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International Center for Public Policy
Andrew Young School of Policy Studies
Georgia State University
Atlanta, Georgia 30303
United States of America

Phone: (404) 651-1144
Fax: (404) 651-4449
Email: hseraphin@gsu.edu
Internet: <http://aysps.gsu.edu/isp/index.html>

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Trends and Quality of Decentralized Public Investment

Lorena Viñuela
World Bank

I. Introduction

1. Around the world state and local governments have an important and growing role in the provision of public infrastructure services. Subnational governments presently account for an average of 63 percent of public fixed capital formation in OECD countries and approximately for 40 percent in developing countries. However, to date, the subnational dimension of public investment has been largely overlooked and it is not as well documented as other local responsibilities in service delivery.

2. In order to contribute to a better understanding of public investment and capital formation in multi-tiered governments, this paper reviews the relevant literature and empirically examines possible determinants of the quality of infrastructure and quantity of public investment, with particular attention to the effect of the overall level of fiscal decentralization. The following questions are explored using cross-sectional and time series analysis: (i) Has decentralization led to an increase or decrease of public investment?; (ii) Are more decentralized countries better off in terms of stock and quality of infrastructure?; and (iii) What are the factors that shape the distribution of public investment across levels of government? In addition, through two short cases I further analyze the impact of decentralization on the allocative efficiency of public investment and whether it is helping to better identify and meet infrastructure needs.

3. The results support the expectation that fiscal decentralization is associated with lower amounts of fixed capital formation and better quality of public infrastructure. Estimates are provided for two different country samples, one including OECD members and the other comprising 58 developing countries. Comparing the two groups shows that the effects of decentralization are greater in developed countries. This suggests that the positive impact of decentralization is contingent on the efficiency of public investment management and overall level of institutional quality. The lower levels of public investment may be reflective of efficiency gains, but it also raises concerns about potentially insufficient access to financing and steady funding sources for subnational governments. Lower investment rates can also be symptomatic of the fact that states and municipalities may be prioritizing other types of social investments over infrastructure.

4. Developing countries are investing more in public infrastructure and are doing so in a more decentralized manner than in the previous decade. After a sharp decline in the mid-1980s, the average public gross fixed capital formation increased approximately 2 percentage points of GDP between 2001 and 2010. During that period, Subnational governments contributed approximately two fifths of new public capital. Developing countries are also adding public fixed capital at a faster pace than developed countries. In the 2000s, low and middle income countries created on average 3.7 percentage points of GDP more of public infrastructure than high income countries.

5. Levels of capital formation have remained relatively low in OECD countries, possibly indicating that most of their infrastructure needs have already been met. Nonetheless, the volume of resources dedicated to capital projects and the share of public investment carried out by the second and third tiers of government are significantly higher than those of developing countries. Subnational governments in industrialized countries spend on average 9 percentage points of total public expenditure more than the rest of the world and are on average responsible for 25 percentage points more of the total public fixed capital formation. In the developed world, most local infrastructure services—local and regional roads, urban transit, water and sanitation,

and others—are fully decentralized¹ and subnational governments are increasingly participating in the implementation of bigger infrastructure projects.

6. Decentralization is in general expected to have positive effects on public performance and the efficiency of spending, including public investment. Ostensibly, it should facilitate the participation of citizens in decisions regarding public goods and services made available to them, allow governments to better accommodate local preferences and needs, and even generate production efficiencies. In order to achieve such benefits, responsibilities and resources need to be given to the level of government that is better able to perform a given activity, while accountability mechanisms must be put in place to prevent the capture of public resources by local elites and avoid other governance risks.

7. On the other hand, producing and maintaining infrastructure is a complex task and requires a long term planning horizon, sustained commitments for maintenance and operation, the mobilization of sizable financial resources, and the coordinated action of actors across different government levels. If institutions are weak or incentives misaligned, decentralization may exacerbate coordination failures and discourage fiscal discipline and the prioritization in public investment. Poor vertical and horizontal coordination among governments may lead to the under or over supply of infrastructure, overlooking potential economies of scales in the production of infrastructure, and preventing the full internalization of costs and benefits from projects that have spillovers to other regions.

8. At the same time, devolving infrastructure services also involves distinctive technical and assignment issues. In order to be an effective policy, it needs to be accompanied by sustained investments in capacity and the establishment of systems to manage the life cycle of capital projects at the local level. In many developing countries, subnational governments may not be as well positioned to manage multi-year investments as central agencies. Additional difficulties may arise from the heterogeneity of local and regional governments, which typically vary significantly in terms of population, revenue base and administrative capacity. Concurrently, subnational governments are subject to regulations passed by the central government on infrastructure provision, which may restrict their ability to accommodate for the local preferences.

9. In terms of financing, subnational governments generally face additional challenges in accessing resources and managing revenue volatility. The design of the intergovernmental fiscal framework affects the spending choices of lower tiers and how much they can effectively dedicate to capital investment. For example, matching capital grants have the potential of creating incentives to expand public investment, but other earmarked or general grants may result in less than proportional additions to capital spending because resources are fungible. Importantly, various revenue-sharing and transfers schemes determine how much of the volatility in government revenue would be transmitted to lower tiers.

10. In particular, the predictability of transfers and revenue sources are important factors affecting the decisions of regional and local governments. Because public investment is a discretionary form of spending, it is more sensitive to cuts than recurrent expenditure, such as wages and social services, which would generate more concentrated opposition. Revenue volatility will also affect sustainability of capital spending and the proper maintenance of the existing capital.

¹ And in some cases, they have been privatized.

11. Considering these factors, the paper proceeds as follows. Section II presents observed changes in capital formation and the trends in fiscal decentralization in OECD and developing countries. Section III reviews the theory of assignment concerning infrastructure services and earlier empirical analyses of the impact of decentralization on public investment levels. This section also states the relevant hypotheses concerning the relationship between decentralization and infrastructure outcomes. Section IV tests several hypotheses using a cross-country panel data. Here also the results from the statistical analysis are presented. In section V, the cases of Argentina and Mexico analyze more closely changes in the allocative efficiency of public investment as a result of decentralization reforms. The last section presents the main findings and policy implications.

II. What do we know about public investment in decentralized settings?

12. In this section the stylized facts of public investment in relation with the overall level of fiscal decentralization are discussed. Despite the many gaps in the available data and the limitations in the measurement of both public investment and fiscal decentralization, it is still possible to describe the major trends in these areas and identify the most salient issues for how they relate to each other.

Definitions, Data Sources, and Limitations

13. Before turning to the data, it is important to introduce some of the main concepts used in the paper. There is a key distinction between the level of public investment and the stock of fixed capital. On the one hand, *public investment* or capital spending is a flow measure and refers to the outlays made by various levels of government with the aim of adding to their capital. In contrast, *gross public fixed capital formation* measures additions to the stock of capital.² This concept refers to addition of capital assets minus depreciation of the existing assets in a given period.

14. There are no consistent estimates on capital outlays that can be used to compare countries. However, both the IMF's World Economic Outlook database and the World Development Indicators offer yearly data on fixed capital formation, total and for the public sector. In this paper, this measure is used as a proxy for the flow of resources. An important caveat is that the gap between capital flows and actual fixed capital formation would be determined by the efficiency with which resources are managed. This gap is likely to be bigger for developing countries (Chakraborty and Dabla-Norris, 2009, Pritchett, 2000). Countries with more efficient public investment management systems would see greater increases in the overall

2. Fixed assets are tangible or intangible assets produced as outputs from production processes that are used repeatedly, or continuously, for more than one year. Gross fixed capital formation, as defined in the 2008 System of National Accounts, is measured "by the total value of a producer's acquisitions, less disposals, of fixed assets during the accounting period plus certain specified expenditure on services that adds to the value of nonproduced assets." Public gross fixed capital formation is calculated by subtracting from the overall measure the share accounted for by the private sector. This definition excludes consumer durable goods and small and inexpensive tools that perform simple operations and the services they generate following the 'so called' asset boundary. (For more information see <http://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf>).

stock of infrastructure for the same amount of capital expenditures than countries with poor systems.³

15. On the other hand, the *stock of public fixed capital* and the *quality of public infrastructure* of a given country are a function of past and cumulative investments in infrastructure and in the adequate maintenance of existing assets and as such they are outcome measures. The quality of infrastructure not only reflects the fact that there is sufficient infrastructure, but also provides information about its conditions and attributes.

16. There are several possible proxies for the stock and quality of the public infrastructure. Using indicators of coverage of various services—such the percentage of paved road, road density, access to water and sanitation, and other similar ones—can provide an overview of how countries and localities compare to each other in terms of capital endowments. Moreover, there are several indicators from perception surveys that use a Likert scale to rate satisfaction with the quality of infrastructure including, for example, measures for overall quality of infrastructure, quality of ports, and quality of logistic and trade infrastructure, such as those provided in the World Economic Forum’s Global Competitive Report. These scores are based on the responses to the Executive Opinion Survey that polls 94 top level managers in each country from a sample of domestic and international (public and private) companies. While this data is considered fairly reliable, comparability over time is limited due to changes in the country coverage and the structure of the survey in 2006 (Munck, 2009).⁴ The data should also be considered with caution as captures the perceptions of a subset of the population and, like other perception data, may be influenced by prevailing or past conditions and events that unduly affect respondents’ views. Note also that these measures are not necessarily capturing the spatial distribution of the existing infrastructure, and that it is likely to be giving a greater weight to urban centers or areas where the polled companies are located.

17. The measurement of the level of decentralization and how it changes overtime is equally problematic. It is common practice in the literature to use data from the International Monetary Fund’s Government Finance Statistics (GFS). The most commonly used indicator to measure fiscal decentralization is the *subnational share of public expenditures*. This measure provides information on the relative position of local governments within the public sector and how it changes over time. However, there is widespread consensus on the fact that this measure only offers very partial information on the level of decentralization and effective subnational autonomy, which by definition are multifaceted phenomena.

18. Several potential problems arise from the GFS dataset that may affect the validity of an analysis using such indicator. Firstly, the measure does not provide information on what proportion of transfers from national governments to subnational entities are conditional or already earmarked for a specific sector. Secondly, the indicator does not provide a measure of the level of autonomy that subnational governments have to determine and raise their revenue base (Yilmaz and Ebel 2002). Such data is available for selected OECD countries and years, but it is yet to be compiled for rest of the world. Thirdly, the data does not provide information on state-owned enterprises, for example in telecommunications or energy sectors, which could be responsible for substantial shares of public investment at the national and subnational level.

3. An efficient public management system is one that translates one unit of spending translated into an equivalent unit of economically and socially productive capital stock.

4. See more details of Gerardo Munck’s commentary on WEF data at <http://www.iadb.org/datagov>.

19. To have a fuller picture of fiscal decentralization, it is necessary to consider not only the percentage of subnational expenditure that is locally controlled (Eaton and Schroeder 2010), but also whether subnational government have the ability to decide the bases and rates of local taxes and to borrow from markets (Ebel and Yilmaz 2002). It is also important to consider how the measures of fiscal decentralization intersect with the political and administrative dimensions of devolution (Rodden 2004).

20. The same problems affect the proxy used to assess the vertical distribution of capital expenditure that is also drawn from GFS. The *subnational share of net fixed public capital formation* is calculated as the percentage of net capital formation reported by subnational governments relative to the total for all levels of government combined. According to the GFS 2001's definition, "net acquisition of nonfinancial assets equals gross fixed capital formation less consumption of fixed capital plus changes in inventories and transactions in other nonfinancial assets."

21. Yet, despite the conceptual limitations of the GFS and potential problems related to the quality of the primary information collected, this dataset is the only one available that can be used to compare, albeit imperfectly, developed and developing countries and assess change overtime. Considering these caveats, some of the most relevant trends across regions are presented below.

Trends in Capital Formation and Fiscal Decentralization

22. The relationship between decentralization and infrastructure service provision is complex. Both sets of variables are correlated with the overall level of institutional and economic development. Developed countries are on average more decentralized than the rest of the world. At the same time, these countries have both a greater stock of fixed capital and exhibit greater quality of infrastructure. To set the background for a closer examination of this relationship, a number of indicators and trends are summarized in this section.

Fiscal Decentralization

The trend towards greater decentralization has continued across the world, although at a slower pace than in previous decades. In all regions the average subnational expenditure and revenue shares have increased since 1980s. The only exception is the Middle East that has the lowest levels of fiscal decentralization.

Table 1 describes the relative position of subnational governments grouped by regions. In most developing countries, subnational expenditures have grown faster than revenues leading to greater vertical imbalances across tiers of governments. The comparison shows that OECD countries exhibit the highest levels of decentralization. East Europe and Central Asia and Latin America and the Caribbean follow. Nonetheless, these estimates hide considerable intra-region variation.

Table 1: Decentralization Indicators by Region, 2001-2010

	AFR	EAP	ECA	LAC	MNA	SAR	OECD	Non-OECD	Diff. OECD/Non-OECD
Subnational Share of Revenue (% of Total Revenue)	14.1	33.7	22.6	23.8	8.2	30.1	30.7	22.2	8.5***
Subnational Own Source Revenue (% of Subnational Expenditure)	44.4	71.4	62.1	63.7	80.2	67.9	62.4	60.2	2.2
Subnational Share of Expenditure (% of Total Expenditure)	23.9	19.0	19.7	19.1	4.5	24.6	28.5	19.2	9.3***
Subnational Share of Capital Formation (% of Total Cap.Form.)	28.4	35.0	43.1	34.9	18.9	47.3	63.9	38.4	25.5***
Subnational Capital Formation (% of Subnational Expenditure)	23.0	37.2	20.9	27.4	35.0	21.2	8.1	23.8	-15.7***

*** Significant at the 0.01 level (2-tailed) ** Significant at the 0.05 level (2-tailed)

Source: IMF's Government Finance Statistics 2012 and World Bank Indicators 2012.

23. There are substantive and statistically significant differences between industrialized and developing countries in the various dimensions of fiscal decentralization and decentralized infrastructure service provision. On average, subnational share of revenue is 8.5 percentage points higher for OECD members than for the rest of the world. Also, OECD countries observe a subnational share of expenditure that is 9.3 higher than others. The disparity is even more accentuated in terms of the share of net fixed capital formation accounted for by subnational governments. In OECD countries that share is on average 64 percent, which is 25.5 higher than for other countries. Nonetheless, infrastructure additions represent a greater portion of subnational expenditure in developing countries.

Stock and Quality of Infrastructure

24. There are also considerable disparities between OECD countries and the rest of the world in all the indicators related to the existing stock of infrastructure and its quality. **Error! Reference source not found.** summarizes various indicators of access to infrastructure services including water and sanitation, road density and pavement, electricity, and telecommunication across regions. Developing countries display consistently lower coverage for the various infrastructure services. This gap is likely to widen as a result of the faster pace of urbanization observed in developing countries, where the urban population is growing at an average of 2.4 percent per year. Nonetheless, Latin America, East Europe and Central Asia, and the Middle East stand out for having relatively high percentages of the population with access to electricity, water, and sanitation.

25. In general, the overall quality of infrastructure is positively associated with the level of income. OECD and high-income countries have an average score close to the maximum, but the mean for developing countries is approximately half of that. East Asia and the Pacific and the Middle East and North Africa also have relatively high average scores with 4.8 and 4.4 respectively. OECD members and other high-income countries (including several resource-rich Middle Eastern countries) appear to be converging. Low and middle income countries have also observed improvements and the gap between these two groups is slowly closing.

Table 2: Decentralization and Infrastructure Indicators by Region, 2001-2010

	AFR	EAP	ECA	LAC	MNA	SAR	OECD	Non-OECD	Diff. OECD / Non-OECD
Overall quality of infrastructure (1=low, 7=high)	3.1	4.8	3.5	3.3	4.4	2.9	5.6	3.6	2.0***
Quality of port infrastructure, WEF (1=low, 7=high)	3.7	4.3	3.6	3.7	4.4	3.5	5.4	3.8	1.6***
Quality of trade and transport infrastructure (1=low, 7=high)	2.1	2.7	2.5	2.4	2.6	2.1	3.8	2.4	1.4***
Access to electricity (% of population)	32.6	71.6	N/A	88.4	94.5	50.9	99.7	66.0	33.7** *
Improved sanitation facilities (% of population with access)	33.0	66.2	91.8	79.1	83.7	50.7	99.9	64.9	35.0** *
Improved water source (% of population with access)	66.3	80.5	94.8	90.9	88.1	82.5	99.9	81.9	18.0** *
Road density (km of road per 100 sq. km of land area)	25.1	106.1	80.7	50.5	70.5	52.1	268.1	64.4	203.7* **
Roads, paved (% of total roads)	32.5	64.7	72.7	31.3	70.5	53.4	81.0	54.5	26.5** *
Fixed broadband Internet subscribers (per 100 people)	0.2	4.6	5.9	3.9	1.5	0.4	17.1	2.8	14.3** *
Telephone lines (per 100 people)	3.0	15.8	26.4	21.5	14.8	4.3	53.9	14.6	39.3** *

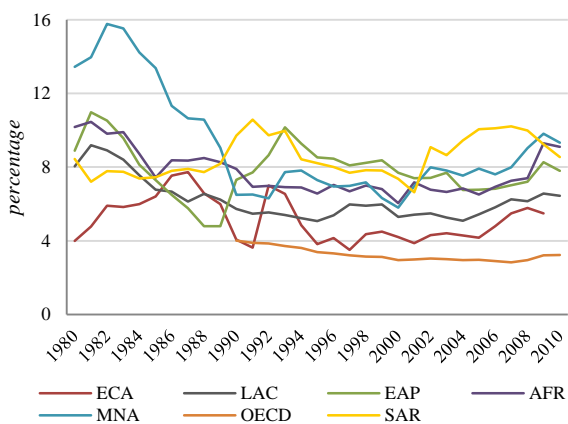
*** Significant at the 0.01 level (2-tailed) ** Significant at the 0.05 level (2-tailed)

Source: World Economic Forum 2012 and World Bank Indicators 2012.

Public Capital Formation

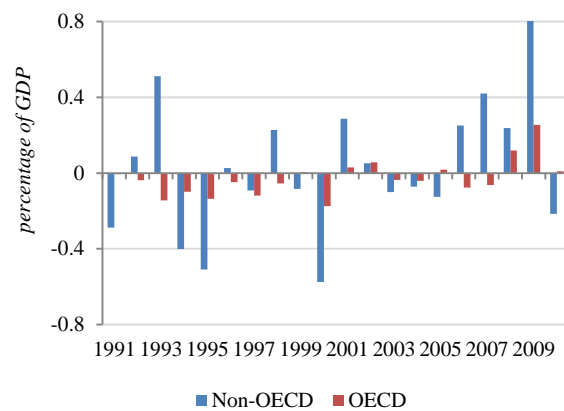
26. OECD countries compare favorably to the rest of the world in terms of stock and quality of infrastructure as well as in the level of fiscal decentralization. On the other hand, developing countries are adding capital assets to their inventories at a higher rate. After a sharp decline in the 1980s, levels of overall gross public fixed capital formation have stabilized or increased in most regions (see Figure 1). Conversely, the OECD and East Asian Pacific regions have observed a decrease of 14 percent in their average capital formation when compared to 1990s levels.

Figure 1: Gross Public Fixed Capital Formation by Region (percentage of GDP), 1980-2010



Source: IMF World Economic Outlook Database 2012.

Figure 2: Gross Public Fixed Capital Formation Yearly Change (percentage of GDP), 1990-2010



Source: IMF World Economic Outlook Database 2012.

27. The recovery of public investment has been especially marked in the Middle East and North Africa. As prices of energy commodities, which are the mainstay of their economy, started increasing again in the 2000s, the level of gross public fixed capital formation rose by 13 percent as compared to the previous decade. As well, Africa saw capital formation increase by 19 percent during the same period, while East Europe Central Asia and Latin America experienced positive but smaller changes, with 7 and 4 percent increases respectively.

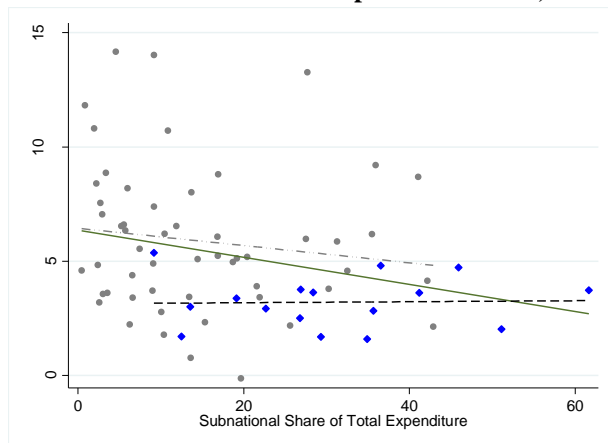
28. Although developing countries are creating more fixed capital as a share of GDP, their investments tend to be more volatile than those of developed countries. The average year-to-year change, as shown by Figure 2, is considerably higher for non-OECD countries. High volatility can be particularly disruptive for public investment portfolios as public officials are not able to forecast revenues and make decisions on multi-year projects. The degree to which this aggregate volatility is transmitted to subnational government is, however, a function of the design of the inter-governmental fiscal framework.

Diverging Trends?

29. A closer examination of the data shows that the relationship between decentralization and the quantity and quality of public investment may be going in different directions for OECD and the rest of the world. Using a cross-section of observations, Figure 3 to Figure 4 **Error! Reference source not found.** display the results across these two groups of countries.

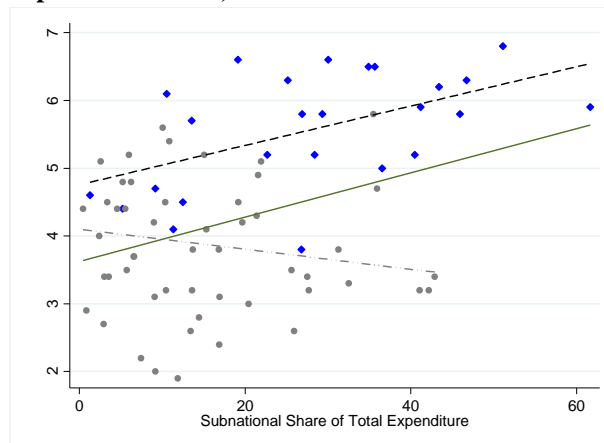
30. When the data for all countries is considered together, it is possible to observe a negative relationship between fiscal decentralization and the quantity of gross formation of public assets (see Figure 3). Similarly, the data shows a positive relationship between the degree of fiscal decentralization and the quality of infrastructure (see **Error! Reference source not found.**). Nevertheless, in the first case, OECD countries fall below the fitted line, whereas in the second they fall north of the predicted value for countries with the same degree of fiscal decentralization. This is to be expected they would have a lower ratio of fixed capital formation to GDP than developing countries facing significant infrastructure gaps.

Figure 3: Gross Public Fixed Capital Formation as % of GDP and Subnational Expenditure Share, 2009



Source: IMF WEO 2012, WB Decentralization Indicators 2012.

Figure 4: Quality of Infrastructure and Subnational Expenditure Share, 2009



Source: WEF 2012, WB Decentralization Indicators 2012.

Note: Blue diamonds represent OECD countries, grey dots represent developing countries. The dash black (---) line is the fitted line for OECD countries and the gray dash dot (-.-) line is the fitted line for developing countries.

31. Greater decentralization is positively associated with better outcomes in terms of quality infrastructure in OECD countries. However, the sign of the relation between capital expenditure and the level of decentralization turns negative for developing countries. The same difference is observed when comparing the relationship between the level of gross public capital formation and fiscal decentralization.

32. This divergence may suggest that the effect of decentralization on the quantity and quality of public investment is contingent on the overall quality of institutions. Institutional capacity and the degree to which local governments are accountable to citizens affect their ability to use resources and their incentives to respond to local preferences and address infrastructure gaps. On the other hand, if accountability and institutional capacity are weak, decentralization can lead to an erosion of infrastructure stocks.

33. Nevertheless, when using the subnational share of net capital formation as the independent variable, a positive relationship is observed between the degree of decentralization in capital investment and the quality of infrastructure for both country groups—OECD and non-OECD. An important caveat is that there are fewer observations available for that variable and countries that report data for subnational governments are likely to be the ones that have a longer tradition of decentralization and more established institutions at the subnational level.

III. Insights from the Literature and Relevant Hypotheses

34. To help us interpret the emerging data, this section turns to the literature on decentralization. Although the empirical research examining the effect of decentralization on infrastructure spending and quality is relative limited, it offers some relevant insights that are here discussed and tested in the following section.

35. A central tenant of the first generation of federalism literature is that decentralization should contribute to reducing aggregate public spending and taming fiscal pressure. Brennan and Buchanan developed a hypothesis, known in the literature as the ‘Leviathan hypothesis’, that states that the “[t]otal government intrusion into the economy should be smaller, *ceteris paribus*, the greater the extent to which taxes and expenditures are decentralized...” (1980: 15). The central mechanism through which the reduction of government size is achieved according to this theory is the competition among subnational governments to offer different fiscal packages to citizens.⁵ Importantly, this theory assumes that individuals are highly mobile across jurisdictions. Following the logic of the ‘Leviathan hypothesis’, decentralization may be expected to reduce all forms of spending, including capital spending.

36. Estache and Sinha (1994) compare data from a small sample of OECD and developing countries to examine how decentralization affects spending in infrastructure. Contrary to the Leviathan hypothesis, they conclude that decentralization tends to increase both total and subnational spending on public infrastructure. According to these authors the elasticity of infrastructure spending is similar across developed and developing countries. The explanation offered in the paper for the increase in capital spending is that subnational governments’ preferences on quality and quantity of infrastructure are different from those of the central

⁵ The relationship between fiscal decentralization and public spending has spurred numerous empirical analyses, but to date there no consensus on what the outcome is.

government. It is important to note that the number of developing countries included in that sample is fairly limited in comparison with the ones included in this paper. In other words, local governments are thought to put a greater weight in capital spending. Kappeler and Vällilä (2008) find similar results using a sample of European countries.

37. A fundamental argument in favor of decentralizing infrastructure is that moving decision-making and implementation closer to clients yields efficiency gains. These gains can come from two sources. First, production efficiency implies that local entities can build and operate a certain types infrastructure less expensively. Cost savings may derive from cheaper local building materials, less expensive local labor, more efficient project design, fewer layers of bureaucratic oversight, and lower corruption, among other sources (Peterson and Muzzini 2005). Sustainability is an important aspect of production efficiency. Second, allocative efficiency implies that locally identified investment priorities would better reflect citizens' preferences than those determined by the central government. And, citizens would value each unit of infrastructure spending more highly.

38. Yet there is little agreement on whether these benefits have materialized, as shown by two studies including the work of Asthana (2003) on water provision in India and Faguet's (2004, 2008) on per capita infrastructure spending in Bolivia and Colombia that offer opposite conclusions. On the one hand, using state level data, Asthana (2003) finds that state and local of public investment in the water sector is less efficient and has higher costs per unit of output. On the other hand, Faguet (2008) compares the impact of decentralization on municipalities' uses of public resources, the distribution of resources across space, local government responsiveness, and poverty-orientation. The author reports that devolving responsibilities to local governments reduces public investment levels and shifts resources to social and human capital spending. Nonetheless, Faguet finds evidence that operating costs remain steady and that decentralization leads to more responsive and better spatially distributed investments.

39. How subnational governments make decisions over capital allocation and administer infrastructure has only also been thinly studied. The limited literature on the subject highlights that greater fiscal autonomy, in particular on the revenue side, fosters competition among localities to attract citizens and investors. Inter-jurisdictional competition may have positive effects on the responsiveness of local governments to infrastructure needs and may even lead an oversupply of fixed capital assets, especially if actions to improve existing infrastructure are not properly coordinated across levels of government (Keen and Marchant 1997). Yet, if the competition for private capital leads to lowering tax rates and revenues, there could be an underinvestment in infrastructure (Sinn 2003). As well, in a similar manner to national level public investment, capital spending by subnational governments is expected to be affected by year-to-year variation in their fiscal balance and access to financing and their ability to take new debt.

40. The existing literature also warns about the highly pro-cyclical character of subnational public investment and about potential disproportional cuts during fiscal downturns. The more dependent subnational governments are on capital grants from the central government, the more volatile their capital expenditure envelope will be. Holtz-Eaking and Schwartz (1995) report that in the United States local capital investment allocations are affected by revenue changes and, in turn, this leads to pro-cyclical spending. In Spain, Solé-Ollé and Sorribas-Navarro (2011) document a disproportional fall of investment at the subnational level as a result of fiscal adjustment.

41. Decentralization may not only change the level of investment at the subnational level, but also change the composition of the investment portfolio. Kappeler and Vällilä (2008) report that, in EU members, decentralization has increased infrastructure investments in schools and hospitals. As well, there may even be an inverse relationship between infrastructure gaps and subnational allocations to capital projects. Cai and Treisman (2005) argue that regions that are unattractive to investors because of the low quality of their infrastructure would not be able to compensate for its initial disadvantage. As a result, they are more likely to use public resources for other goals that offer greater short term benefits.

42. From the review of the literature, it is possible to extract several testable hypotheses about the relationship between fiscal decentralization and public investment. They are synthesized in Table 3. Four sets of factors are expected to influence public investment in three areas, including: (i) the overall quality of infrastructure, (ii) aggregate quantity of public fixed capital formation, and, (iii) how much of those additions are accounted for by subnational governments.

Table 3: Summary of Hypotheses

	Overall Quality of Infrastructure	Aggregate Quantity Public Investment	Subnational Share of Public Investment
Fiscal Decentralization	+	-	+
Revenue	+	-	+
Expenditure	+	-	+
Vertical Imbalance	-	+	-
Demand for Infrastructure	-	+	+
Infrastructure Gaps	-	+	+
Per Capita Income Growth	+	+	+
Urbanization	-	+	+
Population Density	-	+	+
Economic Context	+	+	+
Per Capita Income	+	+	+
Fiscal Space (Balance, Debt)	+	+	+
Volatility of Capital Spending	-	-	-
Quality of Institutions	+	-	+
Control of Corruption	+	-	+
Voice and Accountability	+	-	+
Government Effectiveness	+	-	+

Source: Author's compilation.

43. The first hypothesis is that greater subnational fiscal autonomy is expected to increase the efficiency of capital spending, as well as positively impact the quality of created fixed capital assets as a result of informational advantages and greater direct accountability enjoyed by regional and local governments. Larger subnational shares of expenditure and own revenue should in general be accompanied with more decentralized capital spending.

44. The second group of variables refers to the magnitude of the demand for infrastructure services in a given country. The underlying hypothesis is that the bigger the gap between the stock of present capital and unmet needs is, the larger public investment would be, other things equal. Countries experiencing rapid urbanization would more likely have greater demands for transport, electricity, sanitation and infrastructure for the new dwellers of large urban centers and the settlements and secondary cities that surround them. Similarly, more densely populated

countries would need larger investments than those which are not. On the other hand, developing countries with large infrastructure gaps may resort to decentralization of public investment as a policy to tackle the challenge of increasing access to various services. Additionally, as the measure infrastructure quality is reflective of how much infrastructure services are already available, it is expected that it would be inversely associated with the demand for public investment.

45. A third hypothesis is that better economic conditions would allow for higher rates of public investments as they would make capital spending more affordable. The better the fiscal position of a country is, the greater the room it would have to invest without compromising fiscal sustainability. Higher income would also increase the likelihood that investments are more consistent over time and, consequently, the quality of infrastructure should be greater. Additionally, the reviewed data showed that developed countries are more decentralized.

46. Fourth, the literature suggests that outcomes may be contingent not only on the level of economic development, but also on the overall level of institutional capacity and degree of accountability. Decentralization can shift resources from needed infrastructure investments to recurrent spending or lead to waste if local governments are “too susceptible to elite capture, and too lacking in technical, human and financial resources, to produce a range of public services that are varied, efficient and responsive to local demand” (Faguet 2012: 1116).

IV. Empirical Cross-Sectional Analysis

47. In this section, I test the validity of the hypotheses just discussed. Before turning the analysis, the data, estimation methodology (pooled time series crosssection analysis), and the model specification are presented. Then, I discuss the results linking them to the hypotheses.

Data

In section II, the main definitions and limitations considered have been presented. The (unbalanced) panel comprises yearly observations from 1990 to 2010 for 87 countries, with a total of approximately 1,540 data points. Each observation represents the aggregate national measure. The main sources of data used are the World Bank Decentralization Indicators based on the International Monetary Fund’s Government Finance Statistics (GFS), the IMF’s World Economic Outlook (WEO) databases, the World Bank Development Indicators, and the World Economic Forum. The unit of analysis used is “country-year” within the framework of a multivariate analysis. A detailed description of the variables, their summary statistics, and the sample are available in the Annex’s Table 7 to Table 10.

Estimation Methodology and Model Specification

48. Taking the data’s limitations discussed earlier in the paper into consideration, the analysis uses pooled time-series cross-sectional (TSCS) estimation to overcome the degree of freedom problem created by the limited number of countries and years examined and to have greater variability in the dependent and independent variables. A feasible generalized least squares regression is used to correct for potential heteroschedastic and autocorrelated errors across time

and across countries. Using this technique to estimate the effects of decentralization on gross fixed capital formation as a ratio of GDP, the score for quality of infrastructure, and the subnational share of fixed capital formation are regressed on the indicators of decentralization and the variables best capturing each of the hypotheses discussed in the previous section.

The following multiple regression model is used: $Y_{it} = \beta_0 + \sum_{k=1}^K \beta_k X_{kit} + e_{it}$

49. Where $i = 1, 2, \dots, N$; refers to a cross-sectional unit; $t = 1, 2, \dots, T$; refers to a time period and $k = 1, 2, \dots, K$; refers to each specific explanatory variable. Y_{it} and X_{kit} refer respectively to dependent and independent variables for unit i and time t ; and e_{it} is a random error and β_0 and β_k refer, respectively, to the intercept and the slope parameters. Therefore, a complete model of public investment is given by:

$$Y_{it} = \beta_0 + \beta_1 \text{Fiscal Decentralization}_{kit} + \beta_2 \text{Stock of Infrastructure}_{kit} + \beta_3 \text{Economic Conditions}_{it} + \beta_4 \text{Quality of Institutions}_{kit} + \varepsilon_{kit}$$

50. First, in order to address the possibility that fiscal decentralization is endogenous, and following the literature on the subject (Arzaghi and Henderson 2005, Strumpf and Obersholzer-Gee 2002, Panizza 1999), the model uses geographical area of countries as a control for fiscal decentralization. As Enikolopov and Zhuravskaya (2007, 2283) explain, “[t]he intuition behind this instrument is that, ceteris paribus, costs of centralized governance increase with geographical size of the country which leads to higher economic decentralization in countries with larger area.” While geographical area can be endogenous in the long run, it is possible to assume that of the size of countries is exogenous when only analyzing the last three decades.

51. Partial models are used to test the explanatory power of different independent variables identified by the literature as relevant and presented in the earlier section. Some of the variables used to test the various hypotheses include urban population growth (to proxy for the demand for investment in infrastructure), GDP per capita (to proxy for the purchasing power), cash balance and the ratio of debt to GDP of the central government (to proxy fiscal space), ratio of government consumption to GDP (to proxy for the size of government), road density per sq. km. and access to improved sanitation (to proxy infrastructure stock), and the population density (to consider density effects).

Results

52. This section discusses the results from the econometric analysis. Regressions are run for the complete set of countries, on the one hand, and separately for the OECD and developing countries, on the other hand. The results should be interpreted with caution as some of the predictions in the literature hinge on assumptions whose relevance cannot be examined with the available data.

Public Investment Quantity

53. The results give support to the hypothesis that decentralization lowers the quantity of public investment. Table 4 displays the results of FGLS regressions for gross public fixed capital formation as a share of GDP. The estimates for subnational revenue and subnational expenditure shares are negative. All else equal, a 10 percentage point increase in the share of

revenue implemented by the subnational level is associated with a decrease of 1/5 percentage point in fixed capital formation ratio to GDP. The coefficient for developing countries is the same. For OECD countries, while the coefficient is smaller, the effect of expenditure decentralization is similar with a negative coefficient of 0.02.

54. While the rate of urbanization, a proxy for the demand for infrastructure, has a positive coefficient, a higher share of urban dwellers appears to negatively affect the aggregate level of capital formation. A percentage point of urban population growth is associated with a 0.1 percentage point decrease in public fixed capital formation, all else equal. The coefficient is for OECD countries is 0.3, but it is not statistically significant for the developing country sample.

55. Population density, which is a measure of the potential for economies of scale, does not appear to have a meaningful influence on either aggregate public fixed capital formation or the quality of infrastructure. In contrast, total population and the land area of a country have substantive and statistically significant effects, but the sign of their coefficients go in different directions. A 1 percentage increase in the number of inhabitants will lead to a decrease of 0.6 percentage points in gross public fixed capital formation as a share of GDP, whereas a 1 percentage increase in the total population will increase in the quality of infrastructure. But, a 1 percentage point increase in the surface area of a country in square kilometers will lead to an increase in capital formation of 0.7 percentage points of GDP, while the same percentage increase will lead to a decrease of 0.1 points in the overall quality of infrastructure.

56. Economic development positively affects the ratio of gross public fixed capital formation to GDP positively, with 1 percent increase in per capita GDP leading to a 0.5 rise in that measure. The estimate is also statistically significant for developing countries and the OECD run separately. These results are consistent with the assumed positive relationship between overall level of development and the affordability of capital spending.

57. Higher levels of government debt, or lower fiscal space, reduce aggregate public investment. A 1 percentage point increase in the ratio of government debt to GDP will lead to a decrease of 0.3 percentage points of public fixed capital formation to GDP. Besides, for each additional percentage point of cash deficit to GDP, or the revenue minus expense and the acquisition of nonfinancial assets, there will be a decrease of 0.04 in public fixed capital formation. However, for the sample of developing countries the coefficient is not statistically significant. These results are consistent with the idea that countries with greater fiscal space would be able to invest in capital stocks and maintain them more sustainably.

58. Finally, greater government effectiveness would seem to reduce aggregate fixed capital formation but increase the quality of infrastructure. A point increase in the average score for government effectiveness would lead to a 0.8 decrease in capital formation. The coefficient is higher for the developing country sample, supporting the hypothesized association between low capacity and larger public investment allocations.

Quality of Infrastructure

59. The results are also consistent with the hypothesis that greater decentralization would contribute to improving the quality of infrastructure services. As shown in Table 5, an increase of 10 percentage points in the subnational share of revenue will lead to 0.1 points in the overall score for quality of infrastructure, which given that the score goes from 1 to 7 means a sizeable

change. The coefficient for OECD countries is higher, 0.2. Nevertheless, when the same model is used with the data corresponding to non-OECD countries, the coefficient becomes insignificant. This may be result of the lower quality of governance and institutions observed in developing countries.

60. The percentage of urban population is positively associated with the overall quality of infrastructure, both for OECD and non-OECD countries. The effect is small nonetheless, a 10 percentage point increase in the share of the population living in urban centers, will result in an increase of 0.1 points in the quality score.

61. Similarly, the results also show that 1 percent change in GDP per capita would increase the quality by 0.7 percent, giving support to the proposition that the quality of overall infrastructure is positively associated with economic development. It is important to underscore that the coefficients for subnational expenditure are different for developed and developing countries.

62. Concurrently, 1 average point higher in control of corruption and government effectiveness would translate into a 0.3 and 1 point higher score for quality of infrastructure, respectively. However, the accountability and voice estimate goes in the opposite direction for both dependent variables. Greater accountability appears to be associated with larger shares fixed capital formation and also with better quality. An increase of 1 average point of this estimate would be accompanied with a drop of 0.8 percentage points in fixed capital formation as share of GDP and of 0.6 points in the score of quality of public infrastructure, respectively.

Table 4: Multivariate Regression Analysis of Gross Public Fixed Capital Formation (% of GDP)

	All									Non-OECD Countries		OECD Countries	
	1	2	3	4	5	6	7	8	9	10	11	12	13
Constant	4.1 (0.2)***	4.4 (0.2)***	3.8 (0.2)***	4.0 (0.1)***	7.5 (0.6)***	9.0 (0.5)***	5.0 (0.1)***	8.6 (1.2)***	8.2 (1.2)***	7.8 (2.5)***	9.0 (2.4)***	0.2 (2.2)	2.5 (2.0)
SN Revenue Share	-0.01 (0.0)***							-0.02 (0.0)***		-0.02 (0.01)**		-0.007 (0.0)	
SN Own Revenue Share of Expenditure		-0.01 (0.0)***											
SN Expenditure Share			-0.01 (0.0)***						-0.01 (0.01)**		-0.003 (0.0)		-0.02 (0.0)***
SN Cap. Formation Share				0.004 (0.0)***									
Access to Sanitation (%)					0.0 (0.0)								
Road Density					-0.0 (0.0)**								
Urbanization Growth					0.4 (0.1)***			-0.1 (0.0)***	-0.1 (0.01)***	-0.1 (0.0)***	-0.1 (0.0)***	-0.01 (0.0)	-0.03 (0.0)***
Urban Population (% of Total)					-0.1 (0.0)***								
Population Density					0.0 (0.0)**			0.0 (0.0)***	0.0 (0.0)***	0.0 (0.0)	0.0 (0.0)	0.01 (0.0)***	0.0 (0.0)***
LN GDP per Capita						-0.5 (0.1)***		0.3 (0.1)***	0.3 (0.1)**	0.5 (0.2)***	0.5 (0.2)**	0.6 (0.2)***	0.4 (0.2)**
GDP per Capita Growth						0.01 (0.0)							
Cash Surplus/Deficit						-0.03 (0.0)**		-0.04 (0.0)***	-0.03 (0.01)***	0.02 (0.02)	0.03 (0.0)*	-0.1 (0.0)*	-0.04 (0.0)***
Central Government Debt (% GDP)						-0.01 (0.0)**							
Control of Corruption							0.01 (0.2)						
Voice and Accountability							-0.6 (0.2)***	-0.8 (0.2)***	-0.7 (0.2)***	-1.1 (0.3)***	-1.0 (0.3)***	-0.4 (0.2)*	-0.1 (0.2)
Government Effectiveness							-0.3 (0.2)**	0.04 (0.2)***	-0.01 (0.2)	0.03 (0.3)	0.1 (0.3)	0.1 (0.2)	0.07 (0.1)
LN Population Total								-0.6 (0.1)***	-0.6 (0.1)***	-0.3 (0.3)	-0.4 (0.3)	-0.8 (0.1)***	-0.6 (0.1)***
LN Surface Area (sq. km)								0.7 (0.1)***	0.7 (0.1)***	0.4 (0.3)	0.5 (0.3)	0.9 (0.1)***	0.7 (0.1)***
N	882	753	890	452	425	802	1848	453	490	311	324	142	166
N Groups	67	70	69	60	87	81	159	58	63	44	47	14	16
Wald chi2	8	7.1	2.8	0.2	113.7	129.7	104.1	224.8	151.5	158.1	116.9	114.5	87.8
Prob > chi2	0	0	0.1	0.6	0	0	0	0	0	0	0	0	0

*** Significant at the 0.01 level (2-tailed) ** Significant at the 0.05 level (2-tailed) * Significant at the 0.10 level (2-tailed)

Table 5: Multivariate Regression Analysis of Overall Quality of Infrastructure

	All										NonOECD Countries		OECD Countries	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Constant	6.5 (0.8)***	6.0 (0.8)***	4.3 (0.9)***	3.0 (1.3)**	3.9 (0.1)***	0.1 (0.2)	-2.1 (0.5)***	3.8 (0.0)***	1.8 (0.6)***	0.5 (0.5)	1.7 (1.1)	1.7 (1.0)*	4.8 (1.2)***	2.8 (1.4)**
SN Revenue Share	0.02 (0.0)***								0.01 (0.0)*		-0.0001 (0.0)		0.02 (0.0)***	
SN Own Revenue Share of Expenditure		0.004 (0.0)**												
SN Expenditure Share			0.01 (0.0)**							0.003 (0.0)***		-0.004 (0.0)		0.01 (0.0)***
SN Cap. Formation Share				0.002 (0.0)***										
Gross Public Fixed Capital Formation (% of GDP)					-0.01 (0.01)*									
Access to Sanitation (%)						0.02 (0.0)***								
Road Density						0.002 (0.0)***								
Urbanization Growth						0.2 (0.0)***			0.0 (0.0)	0.01 (0.0)***	0.02 (0.0)***	0.02 (0.0)***	0.01 (0.0)	0.02 (0.0)***
Urban Population (% of Total)						0.03 (0.0)***								
Population Density						0.0 (0.0)			-0.0 (0.0)**	-0.0 (0.0)***	0.0 (0.0)	0.0 (0.0)	-0.0 (0.0)***	-0.0 (0.0)***
LN GDP per Capita							0.7 (0.1)***		0.2 (0.1)***	0.2 (0.1)***	0.2 (0.1)*	0.2 (0.1)**	-0.04 (0.1)	-0.1 (0.1)
GDP per Capita Growth							-0.01 (0.0)**		-0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Cash Surplus/Deficit							0.03 (0.0)***		-0.01 (0.0)***	-0.02 (0.0)***	-0.02 (0.0)*	-0.02 (0.0)**	-0.0 (0.0)	-0.01 (0.0)
Central Government Debt (% GDP)							0.01 (0.0)***		0.0 (0.0)	0.0 (0.0)	-0.0 (0.0)	-0.0 (0.0)	-0.0 (0.0)	-0.0 (0.0)
Control of Corruption								0.4 (0.1)***	0.3 (0.1)***	0.3 (0.1)***	-0.3 (0.2)	-0.2 (0.2)	0.3 (0.1)***	0.3 (0.1)**
Voice and Accountability								-0.2 (0.1)***	-0.6 (0.1)***	-0.7 (0.1)***	-0.6 (0.1)***	-0.7 (0.1)***	-0.2 (0.2)***	0.03 (0.2)
Government Effectiveness								0.9 (0.1)***	1.0 (0.1)***	1.0 (0.1)***	1.2 (0.2)***	1.3 (0.2)***	0.6 (0.1)	0.5 (0.1)***
LN Population Total	-0.04 (0.1)	-0.04 (0.1)	0.1 (0.1)*	0.3 (0.1)***					0.1 (0.0)*	0.2 (0.0)***	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)***	0.2 (0.1)***
LN Surface Area (sq. km)	-0.2 (0.1)***	-0.1 (0.1)*	-0.2 (0.1)***	-0.3 (0.1)***					-0.10 (0.0)***	-0.2 (0.0)***	-0.2 (0.1)***	-0.2 (0.1)***	-0.2 (0.0)***	-0.2 (0.1)***
N	464	447	508	424	896	430	455	1028	304	268	128	135	176	205
N Groups	63	67	69	65	115	86	64	132	44	45	23	25	21	24
Wald chi2	7.4	17	13.1	11.9	3.5	2057.8	290.8	2463.7	1370.6	2084.7	193.5	549.9	281.8	149.9
Prob > chi2	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0

*** Significant at the 0.01 level (2-tailed) ** Significant at the 0.05 level (2-tailed) * Significant at the 0.10 level (2-tailed)

Table 6: Multivariate Regression Analysis of Subnational Share of Net Fixed Capital Formation (% of Total)

	All									Non-OECD Countries		OECD Countries	
	1	2	3	4	5	6	7	8	9	10	11	12	13
Constant	7.1 (1.2)***	53.1 (3.6)***	14.3 (1.4)***	53.5 (2.1)***	21.3 (12.1)*	8.9 (11.3)	29.5 (1.2)***	-72.3 (15.3)***	-72.3 (15.3)***	-20.0 (46.0)	-80.2 (23.4)***	0.2 (2.2)	-22.2 (39.2)
Decentralization										0.7 (0.2)***			
SN Revenue Share	1.6 (0.1)***							0.7 (0.1)***				-0.0001 (0.0)	
SN Own Revenue Share of Expenditure		-0.1 (0.1)											
SN Expenditure Share			1.5 (0.1)***						0.7 (0.1)***		0.8 (0.2)***	-0.01 (0.0)	0.5 (0.2)***
Gross Public Fixed Capital Formation (% of GDP)				-1.8 (0.3)***									
Access to Sanitation (%)					-0.1 (0.1)								
Road Density					0.02 (0.0)								
Urbanization Growth					1.8 (1.6)								
Urban Population (% of Total)					0.5 (0.1)***			-0.2 (0.1)*	-0.2 (0.1)*	-0.3 (0.3)	-0.1 (0.2)	0.01 (0.0)***	-0.5 (0.3)*
Population Density					-0.04 (0.0)***			-0.01 (0.0)	-0.01 (0.0)	0.0 (0.0)	-0.1 (0.0)***	0.6 (0.2)***	-0.0 (0.0)
LN GDP per Capita						6.2 (1.2)***		3.1 (1.6)*	3.1 (1.6)*	1.5 (3.9)	0.8 (2.3)	-0.1 (0.0)***	2.0 (3.7)***
GDP per Capita Growth						-0.1 (0.2)							
Cash Surplus/Deficit						-0.2 (0.2)							
Central Government Debt (% GDP)						-0.2 (0.1)***		-0.1 (0.03)***	-0.1 (0.0)***	-0.2 (0.1)***	-0.04 (0.0)	-0.4 (0.2)*	-0.2 (0.1)***
Control of Corruption							-8.9 (2.4)***	5.2 (1.6)***	5.2 (1.6)***	3.6 (2.8)	0.4 (2.8)	0.1 (0.2)	1.4 (2.8)
Voice and Accountability								1.4 (1.9)					
Government Effectiveness								25.5 (2.4)***					
LN Population Total								6.6 (1.1)***	6.5 (1.1)***	4.0 (1.8)**	11.5 (1.5)***	-0.8 (0.1)***	5.3 (1.7)***
LN Surface Area (sq. km)								-0.8 (1.1)	-0.8 (1.1)	0.7 (1.7)***	-6.2 (1.5)***	0.9 (0.1)***	0.8 (1.9)
N	536	457	603	452	257	359	528	322	322	156	132	142	190
N Groups	68	62	73	60	55	47	73	47	47	20	24	14	23
Wald chi2	1554.1	1.7	732.2	37.5	43.6	32.5	303.9	666.3	666.3	305.8	566.2	114.5	188.3
Prob > chi2	0	0.2	0	0	0	0	0	0	0	0	0	0	0

*** Significant at the 0.01 level (2-tailed) ** Significant at the 0.05 level (2-tailed) * Significant at the 0.10 level (2-tailed)

Determinants of the Subnational Share of Fixed Capital Formation

63. As expected, the share of public fixed capital formation accounted for regional and local governments is largely shaped by the level fiscal decentralization as shown in Table 6. Increases in the percentage of revenue or expenditure that subnational governments carry on generate similar increases in their share of capital formation. In the sub-sample of OECD, the share of urban population and population density further add 0.01 and 0.6, respectively. Additionally, a percentage increase in the total population increases the subnational governments' share of capital formation by 6.5.

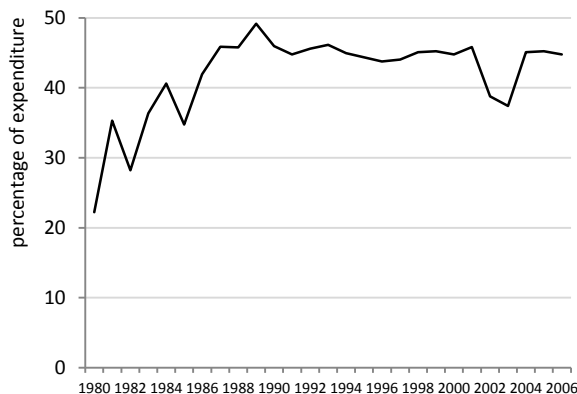
64. Decentralization of public investment appears to be positively impacted by GDP per capita. For every percentage increase in GDP per capita there would be an additional 3.1 percentage points to the subnational share of fixed capital formation. Similarly, countries would have on average a subnational share that is 5.5 higher for every point added to the estimate of control of corruption. Lastly, greater indebtedness, on the other hand, reduces the subnational share by 0.2 percentage points of total fixed capital formation.

V. A Closer Look at Allocative Efficiency in Public Investment: The Cases of Argentina and Mexico

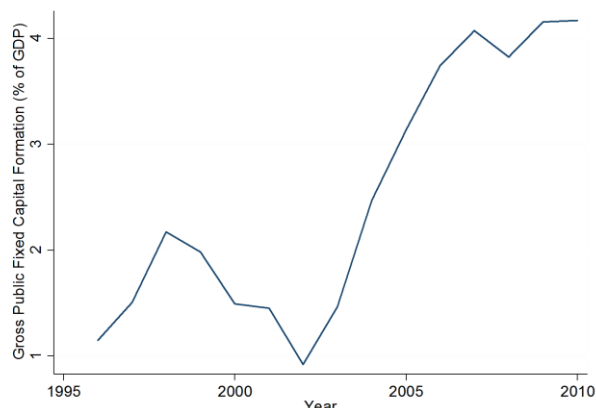
65. Decentralized management of capital expenditures is expected to increase allocative efficiency as local officials are better placed to identify citizens' priorities and preferences. Local officials have more direct access to better and more up-to-date information about the evolving needs of their jurisdiction than central bureaucracies. In some cases, citizens may have the channels to influence local decision-making more directly, for example through voice mechanisms such as participatory budgeting. If informational gains were to be realized, it would be expected that capital spending be more responsive to infrastructure gaps than before the implementation of decentralization reforms. In other words, larger infrastructure needs should be accompanied by higher levels of spending, and vice versa. Thus, devolution of fiscal and administrative functions should contribute to correct existing distortions in capital spending and horizontal disparities in access to infrastructure services across jurisdictions.

66. Whether decentralization has had an impact on the horizontal distribution of capital spending is a critical question that remains unaddressed. Understanding if decentralization changes the distribution of capital spending across subnational units and whether it helps to close horizontal gaps requires analyzing data at the subnational level. Given that information on outcomes and allocations by jurisdictions is not available for cross-sectional analysis, I examine the issue through two brief country cases.

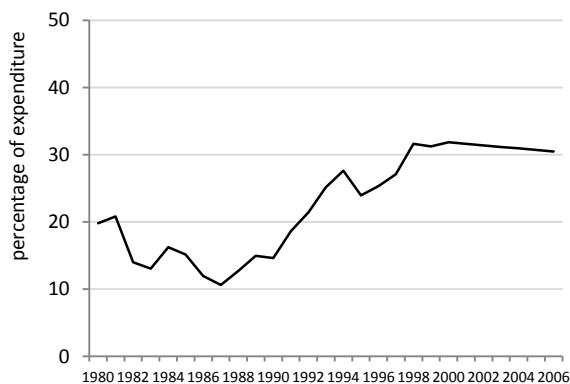
67. In this section, the experiences of Argentina and Mexico, two large federal countries, are used to illustrate how decentralization may lead to dissimilar outcomes as a result of different intergovernmental fiscal framework design choices. Both countries have devolved sizable shares of fiscal resources to subnational governments since the mid-1980s, in particular to second tier governments (see Figure 5 and Figure 7). More recently, in 2007, Mexico introduced a new change in the equalization formula. At the same time, in both cases, levels of capital formation have continued to rise since 1995 and much of the increase is accounted for subnational levels (see Figure 6 and Figure 8).

Figure 5: Subnational Share of Expenditure in Argentina, 1980-2010

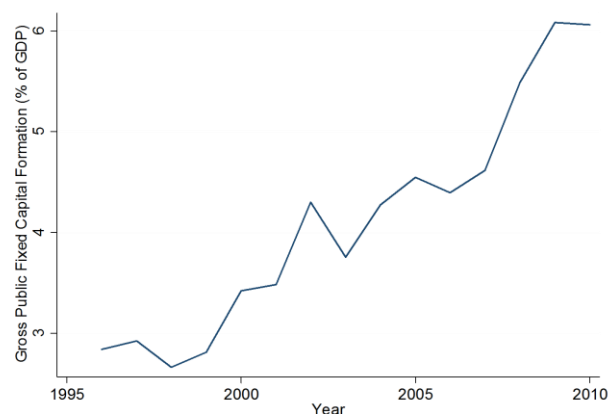
Source: IMF GFS 2012, World Bank Indicators 2012.

Figure 6: Gross Public Fixed Capital Formation in Argentina, 1995-2010

Source: IMF WEO 2012.

Figure 7: Subnational Share of Expenditure in Mexico, 1995-2010

Source: IMF GFS 2012, World Bank Indicators 2012.

Figure 8: Gross Public Fixed Capital Formation in Mexico, 1995-2010

Source: IMF WEO 2012.

68. In each case, the before and after distribution of public investment across subnational units is compared. Also, how well the resulting distribution responds to the needs/infrastructure gaps of various localities is examined. The percentage of households with access to running water is used to proxy the infrastructure gap. This indicator was chosen because it is available for each of the cases at the province/state level in census reports. Access to running water is also a fairly reliable indicator as it is highly correlated with other measures of infrastructure availability, such as access to improved sanitation, coverage of telecommunication services, and road density. Data on the dependent variable, public fixed capital formation and capital spending, were drawn from official government statistics and annual budget reports.

Argentina

69. As many other countries in Latin America, Argentina is characterized by an unequal distribution of economic wealth and population. The four major provinces—Buenos Aires, Santa Fe, Córdoba and Mendoza—account for 78 percent of the GDP and 70 percent of the country's population. For most of its contemporary history, the country remained centralized

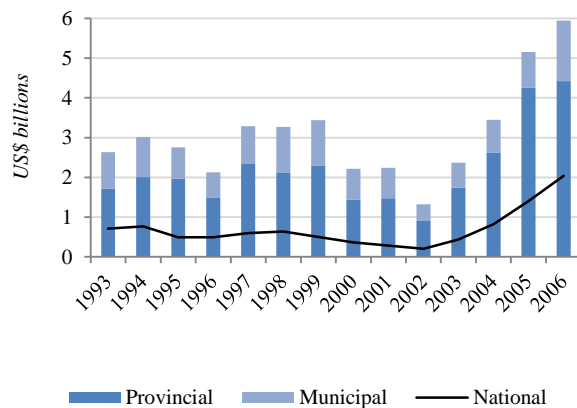
despite having a federal system. The frequent democratic breakdowns sustained and reinforced centralization. The national government directly provided most services, even basic and secondary education and basic health until the early 1980s.

70. But after re-democratization in 1983, provincial governments and municipalities have consistently expanded their control over service delivery and resources, and they currently control almost half of government expenditure and revenue. The original *coparticipation* formula adopted in 1988 included various indicators of expenditure needs to determine the distribution of a common pool of tax revenue. However, later revisions and introduction of new taxes have eroded the system and transfers are no longer necessarily aligned with needs in all cases; a considerable share of the common resource pool is now being distributed on an ad hoc basis.

71. The process of decentralization accelerated in the late 1980s. In 1992, the subnational share of expenditure stabilized at 45% through the ‘second’ *coparticipation* agreement between the national government and the provinces. This agreement limited the percentage of federal revenue to be shared with provinces and it was part of a macroeconomic stabilization package. In exchange for such reduction, the provincial governments were guaranteed a minimum revenue floor. In years of economic growth, this arrangement favored the federal government, but in years of recession the revenue floor provided provinces with secured minimum amount of resources. This provision made fiscal adjustment more difficult during the 2001-2002 crisis.

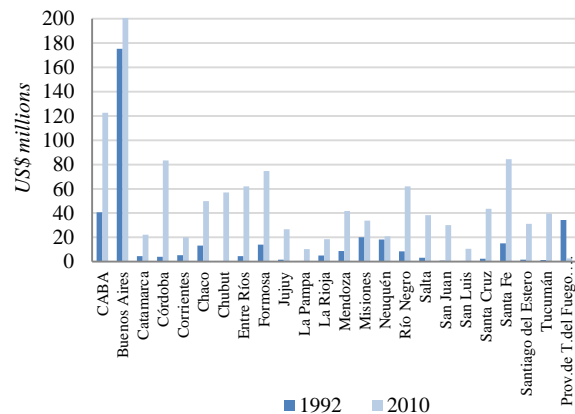
72. The rapid move toward fiscal decentralization was reflected in the distribution of capital spending across levels of government. Subnational governments came to total 80 percent of gross fixed capital formation in 1992, a level that has remained stable, with the exception of 2001 when 90 percent was reached. Provinces currently account for more than two thirds of that share and the rest is the responsibility of municipalities. Concomitantly, the absolute volume invested in fixed assets has more than doubled since 1993. Provinces and municipalities contributed 70 percent of the increase (see Figure 9). Despite the acute nature of the 2001 fiscal crisis, public investment returned to previous levels by 2003-2004 and has continue to grow since. National investments have also risen, but these remain highly concentrated in Buenos Aires (see Figure 10).

Figure 9: Gross Public Fixed Capital Formation (1993 constant prices), 1993-2006



Source: INDEC 2012.

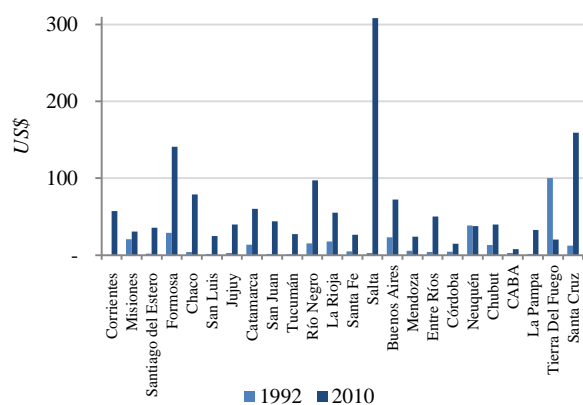
Figure 10: National Government Gross Public Fixed Capital Formation by Province (1993 constant prices), 1992 and 2010



Source: INDEC 2012.

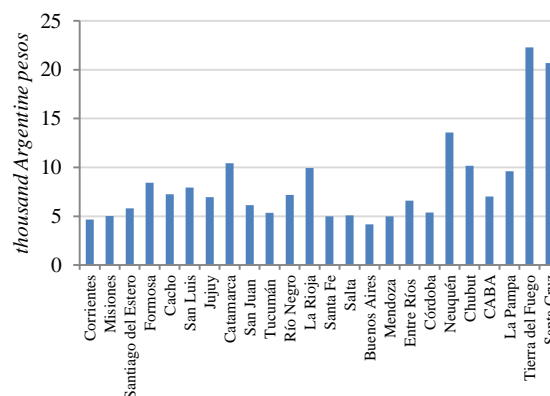
73. Despite the risks to macro-economic stability that the existing intergovernmental system entail, the guaranteed threshold prevented a bigger drop at the subnational level of capital spending during the 2001 crisis. Since 1992, most provinces increased public fixed capital formation per capita, but the biggest gains were observed in Salta, Santa Cruz, and Rio Negro—provinces that have benefited from growing mineral royalties (see Figure 11). Only one province, Tucúman, has seen a decline in the per capita capital formation. In the short term, moving away from a pegged currency in 2002 created additional fiscal space for provinces as inflation reduced the share of the budget needed to pay wages and other current expenditures. Figure 12 shows that spending per capita varies considerably across provinces.

Figure 11: Gross Public Fixed Capital Formation per Capita (1993 constant-ordered by poverty rate), 1992 and 2010



Source: INDEC 2012.

Figure 12: Total Provincial Expenditures per Capita in Argentina (ordered by poverty rates), 2010



Source: INDEC 2012.

74. The stock and quality of infrastructure in Argentina lags behind the country's level of economic development and remains very unequally distributed. This is the legacy of centralization and decades of underinvestment and poor maintenance of existing assets. Although the range has narrowed since decentralization started, outcome measures for infrastructure services still vary widely across provinces. For example, the percentage of households without access to running water and improved sanitation is close a 25 percent for Chaco, Formosa or Santiago and over 28 percent for Misiones, while only half of a percentage point in the City of Buenos Aires.

75. The amount that provincial governments invest in public infrastructure is equally variable. While some provinces invest US\$ 8 per capita, others go as far as US\$ 310. However, leaving outliers aside, a before-and-after comparison (Figure 13 and Figure 14) shows that presently there is a greater correspondence between allocations and infrastructure gaps than before.

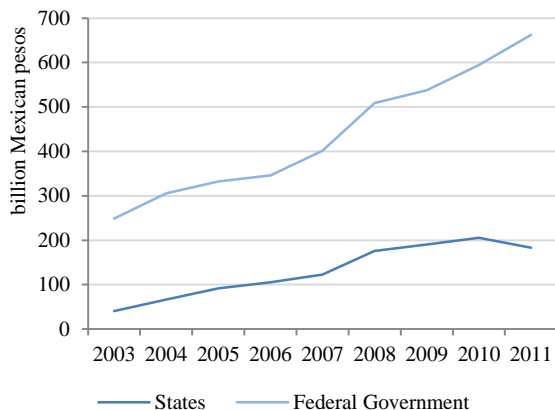
76. Some of the poorest provinces—such as Corrientes, Chaco, Formosa and Jujuy—have increased capital spending per capita several folds. While poorer provinces remain dependent on federal transfers, many other have successfully increased own revenue and used it to finance new infrastructure projects. In this case, the evidence support the expectation that decentralization would contribute to increasing allocative efficiency capital spending.

spending choices. Yet in many cases, states and municipalities continue to be overwhelmed with not fully funded mandates and spend most of their resources on the education and health wage bills. Consequently, non-earmarked resources are mainly used to cover recurrent expenditures.

82. The nominal amount of state fixed capital formation has also risen, going from 4 billion Mexican pesos in 2003 to 205 billion in 2011. These figures are equivalent to an average of 405 Mexican pesos per capita or 37 US\$ in 2003 and to 1,969 Mexican pesos per capita or 151 US\$ in 2010 (see **Error! Reference source not found.**). The federal government continues to be responsible for the majority of fixed capital formation.

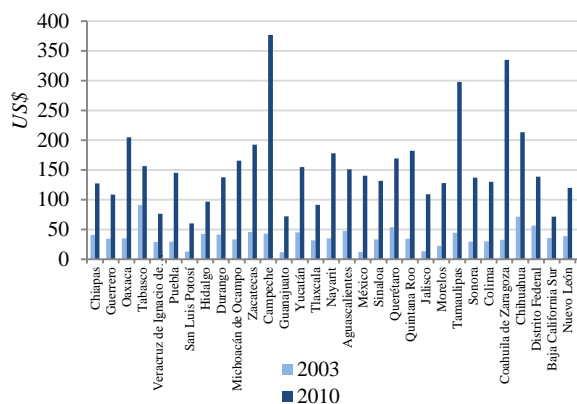
83. When comparing levels of investment before and after the formula reform, it appears that the distribution of fixed capital formation per capita has become more scattered. While the average level of investment in 2003 was considerably lower, states were much closer to each other than they are currently (see **Error! Reference source not found.**). There also seems to be little correspondence between the per capita capital formation and poverty levels.

Figure 15: Gross Fixed Capital Formation by Government Entity, 2010



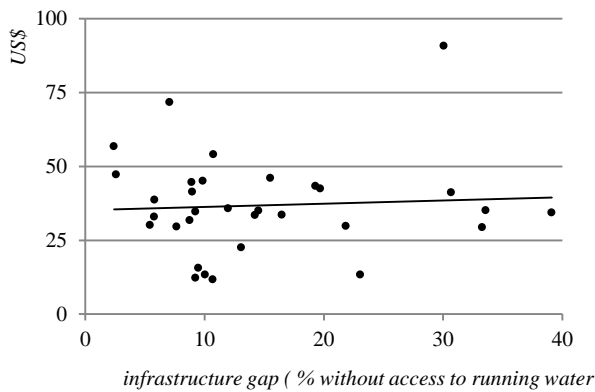
Source: Ministry of Finance of Mexico, 2012.

Figure 16: Gross Public Fixed Capital Formation Per Capita (by poverty level), 2003 and 2010

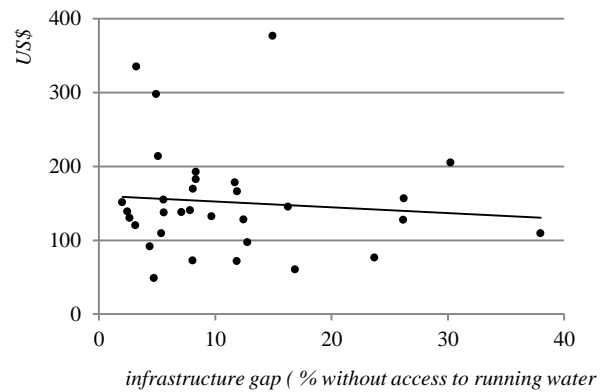


Source: INEGI 2012.

84. As well, investment per capita has become less aligned with infrastructure gaps than prior to the change of allocation formula (see Figure 17 and Figure 18). For example, in Chiapas and Guerrero more than a quarter of households do not have access to running water or sewage. Though these states have more than double increased fixed capital formation, yet their per capita investment are about half of that of Yucatan or Colima, where the coverage is almost complete. In this case, it appears that decentralization may have contributed to worsen the correspondence between needs and investment levels.

Figure 17: Gross Public Fixed Capital Formation per Capita and Infrastructure Needs by State, 2003

Source: INEGI 2012.

Figure 18: Gross Public Fixed Capital Formation per Capita and Infrastructure Needs by State, 2010

Source: INEGI 2012.

85. The two cases help illustrate that although decentralization can help address horizontal disparities in infrastructure endowments, the outcome ultimately depends on the features of the intergovernmental fiscal framework and the incentives it creates. While in Argentina greater local autonomy in expenditure management contributed to increasing public investment and better aligning spending levels with needs, in the case of Mexico decentralization has led to a slower growth of subnational capital spending and a lower allocative efficiency. Differences in own revenues and access to financing are some of the main drivers behind this. In the case of Argentina, provinces have a minimum of resources that are guaranteed every year. This, to some extent, shields them from the overall volatility in federal revenue. At the same time, Argentina enjoys greater autonomy regarding public salaries and can more easily access financing that states in the case of Mexico.

VI. Conclusions

86. The relationship between decentralization and outcomes in infrastructure services remain largely understudied, in particular in the context of developing countries. Having reviewed the existing evidence, this paper highlights the pressing need for expanding data collection efforts and refining definitions around public investment at the national and subnational levels. Many of the predictions found in the literature and the assumptions that these hinge on cannot be tested with the available data. In a large number of countries not even the most basic monitoring or analysis on public investment portfolios is possible. Consequently, there is an important agenda for development partners, and the developing countries implementing decentralization reforms they assist, to improve the quality and coverage of data.

87. The existing evidence suggests that decentralization leads to lower aggregate levels of fixed capital formation. This may be reflective of efficiency gains, but it also raises concerns about potentially insufficient access to financing and steady funding sources for subnational governments. Lower investment rates can also be symptomatic of the fact that provinces and municipalities may be prioritizing other types of social investments over infrastructure. The results from the econometric analysis should be interpreted with caution as the available indicators only offer very imperfect approximations to the variables needed to more adequately

analyze the impact of decentralization on public investment efficiency. On the other hand, with the necessary caveats in mind, the two cases discussed in the previous section show that, under certain conditions, decentralization can lead to a better horizontal allocation of capital spending and favor lagging regions.

88. Future research and policy work on decentralized infrastructure provision should consider several issues. The review of the literature and the analysis of the cases also point to the need of paying greater attention to better aligning the incentives provided by the intergovernmental fiscal system for subnational levels to respond to infrastructure needs. It is not uncommon for countries in which subnational governments heavily rely on vertical transfers to end up with uneven, excessively fragmented, or misaligned levels of capital spending.

89. The design of transfer and revenue-sharing systems should also pay closer attention to providing mechanisms for vertical coordination and promoting inter-jurisdictional cooperation. Both matching grants and technical assistance may be attractive tools to ensure that regional infrastructure is not neglected. Improving the ability for collective action among subnational governments would also be important in helping them to access financing and get better bids. States and, especially municipalities, can greatly benefit from pooling together risks and resources. Vertical coordination is as important as the horizontal one. Infrastructure provision implies the joint production of assets and the management of networks that require coordinated actions by various levels of government. Many countries are creating institutions to facilitate dialogue and decision-making across levels of government and using regional development strategies and contracts to implement joint agreements.

90. Similarly, central government may assist state and local governments to access financing by facilitating borrowing, providing subsidized loans, acting as guarantors in loans to subnational, or temporarily relaxing fiscal rules. Yet there are important lessons to be learned from Latin America and Southern Europe on the danger of excessive subnational borrowing and its implication for fiscal stability.

91. Greater predictability and transparency of vertical transfers is a critical ingredient for better public investment management. As well, measures that delink annual revenues from spending are a necessary ingredient for medium-term predictability in infrastructure envelopes. Increasing the revenue base of subnational governments and incentivizing them to raise their own revenues can help to stabilize and smooth capital spending overtime.

92. Another dimension of infrastructure provision in multi-tiered governments that is often overlooked is the quality of public investment management systems. Central governments, and development partners, can support and encourage subnational units to strengthen public investment management system and ‘invest to invest’ by establishing a more systematic preparation, appraisal, selection, and implementation of infrastructure investment projects.

93. To end, there is also great potential to mobilize demand side governance around public investment at the subnational level by helping improve the capacity of civil society and oversight institutions to act collectively and demand that public resources are invested in the assets that generate greater public benefits. Capital expenditure tracking surveys could be used to monitor financing flows to actual contracts and physical works and leverage some of citizens to local government officials.

Annex I: Variable Definitions and Summary Statistics

Table 7: Dependent and Independent Variables Definitions

Variable	Description
Gross Fixed Capital Formation, Public (% of GDP).	Source: International Monetary Fund WEO Database.
Sub-national Expenditure Share	Percentage of total expenditures by subnational governments, measured as the sum of local and state total expenditures minus state to local grants, divided by the sum of local, state, and national expenditures. Scale 0 to 100. <i>Source:</i> Decentralization Indicators Database 2012, by the World Bank, based on IMF's Government Finance Statistics.
Sub-national Net Fixed Capital Formation Share	Percentage of total net fixed capital formation accounted for by subnational governments, measured as the sum of local and state divided by the sum of local, state, and national net fixed capital formation. Scale 0 to 100. <i>Source:</i> Decentralization Indicators Database 2012, by the World Bank, based on IMF's Government Finance Statistics.
Sub-national Own Source Revenue as a Share of Sub-national Expenditure	Percentage of expenditures financed with subnational governments' own source revenue, measured as the sum of local and state revenues minus grants received from other levels of government, divided by the total subnational expenditures.
Sub-national Revenue Share	Percentage of total revenues accounted for by subnational governments, measured as the sum of local and state total revenues minus grants from state to local government, divided by the sum of local, state, and national revenues. Scale 0 to 100. <i>Source:</i> Decentralization Indicators Database, by the World Bank 2012, based on IMF's Government Finance Statistics.
Sub-national Tax Effort	Percentage of tax revenues collected by subnational governments, measured as the sum of local and state tax revenues, divided by the sum of local, state, and national tax revenues. Scale 0 to 100. <i>Source:</i> Decentralization Indicators Database 2012, by the World Bank, based on IMF's Government Finance Statistics.
GNI per Capita	Data in constant 2000 dollars. <i>Source:</i> World Development Indicators 2012, by the World Bank.
Population	Total population. <i>Source:</i> World Development Indicators 2012, by the World Bank.
Surface Area	Data in squared kilometers. <i>Source:</i> World Development Indicators 2012, by the World Bank.
Federation	1 if Federal Country, 0 if otherwise. Scale from 0 to 1. <i>Source:</i> Political Decentralization Indicators Database.

Source: IMF GFS 2012, IMF WEO 2012, and World Bank Indicators 2012.

Table 8: Correlation Coefficients, World

	Gen. Gov. Final Cons. Expenditure (% of GDP)	Overall Quality of Infrastructure	Gross Public Fixed Cap. Form. (% of GDP)	SN Revenue Share	SN Own Source Revenue Share of Expenditure	SN Expenditure Share	SN Capital Expenditure Share
Overall Quality of Infrastructure	0.19***						
Gross Public Fixed Capital Formation (% of GDP)	0.13***	-0.14***					
SN Share of Revenue (% of Total Rev.)	0.10***	0.31***	-0.08**				
SN Own Source Rev. (% of SN Exp.)	-0.08**	0.23***	-0.11***	0.28***			
SN Share of Expenditure	0.10***	0.32***	-0.11***	0.96***	0.20***		
SN Share of Cap. Expenditure	0.15***	0.41***	-0.12***	0.32**	0.15***	0.32***	
GNI per Capita (US\$ constant 2000)	0.26***	0.48***	-0.07***	0.24***	0.10***	0.20***	0.23***
LN Surface Area (sq. km)	-0.14***	-0.20***	-0.09***	0.45***	0.20***	0.41***	0.11***
High Income	0.23***	0.44***	-0.09***	0.21***	0.04***	0.14***	0.22***
OECD	0.22***	0.34***	-0.11***	0.30***	0.04***	0.27***	0.22***

*** Significant at the 0.01 level (2-tailed) ** Significant at the 0.05 level (2-tailed) * Significant at the 0.10 level (2-tailed)

Source: IMF GFS 2012, IMF WEO 2012, and World Bank Indicators 2012.

Table 9: Number of Observations and Averages by Country, 1990-2009

Variable	1990-1999			2000-2009		
	Obs	Mean	St. Dev.	Obs	Mean	St. Dev.
Africa						
Overall Quality of Infrastructure (1=low, 7=high)	—	—	—	195	3.1	1.1
Public Investment (% of GDP)	404	7.0	7.4	543	8.3	22.7
SN Share of Revenue (% of Total Revenue)	20	18.8	15.2	33	13.7	15.7
SN Own Source Revenue (% of SN Expenditure)	22	43.6	18.1	66	43.8	25.7
SN Share of Expenditure (% of Total Expenditure)	20	15.6	12.8	39	25.4	33.9
SN Share of Capital Expenditure (% of Total Cap. Exp.)	2	68.2	4.1	31	27.5	35.5
SN Capital Expenditure (% of SN Expenditure)	2	9.2	1.8	63	22.6	17.9
East Asia Pacific						
Overall Quality of Infrastructure (1=low, 7=high)	—	—	—	106	4.8	6.3
Public Investment (% of GDP)	104	8.5	6.6	171	7.3	5.1
SN Share of Revenue (% of Total Revenue)	33	16.5	10.5	23	31.8	22.0
SN Own Source Revenue (% of SN Expenditure)	21	55.8	27.2	19	70.3	14.0
SN Share of Expenditure (% of Total Expenditure)	34	15.9	12.1	19	18.6	12.2
SN Share of Capital Expenditure (% of Total Cap. Exp.)	0			15	33.8	31.9
SN Capital Expenditure (% of SN Expenditure)	0			24	39.3	25.0
Europe and Central Asia						
Overall Quality of Infrastructure (1=low, 7=high)	—	—	—	204	3.5	0.9
Public Investment (% of GDP)	162	4.6	4.5	323	4.9	3.4
SN Share of Revenue (% of Total Revenue)	98	21.9	8.2	212	22.8	9.1
SN Own Source Revenue (% of SN Expenditure)	86	68.3	23.8	177	63.3	17.7
SN Share of Expenditure (% of Total Expenditure)	98	18.6	8.0	224	19.9	9.4
SN Share of Capital Expenditure (% of Total Cap. Exp.)	10	34.8	25.1	182	43.2	21.1
SN Capital Expenditure (% of SN Expenditure)	6	27.9	17.0	199	20.8	14.2
Latin America and the Caribbean						
Overall Quality of Infrastructure (1=low, 7=high)	—	—	—	197	3.3	0.9
Public Investment (% of GDP)	271	5.5	3.3	333	5.7	3.4
SN Share of Revenue (% of Total Revenue)	67	21.2	15.0	78	24.4	21.5
SN Own Source Revenue (% of SN Expenditure)	45	65.7	23.8	70	64.3	21.5
SN Share of Expenditure (% of Total Expenditure)	68	17.6	13.0	84	19.4	20.5
SN Share of Capital Expenditure (% of Total Cap. Exp.)	5	.	641.2	70	35.1	24.5
SN Capital Expenditure (% of SN Expenditure)	5	38.8	7.6	76	27.6	22.2
Middle East and North Africa						
Overall Quality of Infrastructure (1=low, 7=high)	—	—	—	83	4.4	0.9
Public Investment (% of GDP)	144	7.0	2.9	199	7.9	5.6
SN Share of Revenue (% of Total Revenue)	0			21	8.2	1.9
SN Own Source Revenue (% of SN Expenditure)	0			10	80.2	5.5
SN Share of Expenditure (% of Total Expenditure)	0			24	4.5	1.7
SN Share of Capital Expenditure (% of Total Cap. Exp.)	0			18	18.6	8.6
SN Capital Expenditure (% of SN Expenditure)	0			5	35.0	19.7
OECD						
Overall Quality of Infrastructure (1=low, 7=high)	—	—	—	223	5.6	0.9
Public Investment (% of GDP)	118	3.5	1.6	176	3.0	1.2
SN Share of Revenue (% of Total Revenue)	175	32.4	13.5	228	30.7	15.5
SN Own Source Revenue (% of SN Expenditure)	173	66.7	21.3	221	62.6	19.6
SN Share of Expenditure (% of Total Expenditure)	193	28.6	14.1	265	28.6	14.9
SN Share of Capital Expenditure (% of Total Cap. Exp.)	36	61.7	24.6	202	63.9	24.6
SN Capital Expenditure (% of SN Expenditure)	50	6.2	7.4	239	8.0	8.1
South Asia						
Overall Quality of Infrastructure (1=low, 7=high)	—	—	—	40	2.9	0.7
Public Investment (% of GDP)	63	8.9	5.3	90	8.9	8.0
SN Share of Revenue (% of Total Revenue)	9	47.0	1.3	14	31.3	23.5
SN Own Source Revenue (% of SN Expenditure)	9	63.1	3.1	9	67.1	8.7

Variable	1990-1999			2000-2009		
	Obs	Mean	St. Dev.	Obs	Mean	St. Dev.
SN Share of Expenditure (% of Total Expenditure)	9	38.3	0.7	14	25.6	19.4
SN Share of Capital Expenditure (% of Total Cap. Exp.)	0			12	47.3	40.6
SN Capital Expenditure (% of SN Expenditure)	0			9	21.2	10.5

Source: IMF GFS 2012, IMF WEO 2012, and World Bank Indicators 2012.

Table 10: Public Investment and Decentralization Indicators by Country, 2009 (or latest available year)

	Overall Quality of Infrastructure (1=low, 7=high)	Access to Electricity (% of population)	Improved Sanitation Facilities (% of population with access)	Improved Water Source (% of population with access)	Road density (km of road per 100 sq. km)	Fuel exports (% of merchandise exports)	Gen. Gov. Final Consumption Expenditure (% of GDP)	Public Investment (% of GDP)	SN Share of Revenue (% of Total Revenue)	SN Own Source Revenue (% of SN Expenditure)	SN Share of Expenditure (% of Total Expenditure)	SN Share of Capital Expenditure (% of Total Cap. Exp.)	SN Capital Expenditure (% of SN Expenditure)
Cape Verde			60.0	87.0	33.0		25.7	14.0	12.7	56.2	9.2	14.1	62.1
Congo, Rep.		37.1	18.0	71.0	5.0		12.2	10.8	1.6	59.1	1.9	2.1	31.5
Ethiopia	3.2	17.0	20.0	44.0	4.0	0.0	8.2	17.6		23.9			29.3
Kenya	3.2	16.1	31.0	58.0	11.0	4.2	15.8	3.8		95.3			39.4
Lesotho	2.9	16.0	26.0	78.0	20.0		39.8	11.8	2.5	44.6	0.8	0.1	1.9
Mauritius	4.4	99.4	89.0	99.0	101.0	0.0	14.1	6.6	5.7	25.9	5.5	9.7	18.4
South Africa	4.7	75.0	79.0	91.0	30.0	11.1	21.1	9.2	40.7	29.1	35.9	90.2	12.0
Swaziland			57.0	68.0	21.0		14.7	8.4	2.2	94.8	2.2		
Uganda	2.9	9.0	34.0	71.0	29.0	1.4	11.6	5.4		4.6			5.0
Zambia	2.9	18.8	48.0	61.0	12.0	0.9	13.1	3.4		84.6			0.6
Zimbabwe	3.2	41.5	39.0	80.0	25.0	0.9	13.3	0.8	14.7		13.6		
China	4.0	99.4	63.0	90.0	40.0	1.7	13.4	22.9	67.5	79.9			7.9
Fiji			83.0	98.0	19.0	0.2		2.9		88.8			
Indonesia	3.1	64.5	54.0	81.0	25.0	28.4	9.6	4.9	10.9	37.7	9.1		
Korea, Rep.	5.8		100.0	98.0	105.0	6.4	16.0	6.2	40.4	58.0	35.5	83.8	46.1
Malaysia	5.4	99.4	96.0	100.0	30.0	14.8	14.1	10.7	11.4	98.8	10.8		
Mongolia	1.9	67.0	51.0	82.0	3.0		14.7	6.5	12.9	88.6	11.9	6.6	12.1
Thailand	4.8	99.3	96.0	96.0	35.0	5.2	13.4	6.5	15.0	65.4	5.2	29.6	40.6
Albania	3.1		94.0	95.0	63.0	11.6	8.8	8.8	20.8	3.5	16.9		
Armenia	3.5		90.0	98.0	26.0	0.1	13.3	6.3	6.8	49.9	5.7	3.8	17.9
Azerbaijan	4.5		82.0	80.0	61.0	92.9	13.8	8.9	2.2	30.8	3.4	1.7	21.7
Belarus			93.0	100.0	46.0	37.3	16.9	3.8	31.7	84.1	30.2	54.9	18.8
Bosnia and Herz	2.0		95.0	99.0	43.0	13.1	21.4	7.4	11.3		9.2	35.7	20.3
Bulgaria	2.8		100.0	100.0	36.0	12.6	16.3	5.1	16.7	37.8	14.4	45.1	36.6
Croatia	4.5		99.0	99.0	52.0	12.9	21.5	1.8	12.3	98.7	10.4	46.2	19.9
Czech Republic	4.5		98.0	100.0	166.0	3.6	21.7	5.1	25.2	68.5	19.2	81.4	26.9
Estonia	5.1		95.0	98.0	129.0	16.2	22.0	3.4	23.0	63.5	21.9	38.2	11.3
Georgia	3.8		95.0	98.0	29.0	5.0	24.5	8.0	19.6	39.3	13.7	29.0	37.8
Hungary	4.3		100.0	100.0	212.0	2.5	22.7		22.0	34.6	21.4	29.1	4.1
Kazakhstan	3.8		97.0	95.0	4.0	70.6	11.7	5.9	43.0	61.5	31.3	75.3	52.6
Kyrgyz Republic	2.8		93.0	90.0	17.0	6.2	18.4	5.0		56.6			9.7
Latvia	4.2		78.0	99.0	107.0	5.1	19.6		25.4	73.1	19.7	64.3	23.3
Lithuania	4.9		86.0	92.0	125.0	21.4	21.9	3.9	26.9	39.3	21.6	58.1	10.0
Macedonia, FYR	3.2		88.0	100.0	54.0	1.1	19.1	6.2	12.5	49.1	10.5	21.1	26.0
Moldova			85.0	96.0	38.0	0.4	22.1	5.0	23.2	50.6	18.7	50.2	13.2
Poland	2.6				123.0	3.0	18.4		30.6	49.3	25.9	66.0	17.8
Romania	2.4				83.0	5.9	15.2	5.2	23.6	26.7	16.9	43.9	21.8
Russian Fed.	3.3		71.0	97.0	6.0	66.7	21.0	4.6	48.8	97.6	32.5	50.7	17.3
Serbia	2.6		92.0	99.0	50.0		20.2	3.4	15.5	79.7	13.4	55.1	28.7
Slovak Republic	4.1		100.0	100.0	89.0	4.5	20.1	2.3	18.2	61.0	15.3	10.3	6.9
Slovenia	5.2		100.0	99.0	192.0	3.3	20.3		19.5	70.9	15.1	55.5	30.9
Tajikistan	3.2		94.0	64.0	19.0		28.3	13.3		72.1	27.7	42.6	98.4
Turkey	4.2		90.0	99.0	46.0	4.0	14.7	3.7	11.7	54.4	9.0	51.2	28.9
Ukraine	3.5		94.0	98.0	28.0	5.2	20.1	2.2	28.7	53.5	25.6	59.8	4.5
Argentina	3.2	97.2	90.0	97.0	8.0	10.3	15.2	4.2	44.3	87.9	42.2	79.8	12.9
Brazil	3.4	98.3	78.0	97.0	21.0	9.0	21.2	2.1	45.6	76.1	42.9	59.2	9.5
Chile	5.6	98.5	96.0	96.0	10.0	0.8	12.6	2.8	11.7	70.5	10.0	1.4	1.1
Colombia	3.4	93.6	77.0	92.0	15.0	50.7	15.8	6.0	30.1	69.9	27.5	12.6	4.3
Costa Rica	3.4	99.3	95.0	97.0	76.0	0.6	16.8	3.6	6.7	99.0	3.5	8.7	24.8
Dominican Rep.	3.4	95.9	83.0	86.0	26.0	0.2	7.8	3.6	0.9	36.9	3.0		
Ecuador	3.1	92.2	92.0	94.0	17.0	49.8	12.3	12.1	18.3				
El Salvador	4.8	86.4	87.0	87.0	48.0	2.8	10.6	2.2	10.1	72.8	6.3	45.2	48.6

	Overall Quality of Infrastructure (1=low, 7=high)	Access to Electricity (% of population)	Improved Sanitation Facilities (% of population with access)	Improved Water Source (% of population with access)	Road density (km of road per 100 sq. km)	Fuel exports (% of merchandise exports)	Gen. Gov. Final Consumption Expenditure (% of GDP)	Public Investment (% of GDP)	SN Share of Revenue (% of Total Revenue)	SN Own Source Revenue (% of SN Expenditure)	SN Share of Expenditure (% of Total Expenditure)	SN Share of Capital Expenditure (% of Total Cap. Exp.)	SN Capital Expenditure (% of SN Expenditure)
Guatemala	4.3	80.5	78.0	92.0	13.0	4.1	10.2	3.8		60.3			
Honduras	3.7	70.3	77.0	87.0	12.0	4.3	18.5	3.4	10.4	70.7	6.6	30.0	79.8
Jamaica	4.4	92.0	80.0	93.0	201.0	17.2	15.4	4.6		80.7	0.5		
Mexico	3.8		84.0	95.0	19.0	13.5	12.0	6.1	36.7	79.4	16.8		
Nicaragua	2.7	72.1	52.0	85.0	17.0	0.9	10.8	7.1	8.8	45.3	2.9		
Panama	4.0	88.1	69.0	93.0	19.0	0.9	10.8	4.8	2.5		2.4		
Paraguay	2.2	96.7	70.0	86.0	8.0	0.0	11.8	5.5	8.8	67.9	7.5	17.8	36.4
Peru	3.0	85.7	70.0	85.0	10.0	10.3	10.3	5.2	29.4	23.7	20.4	67.3	77.0
Trinidad and T.	4.4	99.0	92.0	94.0	162.0	79.0		14.2		96.9	4.6		
Iran		98.4	100.0	96.0	11.0			7.6	6.9		2.7	22.5	
Jordan	5.2	99.9	98.0	97.0	9.0	0.6	21.9	8.2	7.7		6.0	18.7	63.3
Morocco	3.7	97.0	70.0	82.0	13.0	2.3	18.2	4.4	10.1	80.7	6.5	16.3	29.1
Tunisia	5.1	99.5	85.0	94.0	12.0	13.6	16.2	3.2		86.0	2.6	22.0	8.4
Australia	5.0		100.0	100.0	11.0	32.0	17.6	4.8	38.9	59.0	36.6		
Austria	6.6		100.0	100.0	127.0	3.5	19.8		30.4	69.1	30.0	29.5	
Belgium	5.8		100.0	100.0	504.0	7.0	24.5	1.7	30.7	39.6	29.3	17.3	0.0
Canada	5.9		100.0	100.0	14.0	25.0	22.1	3.7	61.9	68.9	61.6	90.6	9.0
Denmark	6.3		100.0	100.0	170.0	7.5	29.8		48.3	43.0	46.7	44.8	0.8
Finland	6.5		100.0	100.0	23.0	6.6	25.1	2.8	36.7	70.3	35.7	86.7	2.1
France	6.6		100.0	100.0	173.0	3.6	24.8	3.4		28.9	19.2	87.2	4.9
Germany	6.5		100.0	100.0	180.0	2.1	20.0	1.6	35.0	83.1	34.9	87.9	0.4
Greece	4.4		98.0	100.0	89.0	9.5	20.4		8.1	39.4	5.2	40.0	13.7
Iceland	6.3		100.0	100.0	13.0	1.0	26.5		29.9	89.0	25.1	60.7	6.5
Ireland	4.1		99.0	100.0	137.0	0.7	19.9				11.4	69.8	27.8
Israel	4.5	99.7	100.0	100.0	83.0	0.0	24.0	1.7	14.1	65.1	12.5	68.7	3.1
Italy	3.8			100.0	162.0	3.6	21.4	2.5	29.5	49.5	26.8		3.5
Japan	5.8		100.0	100.0	320.0	1.8	19.9	4.7	58.5	56.8	45.9	63.5	1.8
Luxembourg	6.1		100.0	100.0	202.0	1.3	16.9		12.1	61.8	10.5	50.5	19.9
Malta	4.6		100.0	100.0	968.0	1.6	21.2		1.7	24.9	1.3		15.3
Netherlands	5.8		100.0	100.0	329.0	8.2	28.7	3.8	29.2	29.7	26.9	69.8	4.3
New Zealand	4.7			100.0	35.0	5.1	20.3	5.4	10.0	90.7	9.2	65.7	23.4
Norway	5.2		100.0	100.0	29.0	63.0	22.5	3.6	22.5	58.0	28.4	48.9	5.4
Portugal	5.7		100.0	99.0	90.0	4.9	22.1	3.0		95.7	13.6	45.4	5.7
Spain	5.2		100.0	100.0	132.0	4.4	21.3		47.0	55.2	40.5	76.3	9.5
Sweden	6.2		100.0	100.0	129.0	6.1	27.7		43.7	79.4	43.4	52.7	2.5
Switzerland	6.8		100.0	100.0	173.0	2.8	11.6	2.0	51.3	80.5	51.1	82.8	1.0
United Kingdom	5.2		100.0	100.0	172.0	11.2	23.5	2.9	28.0	30.3	22.7	48.2	5.9
United States	5.9		100.0	99.0	67.0	5.8	17.6	3.6	53.3	78.7	41.2	91.7	5.2
Afghanistan		15.6	37.0	50.0	6.0		10.1	22.9	0.8		0.4	0.7	
India	3.2	66.3	33.0	91.0	125.0	13.4	12.0	8.7	49.5	58.7	41.1	84.2	25.1

Source: IMF GFS 2012, IMF WEO 2012, and World Bank Indicators 2012.

References

- Alegre J.G., Kappeler A., Kolev, A. and Vålilä T. 2008. "Composition of government investment in Europe: Some forensic evidence." EIB Papers 13/1: 23–54
- Beck, Thorsten, George Clarke, Alberto Gro, Philip Keefer, and Patrick Walsh. 2001. "New Tools in Comparative Political Economy: The Database of Political Institutions." *World Bank Economic Review*. 15(1):165-176.
- Brennan, Geoffrey and James M. Buchanan. 1980. *The Power to Tax: Analytical Foundations a Fiscal Constitution*. Cambridge: Cambridge University Press.
- de Mello, Luiz. 2012. "Fiscal Decentralization and Public Investment." In: Brosio, Giorgio, and Juan Pablo Jiménez, eds. *Decentralization and Reform in Latin America: Improving Intergovernmental Relations*, London: Edward Elgar.
- de Mello, Luiz. 2000. "Fiscal decentralization and intergovernmental fiscal relations: a cross- country analysis," *World Development*, 28, 365–80.
- Eaton, Kent and Larry Schroeder. 2010. "Measuring Decentralization," in E. Connerley, K. Eaton, and P. Smoke, eds. *Making Decentralization Work: Democracy, Development, and Security*, Boulder: Lynne Rienner Publishers (2010): 167-190.
- Ebel, Robert and Serdar Yilmaz. 2003. "On the Measurement and Impact of Fiscal Decentralization," in Jorge Martinez-Vasquez and James Alm, eds. *Public Finance in Developing and Transitional Countries: Essays in Honor of Richard Bird*. Cheltenham, UK: Edward Elgar.
- Estache, Antonio and Frannie Humplick. 1994. Does Decentralization Improve Efficiency in Infrastructure? World Bank, Washington, D.C.
- Estache, Antonio and Marianne Fay. 2007. "Current debates on infrastructure policy," Policy Research Working Paper WPS4410, World Bank, Washington, DC.
- Esteller A. and Solé A. 2005 "Does decentralization improve the efficiency in the allocation of public investment? Evidence from Spain," Institut d'Economia de Barcelona (IEB), Working Papers 2005/5.
- Faguet Jean-Paul. 2004. "Does decentralization increase government responsiveness to local needs?: Evidence from Bolivia," *Journal of Public Economics* 88(3-4): 867-893
- Faguet, Jean- Paul. 2004. "The effects of decentralisation on public investment: evidence and four lessons from Bolivia and Colombia," Working Paper 62, Crisis States Research Centre, LSE, London.
- Faguet, Jean-Paul. 2008. "Decentralisation's effects on public investment: Evidence and policy lessons from Bolivia and Colombia." *Journal of Development Studies* 44 (8): 1100-1121.
- Hoyt, W. H. 1999. "Leviathan, local government expenditures, and capitalization." *Regional Science and Urban Economics*, 29 (2): 155-171.
- Hulten, C.R. and R.M. Schwab. 1997. "A fiscal federalism approach to infrastructure policy," *Regional Science and Urban Economics*, 27, 139–59.
- Humplick, F. and A. Moini- Araghi. 1996. "Decentralized structures for providing roads: a cross- country comparison," Policy Research Working Paper 1658, World Bank, Washington, DC.
- Humplick, F. and Antonio Estache. 1995. "Does decentralization improve infrastructure performance?," in A. Estache (ed.), *Decentralizing Infrastructure: Advantages and Limitations*, World Bank Discussion Paper Series, No. 290, World Bank, Washington, DC.
- Humplick, Frannie. 1992. "Private Ownership, Competition and Decentralization: Impacts on Infrastructure Performance." World Bank, Washington, D.C.
- Kappeler, Andreas, and Timo Vaelilae. "Fiscal federalism and the composition of public investment in Europe." *European Journal of Political Economy* 24 (3): 562-570.
- Keen, Michael and M. Marchand. 1997. "Fiscal competition and the pattern of public spending." *Journal of Public Economics* 66 (1): 33–53.

- Lago-Peñas, S. 2006. "Capital Grants and Regional Public Investment in Spain: Fungibility of Aid or Crowding-in Effect?" *Applied Economics* 38 (15): 1737-1748
- Lewis, Blane D. and Andre Oosterman. 2011. "Sub-National Government Capital Spending in Indonesia: Level, Structure, and Financing." *Public Administration and Development* 31 (3): 149-158.
- Loehr, William, and Rosario Manasan. 1999. *Fiscal Decentralization and Economic Efficiency: Measurement and Evaluation*. Cambridge, MA: Harvard Institute for International Development.
- Martinez-Vazquez, Jorge and Robert McNab. 2003. "Fiscal Decentralization and Economic Growth." *World Development* 31(9):1597-1616.
- Mehrotra, A. and Väililä T. 2006. Public investment in Europe: evolution and determinants in perspective. *Fiscal Studies* 27 (4): 443-471.
- Oates, Wallace E. 1972. *Fiscal Federalism*. New York: Harcourt Brace Jovanovich.
- Oates, Wallace. 1985. "Searching for Leviathan: An Empirical Study." *American Economic Review* 75(4):748-757.
- Oates, Wallace. 2005. "Toward a Second-Generation Theory of Fiscal Federalism." *International Tax and Public Finance* 12(4): 349-373.
- Panizza, Ugo. 1999. "On the Determinants of Fiscal Centralization: Theory and Evidence." *Journal of Public Economics* 74: 97-139.
- Peterson, George E., and Elisa Muzzini. 2005. "Decentralizing Basic Infrastructure Services." In *East Asia Decentralizes: Making Local Government Work*, ed, Washington, DC: World Bank.
- Pritchett, Lant. 2000. "The Tyranny of Concepts: CUDIE (Cumulated, Depreciated, Investment Effort) Is Not Capital." *Journal of Economic Growth* 5 (4): 361-84.
- Qian, Yingyi and Barry Wiengast. 1997. "Federalism as a Commitment to Preserving Market Incentives." *Journal of Economic Perspectives*, 11(4)83-92.
- Rodden, Jonathan. 2004. "Comparative federalism and decentralization - On meaning and measurement." *Comparative Politics* 36 (4): 481-+.
- Schneider, Aaron. 2003. "Decentralization: Conceptualization and Measurement." *Studies in Comparative International Development* 38 (3): 32-56.
- Stegarescu, D. 2005. "Public sector decentralisation: Measurement concepts and recent international trends." *Fiscal Studies*, 26 (3): 301-333.
- Stein, Ernesto. 1999. "Fiscal Decentralization and Government Size in Latin America." In *Democracy, Decentralization and Deficits in Latin America*, ed. Kiichiro Fukasaku and Ricardo Hausmann. Washington, D.C.: Inter-American Development Bank and OECD.
- Wagenvoort, Rien, De Nicola, Carlo and Kappeler, Andreas. 2011. *Infrastructure Finance in Europe: Composition, Evolution and Crisis Impact*. EIB Papers 15 (1):-.
- World Bank. 2005. *East Asia Decentralizes: Making Local Government Work*. Washington, DC: World Bank.
- Zodrow, G. and Mieszkowski P. 1986. Pigou, Tiebout, property taxation, and the underprovision of local public goods. *Journal of Urban Economics* 19: 356-370