goods, such as primary education in Brazil, local governments are in always in charge of a much smaller budget than federal governments. Andersen et al. (2010) find some evidence in line with this hypothesis in a study of Norwegian municipalities: they find that the national-local turnout differential is lower in municipalities that receive revenue windfalls from hydro energy sources.

Can this hypothesis explain differences in the national-local turnout differential across countries? Data on turnout and expenditures at the local level is rarely available in developing countries.[3] One needs to turn to developed countries to look for a potential link between fiscal decentralization (how much government expenditures are decentralized to sub-national units) and the turnout differential.[4] Table 6.1 lists the countries for which ratios of

[3]The issue is complicated further by the fact that many developing countries have compulsory voting laws.

[4]Data on government expenditures at the central and sub-national levels for the period 2000-2006 comes from the OECD publication *Governments at a Glance 2009*. Turnout at data the central government level is compiled by the Institute for Democracy and Electoral Assistance (IDEA). Local turnout rates for 15 European Union countries during the 1990s comes from the EU publication *Voter Turnout at Regional and Local Elections in the European Union, 1990-2001.*. Local turnout data for non EU countries comes from official government websites and are averages for the period 1990-2001. Most countries

national to local elections turnout and central to sub-national government expenditures are available, the type of local government considered and the number of these local governments. Municipal governments are an administrative and political entity whose definition varies a lot across countries and for which data is typically less available than for regional governments. I therefore only consider turnout at the highest sub-national level. The expenditure data typically does not differentiate between municipal and regional governments, I use the ratio of central to sub-national expenditures to measure fiscal decentralization.[5]

Table 6.1: Countries in the sample, type and number of local governments

Country	Local government type	Nb of local governments
Austria	Region (*Lander*)	9
Czech Republic	Region (*Kraje*)	13
Denmark	Region (*Amter*)	14
Finland	District (*Kunta*)	455
France	Region (*Régions*)	26
Germany	Region (*Lander*)	16
Hungary	Region (*Counties*)	19
Iceland	District (*Municipalities*)	79
Italy	Region (*Regioni*)	20
Ireland	District (*City councils*)	29
Netherlands	Region (*Provinciale Staten*)	12
New Zealand	Region (*Regional Councils*)	12
Poland	Region (*Voivodeships*)	16
Portugal	District (*Municipios*)	305
Slovakia	Region (*Krajov*)	8
South Korea	Region (*Provinces and cities*)	14
Spain	Region (*Communidades Autonomas*)	17

Figure 6.1 presents relative turnout as a function of fiscal decentralization. We see that citizens do vote more when electing politicians in charge of

have three tiers of governments - federal, state (or region) and local governments per se.

[5]I exclude from the sample countries which have compulsory voting laws (such as Belgium, Greece and Luxembourg), countries in which local elections are typically held at the same time as local elections (such as the US) and countries in which local elections happen at different times, so that there is no single measure of turnout at local elections (such as Japan). An exception is Germany, where states hold elections at different times but for whose small number of local governments makes it possible to gather data on all local elections over a given time period.

larger budget: as the share of central to local expenditure increases so does the turnout differential. Figure 6.2 considers the possibilities that voters care about expenditures *per capita* and not total expenditures when deciding whether to vote by scaling the expenditure ratios by the number of local governments. The relationship between the turnout differential and fiscal centralization remains positive.

The cross-country evidence in Figures 6.1 and 6.2 suggests that voters are more likely to mobilize politically when there is more government expenditure at stake. It is difficult to reach firm conclusions regarding causality based on this evidence alone. Citizens in some of these countries may have a particularly strong attachment to their regional identities that are reflected in the country's fiscal constitutions (the choice of being a federation, for example) and lead to higher turnout at the local level. The government expenditures ratio may moreover not be the type of fiscal decentralization citizens care about when deciding to turn out. The model in Chapter 5 suggests that the ratio of central to sub-national taxes may be a more relevant measure[6]. However, this evidence combined with the results of Andersen et al. (2010) helps explain low levels of turnout during local elections in developed countries. This does not contradict the idea that decentralization increases citizen's political mobilization.[7] But it does imply that to reap these mobilization benefits a substantial share of government expenditures must be devolved to sub-national governments.

[6] This ratio is available for only a small number of countries in the sample.

[7] One would have to compare citizens' involvement in local policy issues when these are dealt with by a local government and by the local branch of a federal bureaucracy.

Figure 6.1: Relative turnout and government size in OECD countries

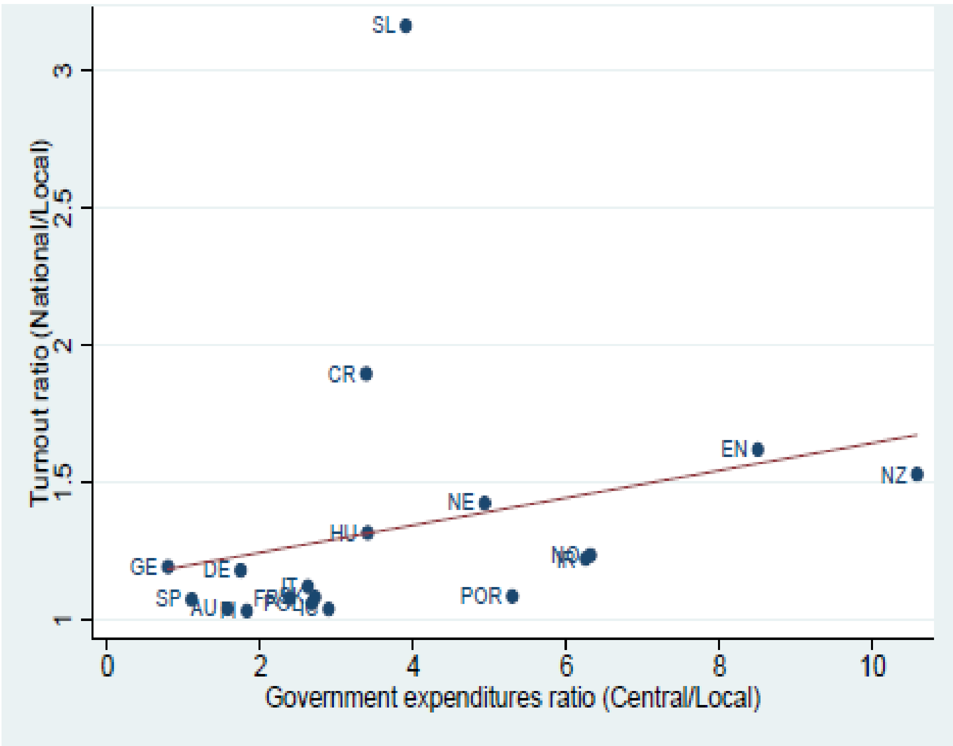
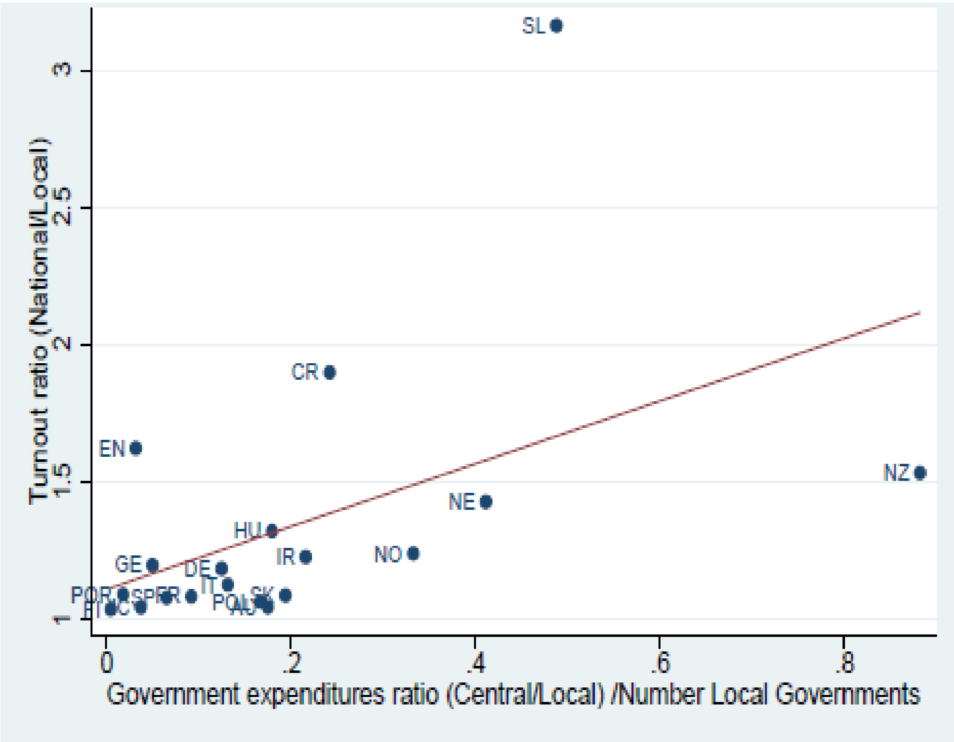


Figure 6.2: Relative turnout and government size in OECD countries (3)



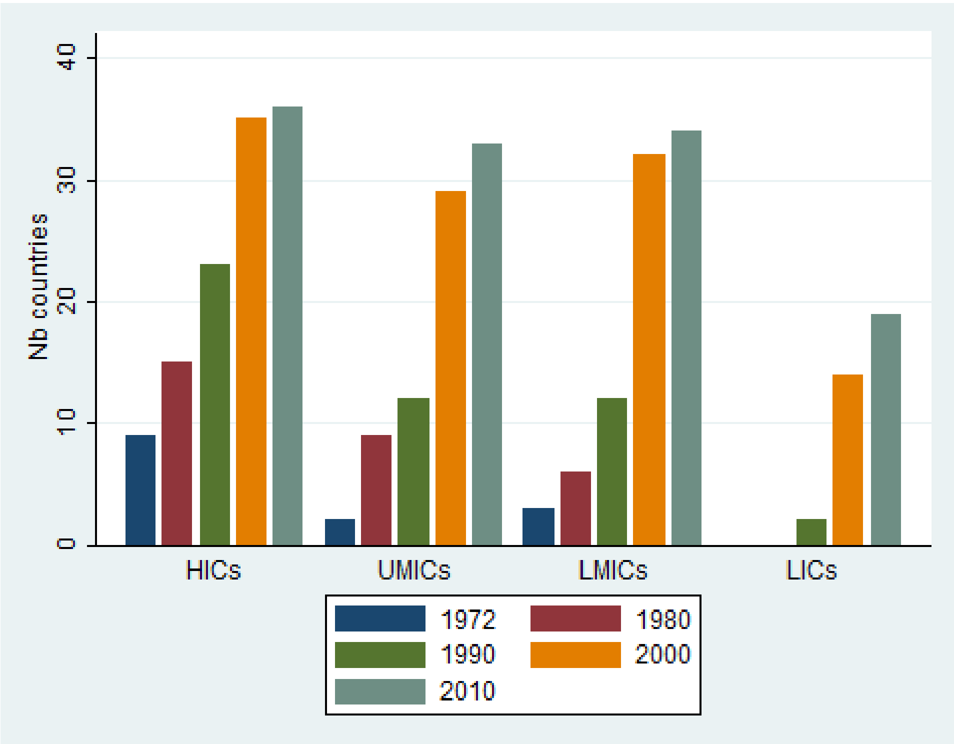
3 VAT everywhere but in tax statistics

We have seen in the introduction that developing countries collect over a third of their total tax revenues through taxes on goods and services. One of these taxes is used by most countries around the globe and is of particular interest for developing countries. Over 140 countries use Value-Added Tax (VAT) today (Bird and Gendron, 2007). It is generally considered to be superior to any other forms of taxation on good and services, for two reasons. First, when perfectly implemented it does not induce production inefficiencies, unlike turnover and sales taxes. The VAT is levied on all value added at each production stage: firms pay VAT on the difference between total sales and total input cost so the burden of taxation ultimately only bears on final consumption. Second, it is widely believed to facilitate enforcement through a built-in incentive structure (Kopczuk and Slemrod, 2006; Slemrod, 2008). Firms have an incentive to ask their suppliers for accurate receipts because they can deduct input costs from their VAT bills. The amounts paid are recorded in two sets of books, making cross-checking by the tax authorities easier.[8] This enforcement advantage is particularly interesting for developing countries with limited tax capacity.

Fifty years ago the VAT was seen as a French delicacy – generally thought to be a good idea but rarely found outside France. The rise of this tax has been one of the most significant development in tax policy of recent decades (Keen and Lockwood, 2010). Figure 6.3 shows how it has gradually been adopted by most countries in the world with a surge since the 1990s. Keen and Lockwood (2010) discuss the reasons for this widespread adoption. They show that participating in an IMF program is a particular important determinant of VAT adoption and that countries are more likely to adopt it when many of their neighbors already have it.

[8]See Pomeranz (2010) for a generalization of this argument in an Allingham-Sandmo model of tax evasion.

Figure 6.3: Number of countries with VAT system



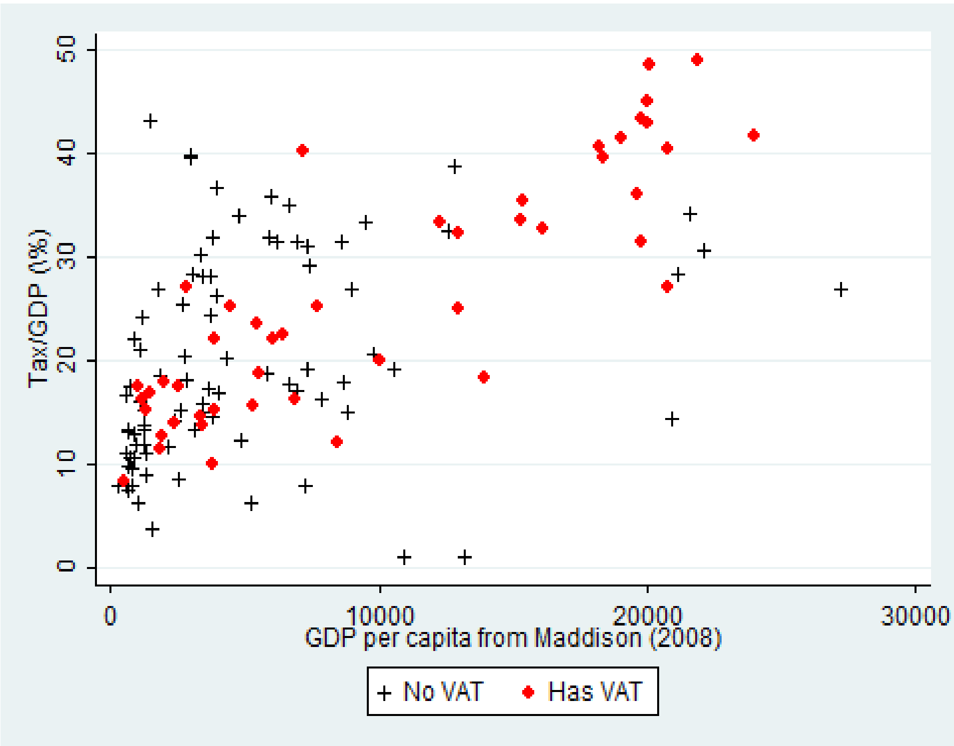
The literature on the VAT is surprisingly sparse. There is little empirical evaluation of its impact on tax revenues. An exception is Keen and Lockwood (2010) who find that adopting a VAT has a small positive impact on tax revenues. However they show that revenue gains are greater in high income countries; their estimates suggest that the adoption did not have significantly positive impact on tax revenues in low income countries. Similarly Nellor (1987) finds a positive impact of VAT adoption on the tax ratios, but he only considers European countries. In Chapter 3 of this thesis I find that having a VAT system does not help countries recover the tax revenue lost from trade liberalization.

Robert Solow famously once said 'You can see the computer age everywhere but in the productivity statistics'[9]. One could say similarly say that the VAT is in developing countries but in the tax statistics. Figure 6.4 plots average tax ratios as a function of GDP over the 1990-2010 period separately for countries with or without a VAT system in 1990. We see no evidence that countries with a VAT levy more taxes as a share of GDP amongst developing countries, in line with the results in Keen and Lockwood (2010). This could indicate that the enforcement facilitating properties of the VAT are either overstated, or exist but have not materialized in many developing countries.

Is the VAT really an efficient revenue-raiser? The presence of large informal sectors in developing countries implies that VAT will not be collected on a large share of sales unless informal producers of intermediate goods are pushed towards tax compliance when their clients ask for official receipts. Pomeranz (2010) finds some evidence of this positive spillover effect in Chile where increasing the audit probability of firms suspected of VAT evasion increases their suppliers' tax payments. This suggests the VAT does have a built-in enforcement structure that is effective when combined with audits

[9] Robert Solow "We'd better watch out", New York Review of Books, July 12, 1987.

Figure 6.4: Tax ratios as a function of GDP, with and without VAT, 1990-2010



in the context of Chile, a country with very low levels of tax evasion according to the OECD. Many countries that have adopted the VAT do not have Chile's high tax compliance record. Whether the VAT increases the ease of collecting taxes in these countries is an open question.

The efficiency advantage of the VAT can be discussed on theoretical grounds as well. By imposing a tax on formal sector production it provides producers of *final* goods with an added incentive to become informal. This could outweigh the positive impact on incentives of producers of intermediate goods to become formal. Piggott and Whalley (2001) provide a formalization of this argument and some evidence that the replacement of a manufacturing sales tax with a VAT on goods and services leads household to shift their consumption away from market production in favor of household production in Canada. Similarly, Emran and Stiglitz (2005) show theoretically that replacing tariffs with a VAT increases the size of the informal sector and could potentially be welfare-reducing. This argument is likely to be of particular importance in developing countries, where the informal sector is typically much larger than in Canada.

A related question is that of the incidence of VAT. The incidence of consumption taxes in an economy without an informal sector has been studied at length in the economic literature (see for example Besley and Rosen (1999)). Introducing an informal sector and potential spillover effects between suppliers and producers of consumption goods in the classic model will very likely change the distribution of the burden of taxation. There is however, to the best of my knowledge, no theoretical or empirical investigation of this question.[10] The fact that many countries with large informal sectors have a VAT suggests that this question is of interest and can be studied using real-world quasi-experiments.

[10]Piggott and Whalley (2001) show that the VAT is progressive in a model without intermediate consumption if one assumes the poor produce goods in the informal sector.

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Chapter 7

Appendix - Tax Capacity...

1 Countries in our sample

Countries followed by * are included in the descriptive statistics presented in the introduction but excluded from the remainder of the analysis because they levy less than 1% of GDP in trade taxes at the start of the period.

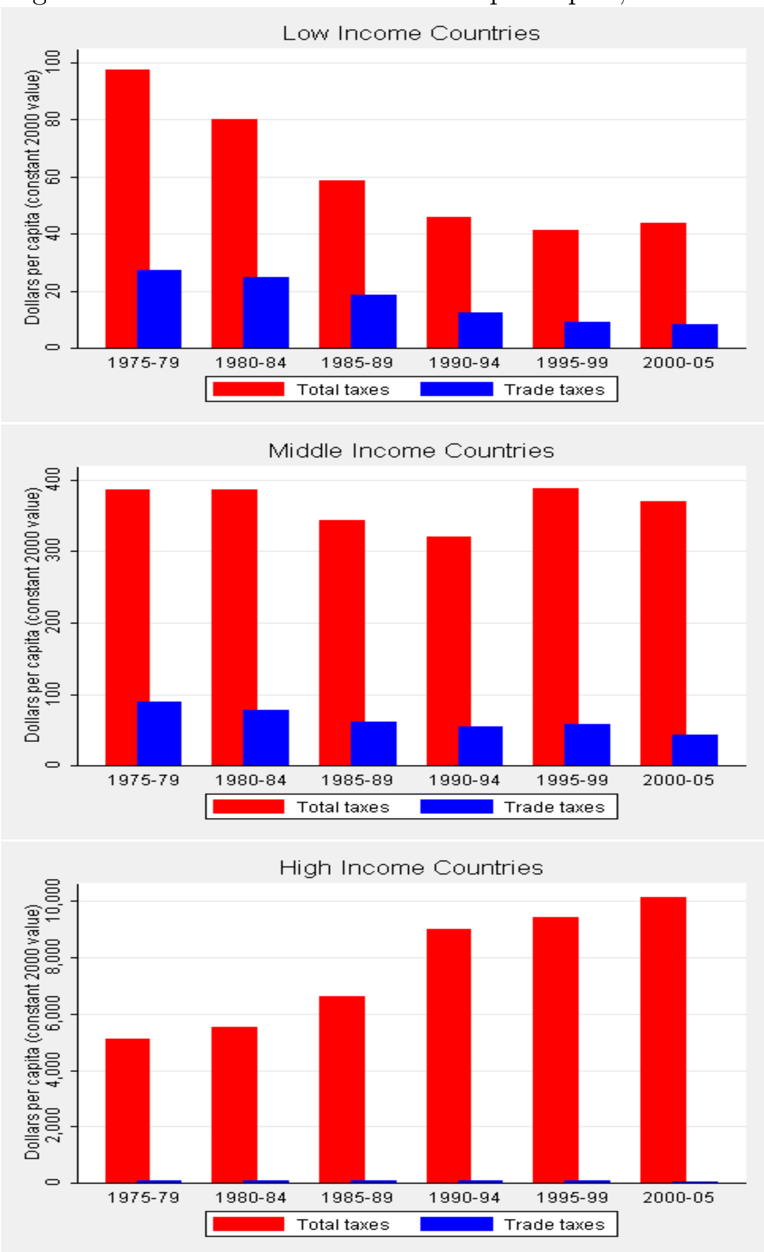
High Income Countries: Australia*; Austria*; Bahamas; Belgium*; Canada*; Denmark *; Finland*; France*; Germany*; Greece; Iceland; Ireland *; Italy *; Japan *; Korea; Kuwait; Luxembourg*; Netherlands*; New Zealand*; Norway*; Portugal; Singapore; Slovenia; Spain *; Sweden *; Switzerland *; United Arab Emirates *; United Kingdom*; United States*.

Middle Income Countries: Algeria; Argentina; Belize; Bolivia; Botswana; Brazil*; Bulgaria; Chile; China; Colombia; Costa Rica; Djibouti; Dominica; Dominican Republic; Ecuador; Egypt; El Salvador; Equatorial Guinea; Fiji; Gabon; Guatemala; Guyana; Honduras; Jamaica; Jordan; Malaysia; Mauritania; Mauritius; Mexico; Morocco; Namibia; Nicaragua; Oman*; Panama; Paraguay; Peru; Philippines; South Africa; Sri Lanka; Suriname; Swaziland; Syria; Thailand; Trinidad and Tobago; Tunisia; Uruguay; Vanuatu; Venezuela.

Low Income Countries: Bangladesh; Benin; Bhutan *; Burkina Faso; Burundi; Cameroon; Central African Republic; Chad; Comoros; Congo, Rep; Cte d'Ivoire; Ethiopia; Gambia; Ghana; Guinea; Haiti; India; Indonesia; Kenya; Lesotho; Madagascar; Malawi; Mali; Mozambique; Myanmar; Nepal; Niger; Nigeria; Pakistan; Papua New Guinea; Sao Tome and Principe; Senegal; Sierra Leone; Tanzania; Togo; Uganda; Zambia; Zimbabwe.

2 Evolution of tax revenues 1975-2005, alternative definition

Figure 7.1: Evolution of tax revenues per capita, 1975-2005



All values are median values for the country group and time period considered. The sample includes in each time period 26 low income countries, 40 middle income countries and 32 high income countries. See Appendix 1 for the list of countries included in our sample and Appendix 3 for a description of the variables.

3 Data Sources

A Tax and Public Expenditure Data

We collect tax data (total taxes and trade taxes) from three different data sources: data from Baunsgaard and Keen (2010), *Historical Government Finance Statistics* and recent *Government Finance Statistics* data; and Mitchell (2007).

Baunsgaard and Keen (2010) take the Government Finance Statistics (GFS) produced by the IMF as their starting point and complement it using the revenue information provided in the context of the IMF's periodic consultations with member countries ('Article IV' data). They obtained an unbalanced panel of 117 countries for the period 1975–2006.

We merge Historical GFS data for the period 1972-1989 with more recent GFS data (1990-2006). We follow the instructions in *Government Finance Statistics Manual 2001 Companion Material – Classification of GFSM 1986 Data to the GFSM 2001 Framework* (IMF, 2001).

We use data for the central government budgetary sector rather than the general government budgetary sector, because coverage is much better for central government data.

The data are in cash since for Historical GFS we do not have accrual data. With the cash basis, flows are recorded when cash is received or disbursed.

Since all the GFS data are in local currency units, we check the currency used (which is not always the same for Historical and current GFS data) and correct a number of mistakes as to the units. We then convert all the data in USD$ and correct a couple of inconsistencies.

We digitize data from Mitchell (2007) for the developing countries for which data is available for the period 1945-2000: Mexico; Argentina; Brazil; Chile; Colombia; Peru; Uruguay; Venezuela; South Africa; India; Indonesia;

Iran; Japan; South Korea; Pakistan; Phillippines; Thailand; Turkey; Australia; and New Zealand. We check consistency between this dataset and the GFS or Baunsgaard and Keen (2010) datasets for the periods for which data is available for more than one source.

We similarly combine GFS, HGFS data and data from Mitchell (2007) to obtain data on government expenditures.The data used to scale tax revenues by GDP or population size comes from the WDI and Maddison (2008).

B Covariates

Agricultural share of GDP (%): World Development Indicators (WDI).

Capital Account Openness: IMF *Annual Report on Exchange Arrangements and Exchange Restrictions*, available from 1950[1].

Democracy: Polity2 index of the Polity IV project.

Exchange rate: WDI.

GDP (constant US dollars): WDI.

Population: World Economic Outlook (WEO) and WDI.

Population density: WDI.

Tariff: Clemens and Williamson (2004) for 1945-1999; WDI for 2000-2006.

VAT: VAT variable (date at which each country established a VAT) created by using three different data sources: (i) for African countries only, Krever

[1]We thank Michael Klein for providing us with this data.

(2008); (ii) Purohit (1993); and (iii) Ebrill (2001).

War: War variables are created using data from the Correlates of War database.'War in the next ten (two) years' is an indicator equal to one if the country is coded as being at war with an external enemy in the *Correlates of War* database in the ten (two) years following the start of the episode.

4 List of episodes and causes

The source of the shock is marked 'FTA' if the country enters a free trade agreement just before or after the shock, 'Fall tariffs (trade)' if we see a clear fall in the tariffs (trade) data and 'exchange rates' if there is a clear break in the exchange rate data. All other source types are self-explanatory.

Country	Date of shock	Source of shock
Algeria	1995	FTA
Bahamas	1984	FTA
Bahamas	1994	Fall tariffs
Bangladesh	1978	Fall tariffs
Belize	1988	Fall trade
Benin	1979	Fall trade
Botswana	1981	.
Botswana	1992	FTA
Bulgaria	1993	FTA
Burkina Faso	1977	Fall tariffs
Burundi	1978	Fall trade
Burundi	1987	Fall tariffs
Cameroon	1976	Liberalization reforms (since 1972)
Central African Republic	1979	Exchange rates
Chad	1999	FTA
Chile	1985	Fall trade
China	1985	Liberalization reforms
Colombia	1987	Fall tariffs
Comoros	1983	Fall trade
Congo, Rep.	1975	Fall trade
Congo, Rep.	1992	FTA
Costa Rica	1983	.
Côte d'Ivoire	1979	Fall tariffs
Djibouti	1984	.
Dominica	1989	FTA
Dominican Republic	1975	.
Dominican Republic	1999	Fall tariffs
Ecuador	1979	FTA
Egypt	1979	Exchange rates
Egypt	1993	FTA
El Salvador	1978	Fall trade
El Salvador	1985	Earthquake
Equatorial Guinea	1985	Joins CFA zone

Country	Date of shock	Source of shock
Ethiopia	1978	War
Fiji	1990	FTA
Gabon	1985	.
Gambia	1985	Fall tariffs
Ghana	1978	Fall tariffs
Greece	1980	FTA
Guatemala	1977	Fall tariffs
Guinea	1978	.
Guyana	1975	FTA
Guyana	1993	FTA
Haiti	1980	.
Honduras	1991	FTA
Iceland	1975	Fall trade
India	1987	Fall tariffs
Indonesia	1951	FTA
Indonesia	1970	Exchange rates
Jordan	1978	Fall tariffs
Jordan	1993	FTA
Kenya	1980	.
Kenya	1995	FTA
Korea	1979	Fall trade
Lesotho	1983	FTA
Lesotho	1994	FTA
Madagascar	1978	Fall trade
Madagascar	1987	Fall tariffs
Malawi	1995	FTA
Malaysia	1979	.
Mali	1975	Fall trade
Malta	1990	FTA
Mauritania	1984	Fall trade
Mauritius	1987	Fall tariffs
Mexico	1981	FTA
Morocco	1993	FTA
Mozambique	1980	Political unrest (civil war)
Mozambique	1989	FTA
Myanmar	1981	.
Namibia	1985	Political unrest (interim admin. of SAfrica)
Namibia	1991	FTA
Nicaragua	1990	FTA
Niger	1980	Fall trade

Country	Date of shock	Source of shock
Pakistan	1950	FTA
Pakistan	1988	Fall tariffs
Panama	1975	.
Papua New Guinea	1995	FTA
Paraguay	1978	Fall tariffs
Peru	1952	FTA
Peru	1979	.
Philippines	1974	FTA
Philippines	1993	FTA
Portugal	1975	Fall tariffs
Sao Tome and Principe	1981	.
Senegal	1979	Fall tariffs
Senegal	1991	FTA
Sierra Leone	1978	Political unrest
Sierra Leone	1986	Exchange rates
Singapore	1977	.
Slovenia	1994	FTA
South Africa	1969	Fall tariffs
Sri Lanka	1979	Fall tariffs
Suriname	1980	FTA
Swaziland	1979	Exchange rates
Syria	1975	.
Tanzania	1980	Fall tariffs
Tanzania	1994	FTA
Thailand	1964	Fall tariffs
Thailand	1990	FTA
Togo	1978	.
Trinidad and Tobago	1980	Fall trade
Tunisia	1983	Fall tariffs
Tunisia	1991	FTA
Uganda	1984	Exchange rates
Uruguay	1990	FTA
Vanuatu	1987	.
Venezuela	1958	Change political regime
Zambia	1972	Fall tariffs
Zambia	1991	FTA
Zimbabwe	1992	FTA

5 Table Appendix

A Robustness checks on revenue recovery after two years

Table 7.2: Determinants of revenue recovery for non-anticipated episodes

	1	2	3	4	5	6	7
Density	0.008*						0.010*
	(0.004)						(0.005)
Agr\ GDP		-0.003					0.000
		(0.003)					(0.004)
Capital openness			-0.195				-0.155
			(0.160)				(0.192)
Democracy				0.011			0.015
				(0.008)			(0.009)
War this year or next					-0.133		-0.088
					(0.250)		(0.260)
GDP per capita						0.002	0.003
						(0.002)	(0.003)
Size of the episode (% GDP)	-0.024	-0.021	-0.022	-0.026*	-0.025	-0.024	-0.017
	(0.015)	(0.016)	(0.015)	(0.015)	(0.015)	(0.015)	(0.016)
Length of the episode (years)	0.019**	0.017*	0.019**	0.017*	0.020**	0.019**	0.007
	(0.010)	(0.009)	(0.009)	(0.010)	(0.009)	(0.009)	(0.011)
Observations	100	93	97	89	100	100	82

Robust standard errors in parentheses. All results are obtained using an OLS specification and controlling for GDP growth in the next 2 or 10 years. An observation is an episode, defined using the tax to GDP ratios as explained above. See Appendix 3 for a description of the variables.

Table 7.3: Determinants of revenue recovery when the cause of the episode is identified

	1	2	3	4	5	6	7
Density	0.002						0.034
	(0.030)						(0.065)
Agr\ GDP		-0.003					0.001
		(0.004)					(0.005)
Capital openness			-0.127				-0.093
			(0.221)				(0.256)
Democracy				0.012			0.009
				(0.009)			(0.011)
War this year or next					-0.087		-0.053
					(0.307)		(0.304)
GDP per capita						0.002	0.004**
						(0.002)	(0.002)
Size of the episode (% GDP)	-0.023	-0.025	-0.018	-0.019	-0.023	-0.022	-0.013
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.018)
Length of the episode (years)	0.020*	0.017	0.019*	0.016	0.020*	0.019*	0.009
	(0.010)	(0.011)	(0.011)	(0.011)	(0.010)	(0.010)	(0.012)
Observations	80	77	77	72	80	80	67

Robust standard errors in parentheses. All results are obtained using an OLS specification and controlling for GDP growth in the next 2 or 10 years. An observation is an episode, defined using the tax to GDP ratios as explained above. See Appendix 3 for a description of the variables.

Table 7.4: Determinants of revenue recovery with decade fixed effects

	1	2	3	4	5	6	7
Density	0.010*						0.012**
	(0.005)						(0.006)
Agr\ GDP		-0.003					0.001
		(0.003)					(0.004)
Capital openness			-0.205				-0.190
			(0.167)				(0.209)
Democracy				0.011			0.012
				(0.009)			(0.010)
War this year or next					-0.017		0.063
					(0.249)		(0.247)
GDP per capita						0.002	0.003
						(0.001)	(0.003)
Size of the episode (% GDP)	-0.026*	-0.023	-0.023	-0.027*	-0.027*	-0.026	-0.016
	(0.015)	(0.016)	(0.015)	(0.016)	(0.015)	(0.015)	(0.016)
Length of the episode (years)	0.019*	0.017*	0.018*	0.016	0.021**	0.019*	0.005
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.011)
Observations	107	100	103	96	107	107	88

Robust standard errors in parentheses. All results are obtained using an OLS specification and controlling for GDP growth in the next 2 or 10 years. An observation is an episode, defined using the tax to GDP ratios as explained above. See Appendix 3 for a description of the variables.

B Main results using the 'per capita' definition of episodes

Table 7.5: Determinants of revenue recovery after 10 years

	1	2	3	4	5	6	7
Density	0.007**						-0.002
	(0.003)						(0.005)
Agr\ GDP		-0.005**					-0.001
		(0.003)					(0.003)
Capital openness			-0.059				-0.058
			(0.110)				(0.116)
Democracy				0.015**			0.013**
				(0.006)			(0.006)
War in next 10 years					0.027		0.023
					(0.118)		(0.134)
GDP per capita						0.002***	0.003*
						(0.001)	(0.002)
Size of the episode (% GDP)	-0.004*	-0.005**	-0.004	-0.004	-0.004*	-0.005**	-0.006**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Length of the episode (years)	0.006	0.007	0.007	0.008	0.005	0.007	0.008
	(0.010)	(0.010)	(0.011)	(0.010)	(0.010)	(0.010)	(0.011)
Observations	124	114	121	114	124	124	104

Robust standard errors in parentheses. All results are obtained using an OLS specification and controlling for GDP growth in the next 2 or 10 years. An observation is an episode, defined using the tax per capita variables as explained above. See Appendix 3 for a description of the variables.

Table 7.6: Determinants of revenue recovery after 2 years

	1	2	3	4	5	6	7
Density	0.010***						0.001
	(0.003)						(0.005)
Agr\ GDP		-0.005*					-0.002
		(0.003)					(0.004)
Capital openness			-0.141				-0.154
			(0.111)				(0.138)
Democracy				0.002			-0.003
				(0.006)			(0.007)
War this year or next					0.004		0.027
					(0.185)		(0.203)
GDP per capita						0.003***	0.002
						(0.001)	(0.002)
Size of the episode (% GDP)	-0.003	-0.002	-0.003	-0.002	-0.002	-0.004	-0.003
	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
Length of the episode (years)	0.002	0.001	0.005	0.005	0.001	0.004	0.009
	(0.011)	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)	(0.012)
Observations	127	117	124	117	127	127	107

Robust standard errors in parentheses. All results are obtained using an OLS specification and controlling for GDP growth in the next 2 or 10 years. An observation is an episode, defined using the tax per capita variables as explained above. See Appendix 3 for a description of the variables.

Table 7.7: VAT as a determinant of revenue recovery

	1	2	3	4	5	6
VAT at time s	-0.015	-0.112				
	(0.092)	(0.108)				
VAT at time $s+10$			-0.050	-0.224***		
			(0.085)	(0.085)		
VAT created					-0.045	-0.154*
					(0.093)	(0.090)
Other determinants	No	Yes	No	Yes	No	Yes
Observations	124	104	124	104	124	104

Robust standard errors in parentheses. All results are obtained using an OLS specification and controlling for GDP growth in the next 2 or 10 years. An observation is an episode, defined using the tax per capita variables as explained above. See Appendix 3 for a description of the variables.

6 Online Appendix

This online appendix presents results for alternative definitions of episodes of decreases in trade tax revenues. See the companion paper for an explanation of the methods used.

A Descritive statistics

Table 7.8: Episodes defined by a 2 GDP point fall in trade taxes

	Mean	SD	Nb obs
Time of shock	1982.4	9.6	78
Size of the episode (% GDP)	4.8	3.0	78
Tariff revenues (%GDP)	8.6	5.5	78
Tax revenues (%GDP)	20.8	9.8	78
Size of the episode (% tax revenues)	24.6	12.0	78
Share that recovers after 1 year	41.0	49.5	78
Share that recovers after 5 years	44.9	50.1	78
Share that recovers after 10 years	53.8	50.2	78
Time to recovery (years)	5.4	7.0	53
If no recovery, potential recovery time (years)	21.8	5.8	25

Table 7.9: Episodes defined by a 30% point fall in trade taxes per capita

	Mean	SD	Nb obs
Time of shock	1983.9	7.9	113
Size of the episode (% GDP)	66.0	20.7	113
Tariff revenues per capita	134.1	192.5	113
Tax revenues per capita	627.6	1246.0	113
Size of the episode (% tax revenues)	43.4	49.5	113
Share that recovers after 1 year	46.9	50.1	113
Share that recovers after 5 years	49.5	50.2	111
Share that recovers after 10 years	55.0	50.0	111
Time to recovery (years)	5.1	7.6	75
If no recovery, potential recovery time (years)	21.0	6.4	38

B Determinants of recovery

B.1 Episodes defined by a 2 GDP points fall in trade tax revenues

Table 7.10: Determinants of revenue recovery after 10 years

	1	2	3	4	5	6	7
Density	0.053**						0.094
	(0.021)						(0.069)
Agr\ GDP		-0.005					-0.004
		(0.004)					(0.005)
Capital openness			-0.030				-0.037
			(0.206)				(0.265)
Democracy				0.017*			0.019*
				(0.009)			(0.011)
War in next 10 years					0.317**		0.354**
					(0.124)		(0.137)
GDP per capita						0.003**	-0.004
						(0.001)	(0.007)
Size of the episode (% GDP)	-0.002	0.010	0.001	0.004	-0.003	0.002	0.006
	(0.020)	(0.020)	(0.020)	(0.019)	(0.020)	(0.020)	(0.020)
Length of the episode (years)	0.000	-0.000	-0.000	-0.002	0.001	0.000	-0.005
	(0.012)	(0.012)	(0.012)	(0.012)	(0.011)	(0.011)	(0.013)
Observations	75	70	73	66	75	75	61

Robust standard errors in parentheses. All results are obtained using an OLS specification and controlling for GDP growth in the next 2 or 10 years. An observation is an episode, defined using the tax to GDP ratios as explained above. See Appendix C for a description of the variables.

Table 7.11: Determinants of revenue recovery after 2 years

	1	2	3	4	5	6	7
Density	0.010						0.128*
	(0.036)						(0.067)
Agr\ GDP		-0.002					-0.000
		(0.004)					(0.005)
Capital openness			-0.186				-0.051
			(0.203)				(0.235)
Democracy				0.008			0.005
				(0.009)			(0.012)
War this year or next					-0.144		-0.150
					(0.242)		(0.230)
GDP per capita						0.001	0.002
						(0.002)	(0.006)
Size of the episode (% GDP)	-0.020	-0.011	-0.017	-0.018	-0.020	-0.019	-0.010
	(0.018)	(0.019)	(0.017)	(0.018)	(0.018)	(0.018)	(0.020)
Length of the episode (years)	0.013	0.012	0.014	0.008	0.012	0.013	0.003
	(0.011)	(0.012)	(0.011)	(0.012)	(0.011)	(0.011)	(0.014)
Observations	75	70	73	66	75	75	61

Robust standard errors in parentheses. All results are obtained using an OLS specification and controlling for GDP growth in the next 2 or 10 years. An observation is an episode, defined using the tax to GDP ratios as explained above. See Appendix C for a description of the variables.

B.2 Episodes defined by a 30 % fall in trade tax revenues per capita

Table 7.12: Determinants of revenue recovery after 10 years

	1	2	3	4	5	6	7
Density	0.007**						-0.002
	(0.003)						(0.005)
Agr\ GDP		-0.006*					-0.003
		(0.003)					(0.004)
Capital openness			-0.066				-0.085
			(0.122)				(0.130)
Democracy				0.014**			0.013*
				(0.007)			(0.007)
War in next 10 years					0.077		0.052
					(0.129)		(0.149)
GDP per capita						0.002***	0.002
						(0.001)	(0.002)
Size of the episode (% GDP)	-0.003	-0.004*	-0.002	-0.002	-0.002	-0.004	-0.005
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Length of the episode (years)	0.005	0.008	0.006	0.007	0.005	0.007	0.011
	(0.010)	(0.010)	(0.011)	(0.010)	(0.010)	(0.010)	(0.012)
Observations	111	101	108	102	111	111	92

Robust standard errors in parentheses. All results are obtained using an OLS specification and controlling for GDP growth in the next 2 or 10 years. An observation is an episode, defined using the tax per capita variables as explained above. See Appendix C for a description of the variables.

Table 7.13: Determinants of revenue recovery after 2 years

	1	2	3	4	5	6	7
Density	0.009***						-0.001
	(0.002)						(0.006)
Agr\ GDP		-0.008**					-0.005
		(0.003)					(0.004)
Capital openness			-0.208*				-0.219
			(0.113)				(0.138)
Democracy				0.003			-0.002
				(0.007)			(0.007)
War this year or next					0.054		0.054
					(0.220)		(0.243)
GDP per capita						0.003***	0.001
						(0.001)	(0.002)
Size of the episode (% GDP)	-0.002	-0.003	-0.003	-0.002	-0.002	-0.003	-0.003
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Length of the episode (years)	0.001	0.003	0.006	0.003	-0.000	0.003	0.011
	(0.011)	(0.011)	(0.012)	(0.012)	(0.011)	(0.011)	(0.013)
Observations	113	103	110	104	113	113	94

Robust standard errors in parentheses. All results are obtained using an OLS specification and controlling for GDP growth in the next 2 or 10 years. An observation is an episode, defined using the tax per capita variables as explained above. See Appendix C for a description of the variables.

Chapter 8

Appendix - Cyclicality...

Table 8.1: Countries in the sample

Sub-Saharan Africa	Other Developing Countries		Advanced Economies
Angola	Afghanistan	Lebanon	Australia
Benin	Albania	Libya	Austria
Botswana	Algeria	Lithuania	Belgium
Burkina Faso	Argentina	Macedonia	Canada
Burundi	Armenia	Malaysia	Hong Kong
Cameroon	Azerbaijan	Maldives	Cyprus
Cape Verde	Bahamas	Mauritania	Czech Republic
Central African Republic	Bahrain	Mexico	Denmark
Chad	Bangladesh	Morocco	Finland
Comoros	Barbados	Myanmar	France
Republic of Congo	Belarus	Nepal	Germany
Côte d'Ivoire	Belize	Nicaragua	Greece
Equatorial Guinea	Bhutan	Oman	Iceland
Eritrea	Bosnia	Pakistan	Ireland
Ethiopia	Brazil	Panama	Israel
Gabon	Brunei Darussalam	Papua New Guinea	Italy
Gambia	Cambodia	Paraguay	Japan
Ghana	Chile	Peru	Korea
Guinea	China	Philippines	Malta
Guinea-Bissau	Colombia	Poland	Netherlands
Kenya	Costa Rica	Qatar	New Zealand
Lesotho	Croatia	Russia	Norway
Madagascar	Djibouti	Samoa	Portugal
Malawi	Dominica	Saudi Arabia	Singapore
Mali	Dominican Republic	Serbia	Slovak Republic
Mauritius	Egypt	Solomon Islands	Slovenia
Mozambique	El Salvador	Sri Lanka	Spain
Namibia	Estonia	St. Kitts and Nevis	Sweden
Niger	Georgia	St. Lucia	Switzerland
Nigeria	Grenada	St. Vincent & Grenadines	Taiwan
Rwanda	Guatemala	Sudan	United Kingdom
Senegal	Guyana	Suriname	United States
Seychelles	Haiti	Syria	
Sierra Leone	Honduras	Tajikistan	
South Africa	Hungary	Thailand	
Swaziland	India	Timor-Leste	
So Tomé & Prncipe	Indonesia	Trinidad and Tobago	
Tanzania	Iran	Tunisia	
Togo	Jamaica	Turkey	
Uganda	Jordan	Ukraine	
Zambia	Kazakhstan	United Arab Emirates	
Zimbabwe	Kiribati	Uruguay	
	Kuwait	Vanuatu	
	Kyrgyz Republic	Venezuela	
	Laos	Vietnam	
	Latvia	Yemen	

The country classification comes from the World Economic Outlook (IMF).

Table 8.2: Variable Description and Source

	Source	Description
Real GDP growth	World Economic Outlook (WEO), IMF	Growth in nominal GDP deflated using the CPI
Real growth in central government spending	WEO, IMF	Growth in nominal central government total spending deflated using the CPI
Real GDP growth of main trading partners	WEO, IMF	GDP growth of main trading partners weighted by the share of exports in GDP.
Growth in terms of trade	WEO, IMF	Price of exports divided by the price of exports
Trade openness	WEO, IMF	Sum of total exports and exports divided by GDP
Oil price	WEO, IMF	Price in US dollars of a barrel of crude oil
Index of commodity prices	WEO, IMF	Price of non fuel commodity exports
Dependency ratio	World Development Indicators (WDI), World Bank	Ratio of dependants to working age population
Urbanization	WDI, World Bank	Ratio of urban population to total population
Private credit to GDP	WDI, World Bank	Ratio of credit to the private sector to GDP
Real central bank interest rate	International Financial Statistics, IMF	Central bank main interest rate deflated using the CPI
Net foreign capital flows	WEO, IMF	Capital inflows minus capital outflows
Aid	Global Development Finance, World Bank	Official Development Assistance
Current account balance	WEO, IMF	
Commodity Exports	UN Comtrade database	Based on Collier and Hoeffler (2002)'s definition of commodity exports.
Democracy	Polity4 database, polity2 variable	See Marshall (2009)
Constraints on the executive	Polity4 database, xconst variable	Extent of institutionalized constraints on the decision making powers of chief executives)
Political competition	Polity4 database, polcomp variable	Degree of insitutionalization of political competition
Public external debt	Global Development Finance, World Bank	All public debt to foreign creditors
Inflation	WEO, IMF	Growth in the CPI
IMF program dummy	Strategy, Policy and Review department database, IMF	Equal to 1 if there is an IMF program in place in the country during that year.

Table 8.3: Impact of financing constraints and political institutions in good and bad times

Dependent variable : Growth in central government expenditures							
Two-step difference-GMM estimates							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP Growth	2.07**	2.53	1.7	2.35**	2.29***	3.04***	3.2***
All variables below are interacted with GDP growth							
Democracy	-0.3						
Democracy*good times	0.62						
Constraints on the executive		-0.25					
Constraints on the executive*good times		-0.43					
Political competition			0.09				
Political competition*good times			0				
Private credit to GDP ratio				0.01			
Private dredit to GDP ratio*bad times				0.02			
Lagged real central bank interest rate					0.00		
Lagged real central bank interest rate*bad times					0.04		
Lagged net capital flows to GDP ratio						-1.73	
Lagged net capital flows to GDP ratio*bad times						2.84	
Lagged aid to GDP ratio							-8.2**
Lagged aid to GDP ratio*bad times							3.5
Observations	1295	1205	1205	1216	1147	1428	1387

* significant at 10% level; ** significant at 5% level; *** significant at 1% level. 'Good times' is a dummy equal to 1 if growth is above the median for the country over the period considered, and 'bad times' is a dummy equal to 1 if growth is below this median. GDP growth is instrumented for using lags. See data appendix for variable description.

Chapter 9

Appendix: Tax Me...

1 Theoretical appendix

A Proof that the participation constraint is binding in the L case

The representative citizen's maximizes :

$$W(G_L,T_L,T_H,\sigma_H,\sigma_L) = (1-q)(G_L-\phi C(T_L))+q(G_L+T_H-T_L+Z(\sigma_H-\sigma_L)-\phi C(T_H)) \tag{1.1}$$

subject to the following constraints, where λ_i is the lagrange multiplier associated with constraint i

$$\begin{cases} 1: \ G_L \leq (\bar{F}(1-u)+T_L)(1-\alpha)+\sigma_L Z \ (\lambda_1) \\ 2: \ G_L \leq \bar{F}(1+u)(1-\alpha)-\alpha T_H+T_L+\sigma_L Z \ (\lambda_2) \\ 3: \ T_H \geq 0 \ (\lambda_3) \\ 4: \ T_L \geq 0 \ (\lambda_4) \\ \sigma_H \in [0,1] \\ \sigma_L \in [0,1] \end{cases}.$$

where I am using the fact that $G_H = G_L+T_H-T_L+Z(\sigma_H-\sigma_L)$ to rewrite the participation constraint in case H (constraint 2).

The first order conditions for maximization are:

$$\frac{\partial W}{\partial \sigma_H} = Zq \tag{1.2}$$

$$\frac{\partial W}{\partial \sigma_L} = Z(\lambda_1 + \lambda_2 - q) \tag{1.3}$$

$$\frac{\partial W}{\partial G_L} = 0 \Leftrightarrow \lambda_2 + \lambda_1 = 1 \tag{1.4}$$

$$\frac{\partial W}{\partial T_L} = 0 \Leftrightarrow \lambda_4 = (1-q)\phi C_{T_l} + q - \lambda_2 - \lambda_1(1-\alpha) \tag{1.5}$$

$$\frac{\partial W}{\partial T_H} = 0 \Leftrightarrow \lambda_3 = q(\phi C_{T_H} - 1) + \alpha + \lambda_2) \tag{1.6}$$

Note first that the citizen will always set the probability of re-election equal to 1 to maximize the level of public good provided. Trivially, equation (1.2) implies that $\frac{\partial W}{\partial \sigma_H} > 0$ and $\sigma_H = 1$. Combining equations (1.3) and (1.4) similarly gives $\frac{\partial W}{\partial \sigma_L} = Z(1-q) > 0$ and $\sigma_L = 1$. Equation (1.4) shows that one of constraints 1 and 2 must bind. Intuitively one the participation constraints must bind - if not, public good in one of the states could be increased whilst keeping taxes constant.

Suppose the participation constraint in the L case (constraint 1) does not bind. This implies that $\lambda_2 = 1$ so that the participation constraint in the H case binds and G_L is set such that $G_L = (\bar{F}(1+u) + T_L)(1-\alpha) + \alpha(T_L + T_H) + \sigma_L Z$. The participation constraint in the L case implies that the optimal tax levels must respect:

$$(\bar{F}(1+u)+T_L^*)(1-\alpha)+\alpha(T_L^*-T_H)+\sigma_L Z \leq (\bar{F}(1-u)+T_L^*)(1-\alpha)+\sigma_L Z \tag{1.7}$$

$$\Leftrightarrow \alpha(T_L^* - T_H) \leq -(1-\alpha)\bar{F}2u \leq 0 \tag{1.8}$$

Intuitively we must have $T_H^* > T_L^*$ to ensure that the politician in the L case does not find it profitable to pretend he is in the H case. However $\lambda_2 = 1$

and $\lambda_1 = 0$ implies that

$$\lambda_4 = (1-q)\phi C_{T_l} + q - 1 \Leftrightarrow T_L^* = h(1/\phi),\ \lambda_4 = 0 \tag{1.9}$$

and

$$\lambda_3 = q(\phi C_{T_H} - 1) + \alpha \tag{1.10}$$

$$\Leftrightarrow T_H^* = h(q-\alpha)/\phi q),\ \lambda_3 = 0,\ q > \alpha \text{ or } \lambda_3 > 0, T_H^* = 0 \tag{1.11}$$

this implies that $T_H^* < T_L^*$ and violates (1.8). This completes the proof

B Proof of propositions 1-4

The program lowers ϕ by $d\phi < 0$ and therefore increases taxes in both states :

$$\frac{\partial T_H^*}{\partial \phi} = -\frac{h'(1/\phi)}{\phi^2} < 0 \tag{1.12}$$

and

$$\frac{\partial T_L^*}{\partial \phi} = \min\{0, -\frac{h'(1-q-\alpha/\phi(1-q))}{\phi^2}\frac{1-q-\alpha}{1-q}\} \tag{1.13}$$

I write

$$\frac{\partial E(T^*)}{\partial \phi} = -\omega_1 < 0 \tag{1.14}$$

It also increases the spread between T_H^* and T_L^*[1] :

$$\frac{\partial T_H^*}{\partial \phi} - \frac{\partial T_L^*}{\partial \phi} = -\frac{h'(1/\phi)}{\phi^2} - (1-\alpha)(E(T^*)+\bar{F}) - \bar{F}u(1-\alpha) = -\omega_2 < 0 \tag{1.15}$$

From equations (1.12), (1.13) and (1.15) we can write the increase in average public good provision thanks to the program:

$$-\frac{\partial E(G^*)}{\partial \phi} = (1-\alpha)\omega_1 + (1-q)\alpha\omega_2 > (1-\alpha)\omega_1 \tag{1.16}$$

[1] Provided $h(.)$ is not too concave.

Consider an increase in $\bar{F}$ of the same amount ω_1. It leads to an increase in average public good provision such that:

$$\frac{\partial E(G^*)}{\partial \bar{F}}\omega_1 = (1-\alpha)(1-u)\omega_1 < -\frac{\partial E(G^*)}{\partial \phi} \tag{1.17}$$

This completes the proof of propositions 1 and 2.

Proposition 3 follows from observing that equation (1.17) implies that:

$$\frac{\partial E(S^*)}{\partial \bar{F}}\omega_1 > \frac{\partial E(S^*)}{\partial \phi} \tag{1.18}$$

as $E(S^*) = E(T^*) + E(F) - E(G^*)$. This gives proposition 3.

Proposition 4 follows from observing that as u increases $\frac{\partial E(G^*)}{\partial \bar{F}}\omega_1$ increases but $\frac{\partial E(G^*)}{\partial \phi}$ is unchanged.

2 Transfer allocation appendix

A The transfer allocation rule

The most important source of municipal revenue is the *Fundo de Participacao dos Municipios* (FPM), an automatic federal transfer established by the Brazilian Constitution. The FPM allocation mechanism divides local governments into population brackets which determine the share of their state's total FPM resources they will receive. Smaller population brackets are allocated lower shares. Each of the 26 states receives a different share of the total FPM resources in the federal budget, so two municipalities will receive the same amount only if they are in the same population bracket and state. The revenue sharing mechanism determining the amount $FPM^s_{i,t}$ received by government i in state s is

$$FPM^s_{i,t} = \frac{f(pop_{i,t})}{\sum_{j \in s} f(pop_{j,t})} FPM^s \tag{2.1}$$

where $f(pop_{i,t})$ is the coefficient corresponding to the population bracket in which the local government's population is found. Table 9.1 presents the population brackets and associated coefficients[2] in its first two columns.

Why would federal politicians tie their hands and allocated resources based on objective criteria rather than use discretion? Litschig (2011) shows it can be explained by the political agenda of the military dictatorship that put it in place in 1967. One of the objectives of the military was to wrest control of resources away from the traditional political elite and their clientelistic pratices and depoliticize public service provision. Creating a revenue sharing fund for the municipalities based on a objective criteria of need served this agenda. The choice of population brackets limits incentives for local officials to try to tinker with their population figures compared to a linear schedule.

[2] Set by Decree No. 1881/81 and unchanged since 1981.

The initial legislation created cutoffs at round population numbers (multiples of 2000, 4000, 30000, etc) and stipulated that these should be updated regularly to keep up with population growth at the national level. This updating probably explains the value of the exact cutoffs we observe today - though they are never updated during our period of interest. The technical, a-political approach of the military in designing the rule is still reflected in the fact that the thresholds are still equidistant from one another today.

This rule has already been used by several authors (see Brollo et al. (2010); Litschig and Morrison (2010); Litschig (2011)), exploiting it for identification purposes is not a novelty of this paper. This appendix does not attempt to provide an exhaustive discussion of the merits of this identification strategy - the interested reader is referred to the previous papers on the subject for a more thorough discussion. It merely presents important checks for the validity of this strategy.

Table 9.1: Real and Theoretical FPM Transfers per capita and Coefficients

Population	Coefficient	Real Transfer	Theoretical Transfer
<10,189	0.6	385	341
10,189-13,584	0.8	192	170
13,585-16,980	1	175	166
16,981-23,772	1.2	160	47
23,773-30,564	1.4	142	54.6
30,565-37,356	1.6	131	63.7
37,357-44,148	1.8	122	71.7
44,149-50,940	2	117	80.6
50,941-61,128	2.2	108	87.8
61,129-71,316	2.4	99	94.8
71,317-81,504	2.6	92	103.7
81,505-91,692	2.8	85	107.5
91,693-101,880	3	84	125.6
101,881-115,464	82	127.8	134.8
115,465-129,047	76	132.6	135.3
129,048-142,632	68	144.4	146.1

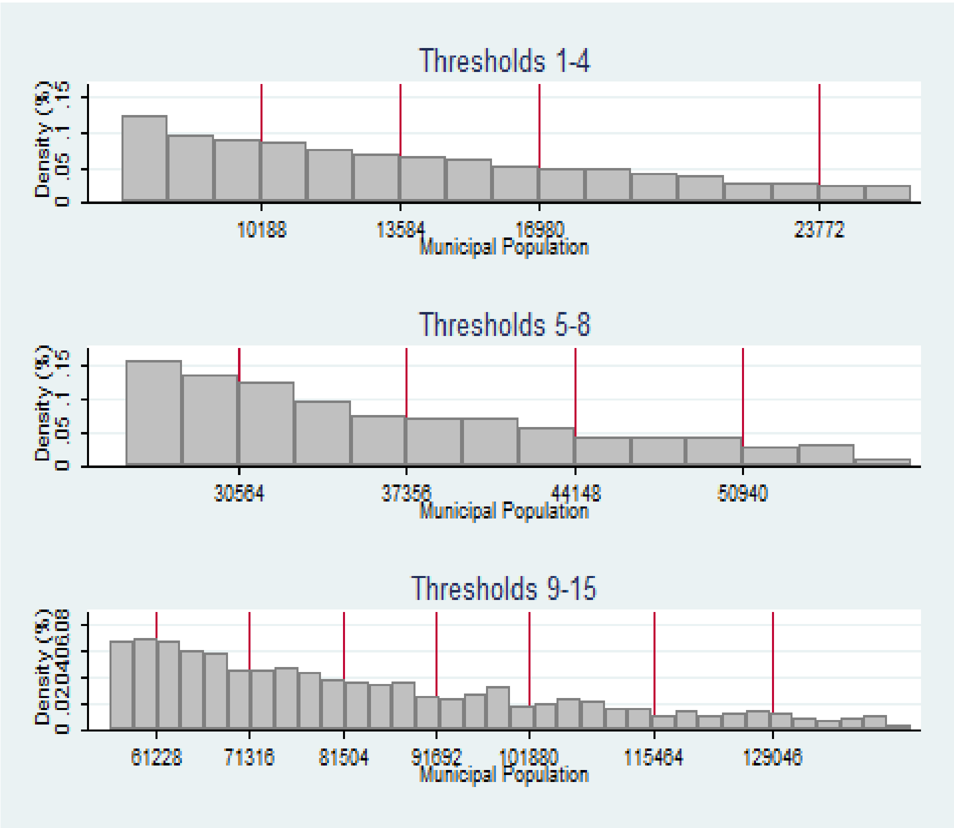
Population is the official population estimate from the IBGE. The coefficient are obtained from official documents of the *Tribunal de Contas Uniao* and used to estimate the theoretical FPM transfer allocated to each municipality. Real FPM transfers received are published by the *Tesouro Nacional*.

The *Tribunal de Contas Uniao* (TCU) determines how much each municipality will receive each year using the population estimates calculated by the Brazilian Statistical Institute (IBGE). The IBGE uses a top-down approach to produce these estimates. In a nutshell IBGE first produces a population estimates for a large area, say the whole of Brazil, based on estimated birth and mortality rates and migration. It then allocates this population to Brazilian states based on their share of total population in the last Census and their growth rate between the last two Census. The same logic applies to the allocation of population within states to municipalities (see Brollo et al. (2010) for more details). The IBGE is an independent agency which does not interact with local governments and prides itself on its political independence. If municipalities wished to tinker with their estimated population numbers it is unlikely that they would choose to try to influence the IBGE. The TCU bases its allocation of transfer revenues on the estimates of the IBGE but does not always perfectly follow the rule. During the 1990s several municipalities split and this reduced the population size of pre-existing municipalities. Several low amendments froze the FPM coefficients to avoid large decreases in FPM transfers. The federal government ruled that by 2008 all municipalities should received the amount of FPM transfers corresponding to their actual population estimates, and established a transition period to the new regime. This explains why the observed FPM transfers do not perfectly follow the rule. What's more the population figures used by TCU (published each year) do not always perfectly coincide with the estimates by the IBGE, suggesting some manipulation may occur at this level (Litschig and Zamboni (2008) finds some evidence of manipulative sorting in 1989 and 1991 in the TCU figures). We therefore expect any manipulative sorting to occur in the TCU data, not the IBGE estimates. I use the IBGE estimates of population size in all the analysis of this paper.

I construct the amounts of theoretical FPM grants each municipality is allocated according to the above rule depending on its state and population size thus estimated for each year. Table 9.1 reports the average of those theoretical grants as well as the average actual grants received by municipalities in each population bracket.It is clear from the table that population state and year do not perfectly predict the FPM grants each municipalities receives, due to several reasons. Nonetheless, real FPM grants received do increase substantially at each population threshold.

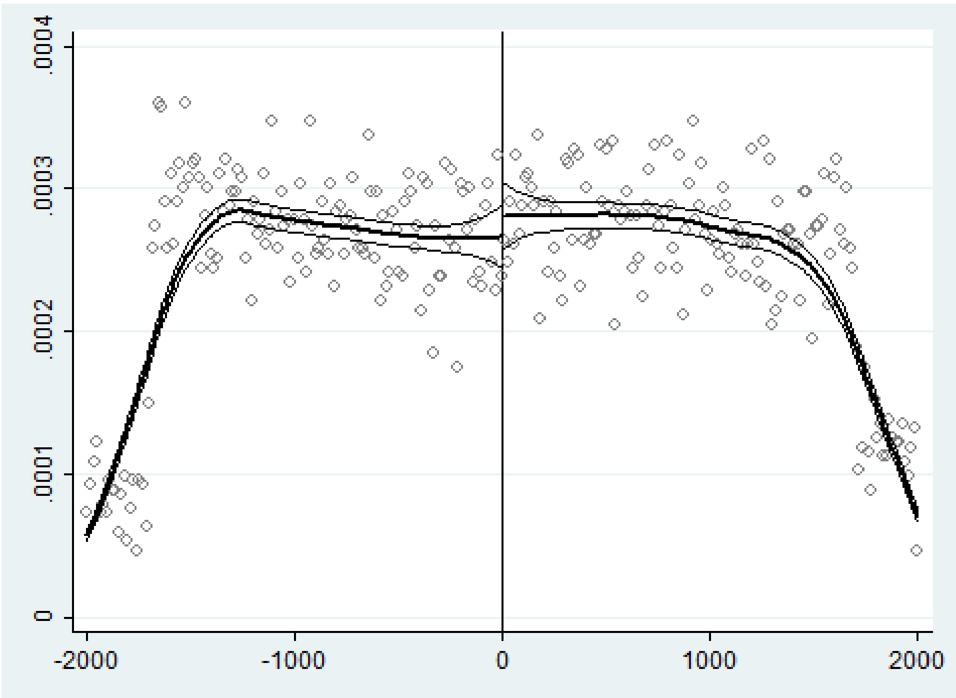
B Validity checks

Figure 9.1: Population density histogram



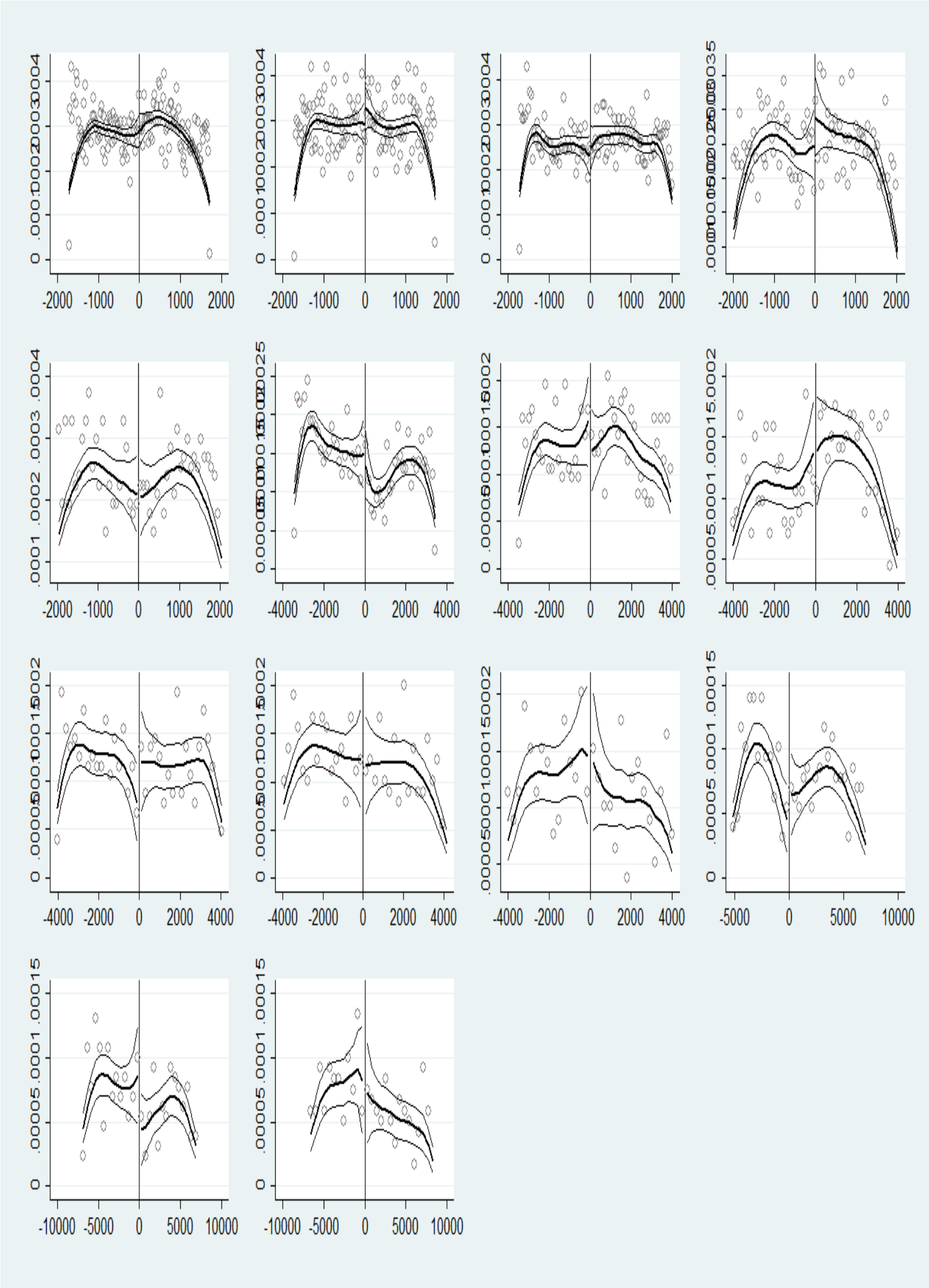
Bin sizes: 1132(top), 2264(middle), 2572(bottom).The bin sizes are chosen so that no bin contains a threshold.

Figure 9.2: McCrary Density Tests: Pooled Thresholds



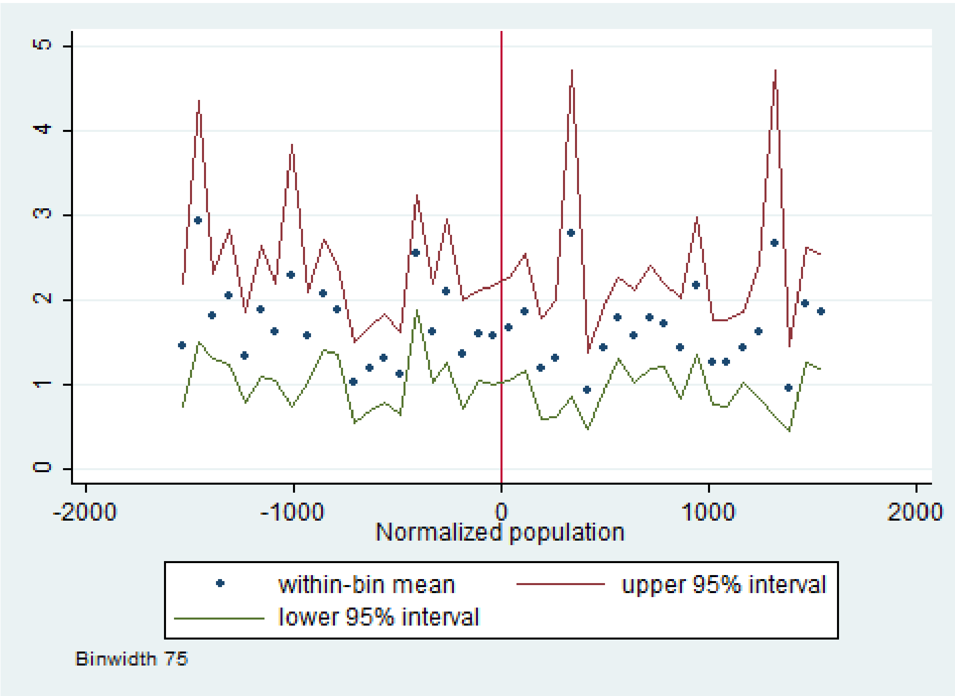
Weighted kernel estimation of the log density according to population size performed separately on either side of the pooled threshold. Optimal binwidth and binsize as in McCrary (2008).

Figure 9.3: The transfer allocation rule



From top right to bottom left: thresholds 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 and 15.Weighted kernel estimation of the log density according to population size performed separately on either side of the threshold. Optimal binwidth and binsize as in McCrary (2008).

Figure 9.4: The population discontinuity and population growth



The graph presents average population growth between year t and $t+1$ averaged over 75 inhabitants bins over normalized population size in year t.

Table 5.2: Descriptive statistics of main variables by FPM threshold

	Threshold 1	Threshold 2	Threshold 3	Threshold 4	Threshold 5	Threshold 6	Threshold 7
Taxes per capita 1998	47.95	42.51	48.26	53.67	60.29	71.76	73.96
	(129.2)	(54.95)	(95.75)	(84.78)	(106.0)	(122.3)	(175.9)
School infrastructure 1998	4.208	4.161	3.997	3.685	3.530	3.106	3.283
	(2.157)	(1.829)	(1.865)	(1.775)	(1.644)	(1.539)	(1.635)
School quality 1998	-0.735	-0.721	-0.823	-0.860	-0.962	-0.761	-0.947
	(1.315)	(1.334)	(1.262)	(1.241)	(1.224)	(1.190)	(1.143)
Health infrastructre 1999	3.649	4.521	5.337	6.571	7.907	9.377	10.16
	(2.515)	(3.028)	(3.596)	(4.437)	(4.746)	(5.293)	(5.453)
Public revenues per capita 1998	423.8	394.4	387.6	376.4	359.8	354.9	343.3
	(217.3)	(192.3)	(175.5)	(184.1)	(156.2)	(155.7)	(211.0)
Population 1998	9784.2	13026.1	16571.0	21994.7	28152.6	34433.8	39909.2
	(1546.1)	(1788.3)	(2171.0)	(3009.9)	(3387.0)	(4014.4)	(4809.4)
GDP per capita in 1999	4543.0	4466.2	4789.6	4807.3	4881.0	4893.3	4585.2
	(3697.0)	(3897.8)	(3964.4)	(3668.5)	(3967.9)	(3661.4)	(3100.7)
Weight	0.359	1.569	0.973	0.834	1.902	1.356	1.597
	(4.472)	(18.27)	(10.77)	(1.181)	(2.332)	(1.419)	(1.582)

	Threshold 8	Threshold 9	Threshold 10	Threshold 11	Threshold 12	Threshold 13	Threshold 14	Threshold 15
Taxes per capita 1998	67.04	72.71	86.56	95.16	89.86	106.5	107.2	119.8
	(84.69)	(95.80)	(98.65)	(100.3)	(90.32)	(86.30)	(98.41)	(133.7)
School infrastructure 1998	3.210	3.092	2.772	2.435	2.139	2.197	2.244	2.034
	(1.514)	(1.477)	(1.206)	(1.031)	(0.889)	(1.125)	(1.099)	(0.754)
School quality 1998	-0.797	-0.725	-0.515	-0.202	-0.356	-0.162	-0.253	-0.496
	(1.102)	(1.198)	(1.170)	(1.204)	(1.058)	(1.136)	(1.098)	(1.054)
Health infrastructre 1999	12.68	12.88	16.53	16.03	14.95	14.15	16.38	18.00
	(7.090)	(7.011)	(11.41)	(11.57)	(8.536)	(5.527)	(6.849)	(7.902)
Public revenues per capita 1998	353.8	346.8	366.3	370.8	340.7	394.4	396.7	391.4
	(294.8)	(238.3)	(190.7)	(197.6)	(146.3)	(205.2)	(262.0)	(301.1)
Population 1998	47148.7	56082.6	64160.5	74253.9	82325.6	90958.0	103026.7	117479.1
	(5206.8)	(6355.7)	(6345.1)	(7864.3)	(9333.5)	(10620.9)	(11259.8)	(12194.3)
GDP per capita in 1999	5414.9	5291.1	6604.1	7001.5	5720.3	7113.5	7272.6	7126.0
	(6413.6)	(5275.1)	(5468.8)	(5916.4)	(3546.8)	(4738.3)	(6093.8)	(5721.6)
Weight	2.003	1.828	2.438	1.421	0.641	0.733	0.698	0.681
	(1.731)	(1.668)	(1.835)	(1.569)	(0.557)	(0.423)	(0.447)	(0.590)

Mean (standard deviation). Each cell contains the average value of the row variable in municipalities around the column threshold. The interval around a threshold is plus or minus 1698 inhabitants for thresholds 1 to 3, plus or minus 3396 for thresholds 4 to 8, plus or minus 5094 for thresholds 9 to 13 and plus or minus 6792 for thresholds 14 and 15. Each interval is constructed so that each municipality with population size between 8490 and 143'633 is in one and one only interval around a threshold.

Table 9.3: Marginal propensity to spend out transfer revenues by threshold

	Quant. education infra.		Qual. education infra.		Health infra.	
Threshold 1						
Transfers per capita	0.098	(0.062)	0.116*	(0.065)	-0.141*	(0.072)
Observations	3682		3680		1205	
Threshold 2						
Transfers per capita	0.106**	(0.500)	0.161**	(0.080)	-0.153	(0.171)
Observations	2982		2982		914	
Threshold 3						
Transfers per capita	0.077	(0.052)	0.027	(0.033)	0.083	(0.168)
Observations	3250		3249		1047	
Threshold 4						
Transfers per capita	0.093***	(0.029)	0.093**	(0.047)	-0.222	(0.189)
Observations	2796		2790		881	
Threshold 5						
Transfers per capita	0.049	(0.083)	0.020	(0.077)	-0.083	(0.634)
Observations	1966		1961		614	
Threshold 6						
Transfers per capita	-0.051	(0.114)	0.134	(0.168)	-0.281	(1.076)
Observations	1146		1146		325	
Threshold 7						
Transfers per capita	0.145	(0.105)	0.112**	(0.062)	-1.280	(0.818)
Observations	852		849		241	
Threshold 8						
Transfers per capita	0.055	(0.079)	0.071	(0.124)	-0.441	(0.925)
Observations	698		697		194	
Threshold 9						
Transfers per capita	0.067	(0.081)	0.130*	(0.075)	0.269	(1.417)
Observations	715		715		206	
Threshold 10						
Transfers per capita	0.099*	(0.055)	-0.156	(0.208)	2.412	(4.399)
Observations	540		540		146	
Threshold 11						
Transfers per capita	0.078	(0.083)	0.110	(0.194)	1.025	(1.445)
Observations	414		414		106	
Threshold 12						
Transfers per capita	-0.156	(0.232)	0.159*	(0.086)	-1.576	(5.726)
Observations	328		328		87	
Threshold 13						
Transfers per capita	0.016	(0.119)	0.069	(0.235)	-4.072	(2.836)
Observations	286		286		52	
Threshold 14						
Transfers per capita	-0.127	(0.119)	-0.051	(0.223)	-2.764	(5.649)
Observations	230		230		55	
Threshold 15						
Transfers per capita	0.110	(0.171)	0.122	(0.147)	-2.866	(3.394)
Observations	236		236		62	

3 Propensity Score appendix

The propensity score used to implement the weighted-difference in differences methodology is calculated by estimating a probit model of the probability that a municipality started a PMAT program sometime between 1998 and 2008 as a function of the pre-intervention characteristics used in the first column of Table 5.3. Table 9.4 presents the results of this estimation.This model is then used to predict the propensity (probability) that a municipality will privatize.

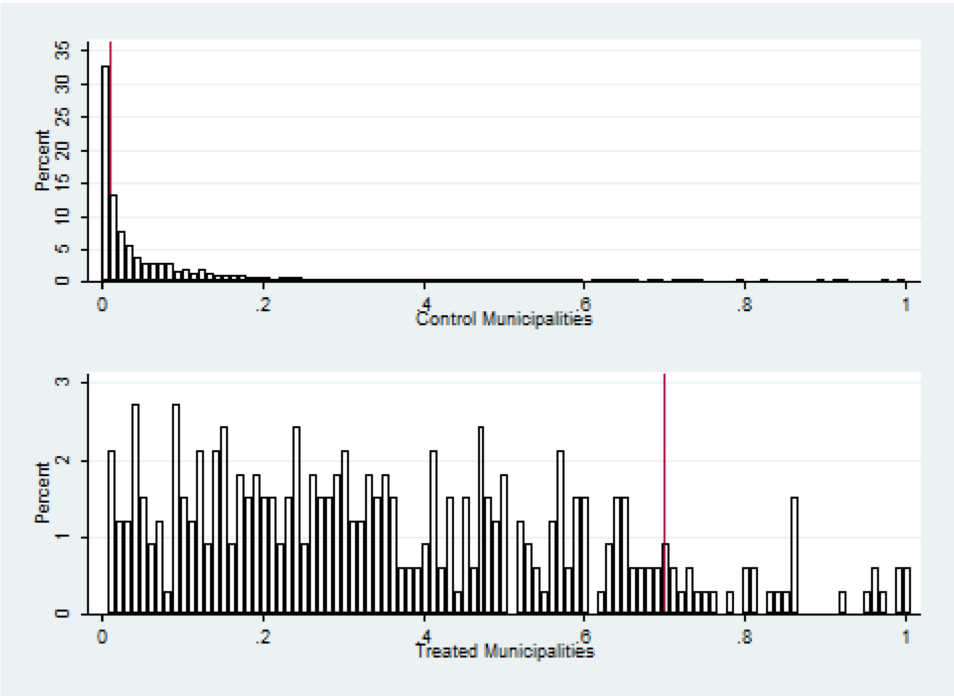
I identify control and treatment observations on a common support as follows. I exclude all control observations whose propensity scores are less than the propensity score of the treated municipality at the mid-point of the first percentile of the treatment propensity score distribution, and exclude all treated observations whose propensity score is greater than the propensity of the control observation at the mid-point of the 99th percentile of the control distribution. This eliminates 33% of control observations and 10% of treated. Figure 9.5 graphs the distribution of the propensity score in the treated and control groups. The red lines indicate the limit of the common support.

Table 9.4: Determinants of the probability of joining a program

Income	0.1586**
	(0.0757)
Population	0.1069**
	(0.0468)
Taxes in 1998	0.0000
	(0.0005)
Agr\ GDP	-0.0048
	(0.0042)
Serv\ GDP	0.0006
	(0.0045)
Education	0.0203
	(0.0875)
Urban pop.	0.8583***
	(0.2942)
Inequality	-0.8831
	(0.9148)
Governor's party	-0.0827
	(0.1073)
Pol. competition	0.7736**
	(0.3786)
Observations	3560

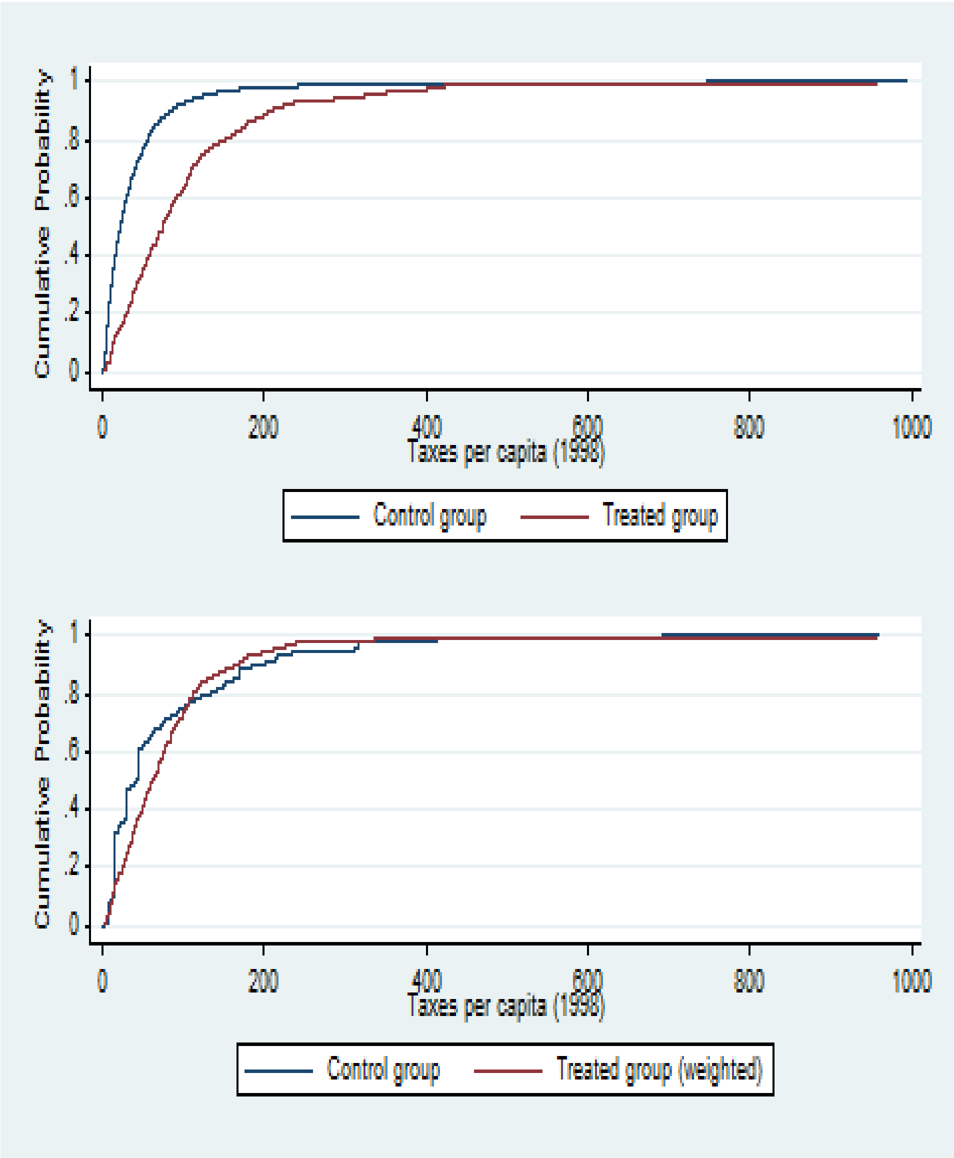
Cluster-robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Each coefficient represents a marginal effect and the regression includes state fixed effects.

Figure 9.5: Distribution of the propensity score



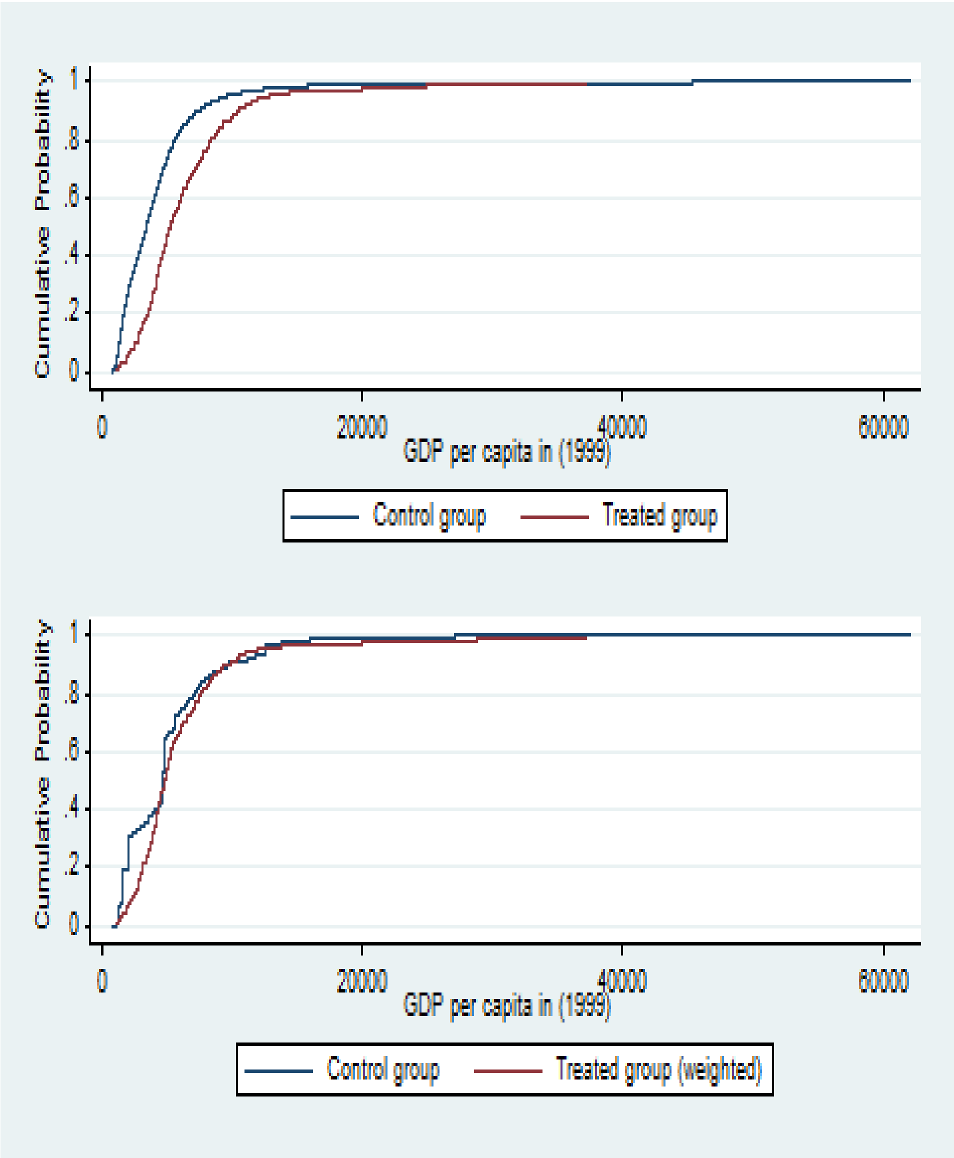
Density distribution of the estimated probability of joining the program. Red lines indicate the limits of the common support sample.

Figure 9.6: CDF of tax revenues per capita in 1998 in treated and control municipalities



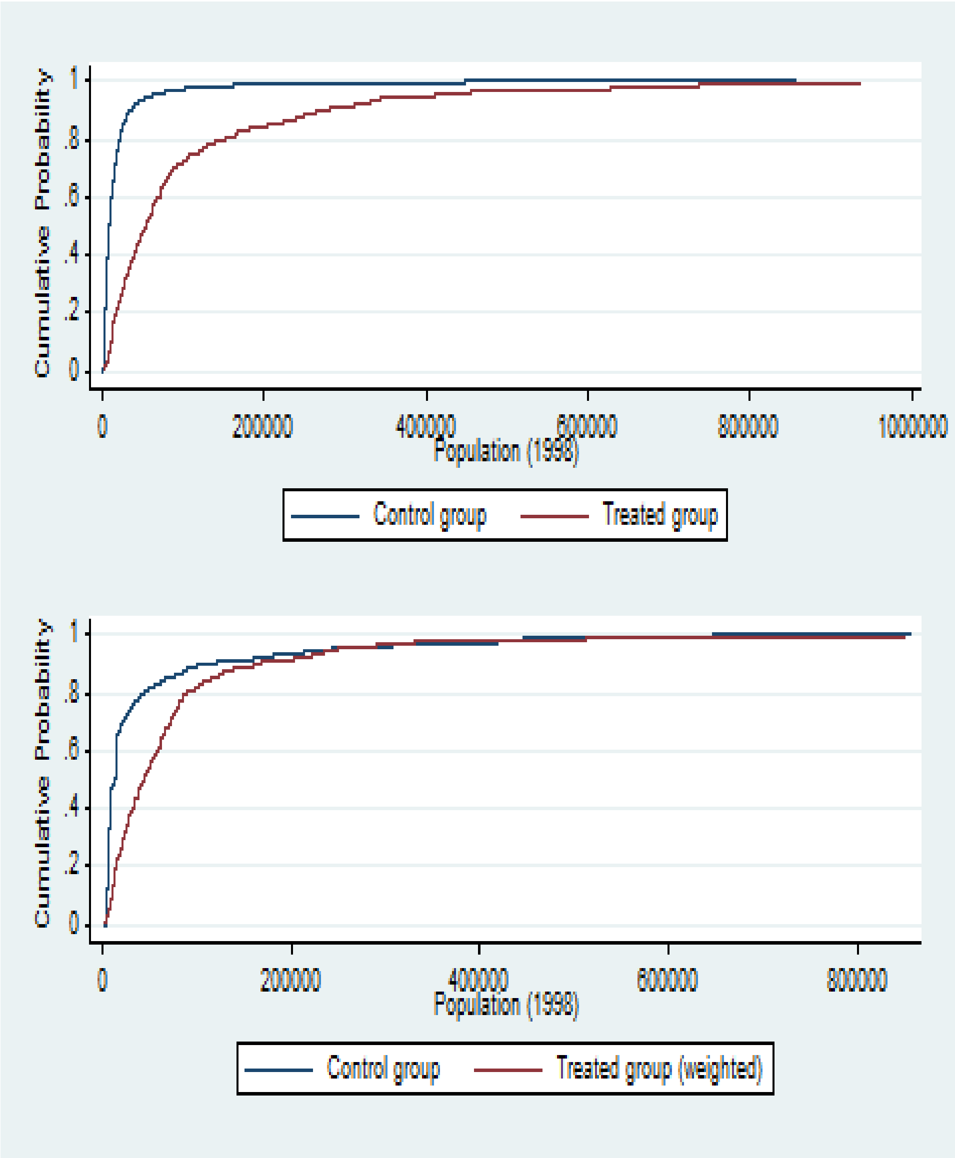
The graphs plot the CDF of tax revenues per capita in 1998 in treated and control municipalities. The top panel plots the distributions for the entire sample. The bottom panel plots the distribution for the common support sample, the control municipalities are weighted by a function of their estimated probability of joining the program.

Figure 9.7: CDF of GDP per capita in 1999 in treated and control municipalities



The graphs plot the CDF of GDP per capita in 1999 in treated and control municipalities. The top panel plots the distributions for the entire sample. The bottom panel plots the distribution for the common support sample, the control municipalities are weighted by a function of their estimated probability of joining the program.

Figure 9.8: CDF of population in 1998 in treated and control municipalities



The graphs plot the population in 1998 in treated and control municipalities. The top panel plots the distributions for the entire sample. The bottom panel plots the distribution for the common support sample, the control municipalities are weighted by a function of their estimated probability of joining the program.

4 Tables and figures Appendix

Table 9.5: Impact of the program, alternative specifications

	Taxes		Educ infrastructure: quantity		Health infrastructure		Corruption	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
				(1): All sample, (2): Logs				
All years	12.581***	0.098***	0.249***	0.046***	1.3	0.071**	-53.248	-0.135
	(2.235)	(0.023)	(0.038)	(0.022)	(0.791)	0.036	(41.890)	(0.122)
Observations	54577	28112	54589	28215	17121	9999	688	526

Cluster-robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. All regressions include municipality and year fixed effects as well as controls for GDP per capita, population size, share of agriculture and services in GDP, and changes in political competition, mayor's party affiliation and mayor's term limit in the previous election. The results for the log specification (2) are obtained from running propensity-score weighted versions of equation (4.1) on the common support sample using the natural logarithm of taxes, infrastructure, enrollment and the corruption index as dependent variables.

Table 9.6: Impact of the program on spending outcomes by time between application and program start

	Educ. infrastructure: quantity			Educ. infrastructure:quality		
Time between application and program start (years)	0	1	2-3	0	1	2-3
3 years before	0.023	-0.016	-0.015	0.022	-0.025	-0.091
	(0.203)	(0.099)	(0.165)	(0.150)	(0.081)	(0.114)
2 years before	0.102	0.010	0.038	-0.014	-0.040	-0.045
	(0.212)	(0.115)	(0.176)	(0.146)	(0.083)	(0.147)
1 year before	0.021	0.012	-0.006	0.020	0.010	0.021
	(0.221)	(0.116)	(0.171)	(0.131)	(0.098)	(0.139)
Program : all years	0.217	0.210*	0.218	0.230**	0.200*	0.199
	(0.202)	(0.121)	(0.152)	(0.125)	(0.110)	(0.164)
Observations	25535	26686	25692	25503	26657	25664

Cluster-robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The quantity of education infrastructure is the number of classrooms in use in municipal schools per 1000 inhabitants, the quality of education infrastructure is a municipal school quality index constructed as explained above and health infrastructure is the number of municipal health establishments per 100,000 inhabitants. All regressions include municipality and year fixed effects and controls for GDP per capita, population size, share of agriculture and services in GDP, political competition in the previous election, mayor's party affiliation and whether the mayor is a facing a term limit.

Table 9.7: Impact of the program on GDP and population

	GDP	Population
Program : all years	0.742	-0.094
	(0.902)	(0.127)
Observations	24070	24070
Municipalities	2462	2462

Cluster-robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. All regressions include year fixed effects, controls are GDP per capita, population size, share of agriculture and services in GDP, and changes in political competition, mayor's party affiliation and mayor's term limit in the previous election.

Table 9.8: Within municipality means (SD) of taxes and transfers

	All	Controls	Treated before *PMAT*	Treated after *PMAT*
Taxes	70.1 (74)	65.1 (78)	90 (19)	142.9 (25)
Transfers	174.8 (48)	182 (77)	106 (17)	129 (22)

5 *PMAT* Appendix

This section describes the types of investments in tax capacity Brazilian municipalities undertook thanks to the *Programma de Modernizacao da Administracao Tributario* (*PMAT*) program studied in the paper 'Tax Me, but Spend Wisely: the Political Economy of Taxes, Evidence from Brazil'. It starts by explaining what the *PMAT* program consists in then moves on to detailing a typology of the types of actions undertaken thanks to the program. The main source used here are the interviews I did with the staff of the Brazilian development bank (BNDES) and staff from local tax administrations in the Summer of 2010 and Spring 2011 and 2002 case study by the BNDES of 8 municipalities enrolled in the program (BNDES, 2002). I am extremely grateful to Marcelo Correa Barbosa Fernandes, Jose Roberto Alfonso, Maria Elena Oliveira, Robert Kallas, Sol Garcon, Rita Gabriella, Luiz Pazos, Eduardo Bandiera and Leticia Correa for helping me understand the *PMAT* program and the challenges faced by local tax administrations. Part of this information was collected thanks to a survey of *PMAT* municipalities undertaken in the Spring of 2011. I thank Beatriz Morais, Kenneth Wong and Daniel Linhares for excellent research assistance during this survey.

A The *PMAT* program

This program offers Brazilian municipalities a subsidized loans to be spent on 'modernizing their tax administration'. It was designed in 1997-1998 as part of an effort amongst Brazilian policy makers to improve the public finances of all levels of governments. During the 1980s and early 1990s Brazil experienced hyperinflation - three to four digits annual inflation rates. The success of the Plano Real in 1993-1994 led to a rapid decrease in inflation, but in the absence of substantive fiscal adjustment pushed all levels of government into fiscal distress. The loss of fiscal control mechanisms that had previously relied on high inflation to erode the real value of budgeted expenditures[3] and the sharp increase in interest rates eventually led to serious cash flow problems in many states, municipalities, and regional banks. In 1996 the federal government first announced its willingness to help address the debt problems of all states and in 1997 it organized a subsidized restructuring of most states' and many municipalities' debts. In 1998 the federal government itself obtained a $41.5 billion loan from the IMF. This fiscal crisis pointed out the costs of soft budget constraints in a fiscal federation and the necessity to re-think inter-governmental fiscal relations (see Bevilaqua (2002) and Baer (2001) for more on this period of Brazil's history.). This eventually led to the drafting of the Fiscal Responsibility Law, passed by Parliament in the year 2000 which specified hard-budget constraint rules at all levels of government and more generally established a broad framework of fiscal planning, execution and transparency, including the presentation of fiscal reports every 4 months and ceilings on personnel spending. It also specified that all municipal governments have to levy the two main taxes - the IPTU and ISS - that are devolved to them. Federal authorities were very aware that municipal tax administration were in many cases unfit for the task set to them by law, yet very anxious that they 'share the burden' of collecting public revenues. The *PMAT* program was initially thought of as an answer to this problem.

The *PMAT* program consists in a subsidized loan from the Brazilian development bank (BNDES) to municipal governments to modernize their tax administration. Interested municipalities have to apply to the BNDES with a tax modernization program specifying how they expect to spend their loan. In practice all projects were accepted, sometimes after some revisions[4]. Mu-

[3]Seignorage was an implicit source of public spending at the local level as well, as tax revenues followed price movements but public payrolls lagged behind.

[4]Municipalities were not eligible to the program if they had outstanding debt with any branch of government, including public banks.

nicipalities have up to 6 years to reimburse the loan. The *FPM* transfer each municipality is entitled to from the federal government is used as a collateral (see the companion paper for more details on this transfer)- in practice no municipality has ever failed to pay back. BNDES officials regularly check that the program's funds are used on tax administration expenditures by going through receipts.

B Investments in tax capacity

One important characteristic of the *PMAT* program is its lack of 'one size fits all' approach. I describe below the types of investments I most frequently encountered but many of the poorer municipalities spent a large share of their funds on items not specifically mentioned below: the purchase of greatly needed hardware and software and basic training of their staff. As I was finishing my field work I met with the team of the city of Marica in Rio de Janeiro state. They were writing their *PMAT* project and most of their planned expenditure for now was on improving the offices of the tax administration (including stopping the leaks in their ceiling), buying tables, chairs and computers. These expenditures do not fit in any of the investment categories below but will very probably be a great boost to their productivity.

B.1 Updating tax registers

No tax administration can function without a basic knowledge of who its potential taxpayers are and a method to assess their tax liability. Municipalities in Brazil levy two main taxes: one on the sale of services and one on property. Many of them however are only equipped with a small list of service firms, rarely updated, and an old register of properties on their territory, often without any indication of their size and value. Virtually every participant in the *PMAT* program undertook an updating of their tax registers - some of them called it a 'creation' of their tax registers when I asked them about it.

The most basic method consists in hiring a small team to go around all the municipality and take notes on every single property. Figure 9.9 below is a local newspaper article from the town of Manaus explaining this process. Enumerators write down the size and physical status of the property, and ask the resident what happens on the property - one way to track down possible service firms. A more sophisticated method of updating registers, undertaken by many larger municipalities, was *geoprocessamento*. This consists in taking comprehensive pictures of each property in the municipality from above, and then extrapolating their value. The city of Nova Iguacu thus doubled in size after updating its registers: the number of registered properties went from 160,000 to 320,000 and the average property doubled in size (it took Nova Iguacu three years to update its registers). Equipped with better information on its tax base the municipality introduced a progressive property tax rate, and lowered the average rate by nearly 50%. Some municipalities also undertook more basic changes in their tax registry, many mention switching from registers stored on paper to electronic versions. This greatly increases the security of individual tax data, something I return to below.

Mayors were on general very aware of the potential political cost of getting more citizens in the tax net. Many tried to mitigate this political cost by emphasizing the uses to which tax revenues are put and involving citizens in the updating process. One particularly time-demanding option was to follow up on the technical updating of registers by organizing local community meetings in which every citizen was told the estimated value of its property and given a chance to disagree with the finding of the register. This seems to have made the initiative quite popular with citizens, who appreciated having their local treasury come to their local area - this sytem was called *Fazenda Movil*, or local treasury.

Finally several municipalities started programs to provide local service firms with incentives to register with the local tax authorities. Formal registration of a firm in Brazil is done with the *Junta Commercial* (Chamber of Commerce) which grants it a legal existence. This registration does not lead to an automatic registration with the local tax authority. There are however some advantages to registering with the municipality as well, in particular this gives you the right to compete in public bids (local administration are important clients for some service firms, caterers for example). The costs of registration are larger however, much larger than just the cost of paying taxes. A study of informal small firms in the study of the Sao Jose area in Manaus reveals that many small entrepreneurs explain that they do not register with the local authorities because the paperwork would take them too much time (SEBRAE, 2008). Several municipalities designed programs that aim to decrease the paperwork associated with registration, streamline the process and emphasize the advantages of registering (in some cases registration was made compulsory to obtain a credit card machine and connect to the local electricity network). The article in Figure 9.9 mentions the *Seja Lega*[5] initiative in Manaus which (according to its organizers) was a great a success.

B.2 Facilitating tax payments

One explanation for low tax compliance at the local government level is regularly put forward by tax officials: they claim that the problem is not so much organized tax evasion but the fact that paying taxes is complicated, time-consuming, and, to a certain extent, not seen as compulsory - '*a principal razao de falta de pagamento neao e sonegacao de impostos*

[5] This name is clever invention of one of my interviewees. The Portuguese word 'legal' translates into 'legal' in English but is also slang for 'great' or 'cool'. The name of the initiative can therefore be understood as 'become legal' or 'become cool'.

mas o esquecimento, a falta de informacao e as difculdades para realizar of pagamento.' (BNDES, 2002). I will come back to the feeling of widespread local tax amnesty shared by many interviewees. Facilitating tax payments was a declared intention of the *PMAT* program, one that had many practical realizations. One strategy that was often used was to 'decentralize and centralize'. Local governments typically had one separate office for each different part of the tax paying process (registering, finding out your tax liability, contesting your liability, paying your tax bill, paying your tax arrears), but all located at the municipality's townhall. Some municipalities sent out tax liabilities to taxpayers but many had no such system, and it was up to the law-abiding citizen to go to the townhall to find out about it. Many *PMAT* participants created several tax bureaus ('*centro fiscal de atendimento ao cidadao*') in different parts of the municipalities in which all steps of the tax paying process could be undertaken and several local benefits could be claimed. This has the double benefit of saving time to the taxpayer and making it easier to communicate each taxpayer's information between different services.

The physical way in which taxes are declared and paid was also changed. Some municipalities installed a system for checking your tax liability and paying your taxes on the internet - this system was called *Projet S-Fiscal* in Belo Horizonte. Many could not presuppose all taxpayers had access to internet but instead launched a system of ISS declaration on a CD-rom (such as Belem, capital of the state of Para). Others set up systems which made it possible to wire tax payments directly from a bank account. Note that this is not a trivial operation. Banks typically have higher security requirements than the average local tax administration and are unwilling to share information with them unless they provide sufficient reassurance that their data is ultra secure. Setting up fool-proof secure personal data systems is a challenge for many local administrations. It generally requires purchasing specific types of software and providing staff with training and certificates that banks and federal authorities recognize.

Once the physical method of finding out tax liabilities and making tax payments is streamlined and facilitated numerous smaller innovations can be made to decrease collection costs borne by both taxpayers and the tax administration. One particularly popular change is allowing for monthly tax payments. This benefits both taxpayers - who may be credit constrained - and the tax administration, as it increases cash on hand.

B.3 Increasing control of taxpayers

Several tax administrators acknowledged that pre-*PMAT* their municipalities were in a state of 'permanent tax amnesty'. One administrator who was involved in several *PMAT* programs estimates that more than 90% of municipalities are unable to check that the amount of ISS paid by a taxpayer is the correct one - and as consequence do not even try. Improving tax registers is the first step in increasing control of taxpayers. Once the identify of taxpayers is known tax administrations have 1) to find out what their tax liabilities are (the registers may suffice to determine the property tax liability, but not that of the service tax) 2) to ensure tax payments are indeed paid.

The most straightforward way to ensure that firms declare their true tax liability is to make it very difficult for them to hide a transaction. This is typically the case when all transactions are done by credit card and the information on the credit card terminal is transmitted to the tax authorities. This systems is complicated, and was set up as part of *PMAT* in a few cases (see Boavista (2011) for a detailed explanation of the set-up of this system in Rio de Janeiro). Once the system is in place one needs to make sure firms actually use it. Several municipalities, including Rio de Janeiro and Sao Paulo, designed a scheme which gives consumers incentives to ask as third party enforcers. These schemes tell consumers of services to ask for a fiscal receipt when they make a purchase. To issue this receipt firms have to use a specific terminal that automatically transmits information about the purchase to the tax authorities. These receipts in turn give customers a right to some financial compensation - tax rebates on their IPTU bill in the most high-profile schemes, or simply a ticket to a local annual lottery.

When tax administrations have to use self-declared tax liabilities the threat of audits provided firms with incentives to declare truthfully. Training staff in the tax administration to undertake these audits is an oft mentioned expenditure financed by the program. But to be efficient these audits cannot be done completely blindly: well organized administrations typically have methods that automatically flag tax payments that seem irregular because their are too low compared to tax payments made by similar firms or the same firm in the previous period. To put this method in place one needs to store and analyze data on previous tax payments and key characteristics of taxpayers. The purchase of software and skills helped put such systems of data management in place.

Cross-checking information is another obvious method that tax administrations can use to check the plausibility of self declared tax liabilities. There is great potential for cross-checking of information in Brazil because they are multiple branches of government that collect data on potential taxpayers: federal, state and municipal governments, the social security system, public banks and chambers of commerce for example. Municipal administrations are likely to be the weakest link in the chain and hence the ones who could benefit the most from the sharing of information. An example is the sharing of information between the federal revenue service and the local tax administration: a doctor deduces his professional expenses from his federal income tax liability, information on these professional expenses is transmitted to the local tax authorities to check whether they are consistent with his declared level of activity as a provider of medical services. Some municipalities, like that of Ipatinga, organized a partnership with the federal revenue service to obtain this information. However this is a particularly costly partnership to organize. One of my interviewees says that to the best of her knowledge only 14 municipalities have such a partnership in Brazil. The reason is that the federal government, even more than regional banks, is very careful about protecting the identity of its taxpayers and does not trust municipal governments to equally protect this data unless they can show their data protection system fits all the required criteria and has been functioning well for at least a couple of years[6].

Once tax liabilities have been cross-checked the tax administration must make sure tax payments are effectively paid. Recovering tax arrears - *divida ativa* - is a preoccupation mentioned by all my interviewees. The law specifies that tax arrears are written off after 5 years if the municipality does not send legally certified document claiming the payment. The development of systems of data management which automatically flag out missing tax payments as part of *PMAT* greatly improved municipalities' capacity to recover tax arrears. Similarly setting up a partnership with a bank (with all the required changes in the data security system this implies) has enabled at least one municipality - Ipatinga - to ask Banco do Brasil for automatic transfer of tax arrears from uncooperative citizens. In the five year period since its implementation this system was never used - the threat and the simultaneous one-time scraping of penalties was enough to make citizens pay their tax arrears.

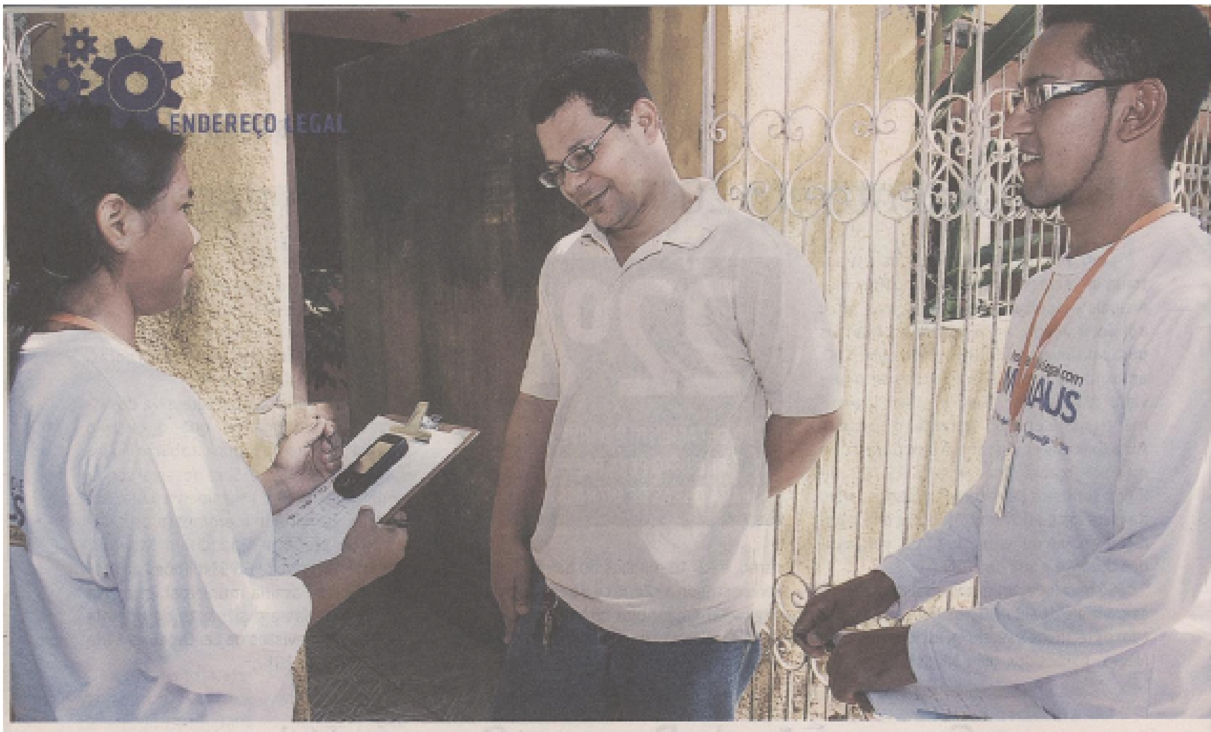
Economists are divided on the importance of social norms in determining tax compliance - see Andreoni et al. (1998). Local governments in Brazil

[6] This suspicion of the federal government and fear of leaks of taxpayers' information is well grounded. In 2010 a journalist was offered to buy social security data on the Sao Paulo black market. This data, subsequently published in a newspaper, contained the name, address and social security benefits of several hundred individuals.

seem not to be: most of them have included in their *PMAT* program some elements which try to increase the social returns to paying taxes and shift the social equilibrium away from the widespread belief that tax amnesty is a norm. Small-scale advertising campaigns emphasized that tax revenues are used to pay for essential public services but also always used some version of the message 'good people pay their taxes'. Local newspapers regularly published articles on the same thing. Many municipalities started small lottery programs such as the ones described above or simply specified that paying your taxes on time enters you in a lottery. The prizes all included a financial component - sometimes only a washing machine - but were delivered during very social occasions. In smaller local governments the lotteries typically happen during the municipality's Christmas party - a very social occasion - and winners are called on the stage, shake hands with the mayor and get their picture and a small interview in the local newspapers. It is of course impossible to disentangle the impact of those social incentives from the purely financial ones but the widespread use of these (cheap) social nudges suggest there are reasons to think they play an important role in this context[7].

[7] Note that these efforts also sometimes increased the social status of tax administrators, though perhaps not by design. Several of them told me that these public events shed a positive light on their job.

Figure 9.9: Local newspaper article on *Endereco Legal* in Manaus



94 mil imóveis recadastrados

Prefeitura avança no recadastramento de ruas e imóveis com o projeto ENDEREÇO LEGAL, para organizar e melhorar a arrecadação da cidade

A Prefeitura começou em agosto de 2009 o recadastramento de endereços e imóveis da cidade. Por meio do projeto Endereço Legal, desenvolvido pela Secretaria Municipal de Finanças e Controle Interno (Semef) em parceira com o Instituto de Planejamento Urbano (Implurb), já foram realizadas 95 mil visitas domiciliares e recadastradas 5.185 ruas. O número corresponde a 43% das 12 mil ruas cadastradas na cidade.

O Endereço Legal não está realizando levantamento imobiliário, referente à cobrança do Imposto Predial e Territorial Urbano (IPTU), e sim, cadastrando e recadastrando ruas e fazendo o levantamento da infraestrutura existente nas ruas visitadas. O objetivo é construir um mapa digital da cidade de Manaus.

Todas as casas serão renumeradas, e as ruas terão CEP correto. Será cadastrado também se a rua é asfaltada ou se tem ponto de ônibus. As informações vão ajudar a Prefeitura a administrar melhor a cidade.

CADASTRO DEFASADO

O cadastro atual da Prefeitura possui 362 mil imóveis. Com o programa Seja Legal, a estimativa da Semef é que sejam cadastrados mais 100 mil. Em quatro meses de trabalho as fachadas de mais de 120 mil imóveis já foram fotografadas.

A foto do imóvel (foto aérea e da fachada) vai compor o cadastro do IPTU. O último recadastramento, feito de forma parcial, foi realizado em 2004.

Hoje a base cadastral está desatualizada, tanto no endereçamento quanto nos dados de imóveis.

O índice de retorno de carnês de IPTU é cerca de 50%, o que representa que apenas 160 mil imóveis estão devidamente cadastrados. Isso resulta em queda na arrecadação, visto que Manaus possui cerca de 500 mil imóveis. O objetivo do projeto não é simplesmente o aumento de arrecadação, mas a organização da cidade.

Seja Legal com Manaus

Implantado em agosto, o programa Seja Legal com Manaus pretende gerar uma grande onda de legalização para regularizar e organizar a cidade. Divide-se em três grandes projetos que visam à desburocratização na abertura de empresas, por meio do projeto Empresa mais Fácil; a regularização simplificada de imóveis, com o projeto Casa Legal; e a reorganização da numeração predial e correção de endereçamento, por meio do projeto Endereço Legal. É uma parceria entre a Secretaria Municipal de Finanças e Controle Interno (Semef) e o Instituto Municipal de Planejamento Urbano (Implurb).

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