Fiscal Governance, Information Capacity, and Subnational Capital Finance

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Abstract

This study posits a theory that a country's capacity to resolve information problems directly relates to the development of subnational government (SNG) capital markets. Based on a sample of fifty-two countries with various degrees of market-based approaches to public debt finance, we evaluate how the capacity to resolve information problems covaries with alternative measures of SNG debt in 2007 to 2014. Empirical findings show that transparency and depth of credit information resolution and extent of disclosure in the private sector positively relate to SNG debt levels, other institutional capacities held constant.

Keywords

subnational capital finance, information capacity, fiscal governance, market development

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Since the 1990s, a number of countries have experimented with decentralizing political and fiscal arrangements to allow subnational governments (SNGs) a greater role in local governance. Among the issues in fiscal governance is the degree to which SNGs are responsible for and able to finance local capital projects. As SNGs experience greater autonomy from higher-level governments, pressure on them mounts to meet citizen demands for infrastructure investment. There is tremendous variation in the degree to which SNGs issue long-term debt; some do not issue any debt, others issue debt from a single or a narrow set of public or private sources, and still others borrow from multiple sources. This study considers how the institutions of information asymmetry resolution, conditional on other existing institutions, relate to the development of SNG capital markets.

A number of institutional factors have been identified as important covariates of SNG debt, including economic, financial and market, political, and legal institutions. However, they fall short of fully explaining the growth of not just SNG debt, but the composition of debt among different instruments and sources of capital. Despite robust empirical evidence of how information impacts private-sector capital markets, the theoretical and empirical literature has been deficient on exploring the institutions of information resolution that contribute to, or retard, the use of SNG debt. And yet, the underlying principles of economics of information are equally present in any capital market, be it for private-sector firms or SNGs.

Within a nation's credit system, market participants are often exposed to the same institutions for information resolution, whether the investments are stocks, corporate bonds, or SNG securities. The theoretical thesis in this article is that the ability of a system to resolve information asymmetry problems, analogous to credit market development in the private sector, rests on the contractability in the system, which refers to the transparency, disclosure, and regulation of information. Based on a sample of fifty-two countries with various degrees of market-based approaches to public debt finance, this study evaluates the extent to which a country's macrolevel ability to resolve informational problems covaries with the size of SNG capital markets from 2007 to 2014. Empirical findings show that transparency and depth of credit information resolution and extent of disclosure in the private sector positively relate to SNG debt levels, other institutional capacities held constant. These findings support the hypothesis that the ability of a system to support information resolution, or ensure contractability between borrowers and lenders, controlling for existing economic, financial and market, political, and legal institutions, is most critical for

SNG credit markets. The research offers recommendations for policy advisors who are engaged in building capital access to SNGs.

Theory

Our theoretical departure is information economics, a theme that is central to theories of capital finance. While countries must acquire a certain level of institutional capacity—necessary alignments in economic, financial and market, political, and legal institutions—before adopting and successfully managing a well-functioning SNG capital market, information capacities in the nation's system matter significantly. Information capacity refers to a system's ability to resolve information problems through transparency, disclosure, and regulation, which we posit are the dominant drivers of SNG capital market size, other institutional capacities held constant. These results contribute to the theoretical and practical literature of how information resolution is critical to SNG capital market development, specifically (Bharath, Pasquariello, and Wu 2009; Peng and Brucato 2004; Reck and Wilson 2006), and to fiscal governance, generally.

At the heart of the theoretical inquiry are two core elements. First, information plays a critical role in markets (Akerlof 1970; Stiglitz and Weiss 1981; Diamond 1984; Ramakrishnan and Thakor 1984; Leland and Pyle 1977; Bertomeu and Marinovic 2016; Liberti and Petersen 2017). Information reduces transaction costs, which reduces geographic boundaries and increases the speed and scale of financial transactions (O'Brien 1992). The resolution of information problems is particularly important for growth in infrastructure, as this asset class requires information density where "there are persistent, localized, and opaque characteristics to infrastructure" (Sharma and Knight 2016, 2).

Second, governance institutions are crucial for the interplay between information and development, public investment, government performance, and fiscal health (Ter-Minassian 1997; de Mello and Barenstein 2001; Ahmad, Albino-War, and Singh 2005; Sellers and Lindstrom 2007; North et al. 2008; Fauget 2014; Morrissey and Udomkerdmongkol 2012; Bertelli 2012; Harbers 2015; Grindle 2004). The institutions of information resolution, which ensure contractability—transparency, disclosure, and regulation of information—are necessary for capital markets, in addition to other important institutions in the governance system. Specifically, information institutions are important for fiscal governance and impact how credit is allocated in the system. Rajan and Zingales (1998) juxtapose the two bases of credit allocation, relationship-based and market-based approaches, along

the distinguishing characteristic of "contractability" of the financial system. Whereas a relationship-based credit allocation system is related to the level of opacity of information, where the financier holds a monopoly on information as well as extracts rents from the borrower, a market-based system relies on information and the allocation of credit according to risk.

The degree of information resolution bears directly on how capital markets develop. "[F]irms' access to capital depends upon how informationally transparent the firms are or how much hard information the financial markets have about the firm" (Liberti and Petersen 2017, 6). Information is hard or soft, with the former referring to information that is quantifiable, standardized, may be public, and whose collection can be separated from decision-making; the latter information is contextual, nonstandardized, proprietary, and is collected by the decision maker (Bertomeu and Marinovic 2016; Liberti and Petersen 2017). Hard information is most present in a transparent information environment, and soft information is most present in an opaque information environment. The degree of access to information is the fundamental distinction between relationship-based and market-based credit allocation systems (Rajan 1992; Rajan and Zingales 1998).

Market-based systems, which rely on the transparency of information, are characterized by enforceable contracts between arm's-length lenders and borrowers, whereby price is determined as a function of risk. The disclosure of information and the court's ability to enforce contracts are necessary to guarantee protection of the lender. Firms financed under market-based arrangements demonstrate higher effort (Rajan 1992), and mature borrowers face lower costs in a market-based system (Rajan and Zingales 1998). A market-based system allows more efficient allocation of capital due to price signals. In application to the subnational public sector, a market-based credit system is likely to allocate capital more efficiently, allow lower prices for mature borrowers, and stimulate own source revenue generation but with the potential for moral hazard behavior.

Thus, a system's information capacity—its ability to resolve information problems through contractability (i.e., transparency, disclosure, and regulation)—is directly relevant to a credit allocation system and market efficiency. By extending the discussion of types of credit systems, it should hold that the role of information has significance not just for private-sector capital markets but for all market types involving borrowers and lenders, including SNG capital markets. Capital markets, be they for private or public sectors, are equally subject to supply and demand forces within the confines of their institutions in the system. Any type of lending involves an

exchange between two parties, the flow of capital to productive uses, and a return to the lender for that exchange.

Literature Review

Despite latent demand for financing, incomplete and unreliable financial data, constrained borrowing authority, absence of rules to handle default proceedings, and uncertain borrower credit quality and debt management capacity continue to hamper the development of SNG capital market borrowing (Leigland 1997; White and Smoke 2005; Martell and Guess 2006). The redistribution of capital raising authority among levels of government poses numerous challenges, given the information asymmetries that one often observes across and within government units, but also among national and subnational entities, and between the private and public actors. Notwithstanding potential fiscal sustainability issues due to incomplete or incompatible institutional rules and norms, certain governance tasks can be better met through decentralization—by making governments accountable and responsive, introducing political and policy competition between governments both vertically and horizontally, enhancing government stability, and placing limits on government power (Bird 2004; Litvack, Ahmad, and Bird 1998; Oates 2005; L. Liu and Pradelli 2012; Fauget 2014; Vo 2010; Baskaran, Feld, and Schnellenback 2016). Therefore, with proper institutional arrangements and capacities in place, SNGs have an important role in fiscal governance.

What institutional factors support the development of SNG capital markets? The question is central to the governance of capital resources and contributes to the discussion of how involving more market participants in the process of capital financing can help in accomplishing fiscal governance tasks. The development of an SNG credit market depends on the institutional arrangements in the system (Noel 2000; Giugale et al. 2000; Kim 2003; Guess and Ma 2015; M. Freire and Petersen 2004). In addition to institutions of information resolution, the use of SNG debt and the type of debt depend on four dimensions of institutional capacity—economic, financial and market, political, and legal.

The economic dimension of institutions attends to prudent financial policies both at the macroeconomic level and at the subnational level of fiscal health. The macroeconomic level of institutional capacity refers to sovereign macroeconomic fiscal management, control, and effectiveness of the sovereign to direct a healthy economy. A necessary condition of institutional capacity is sound macroeconomic policies to achieve

macrostability (Laeven 2014), which in turn permit SNGs to operate in environments with sufficient economic activity. At the same time, macroeconomic policies are important, as there is evidence that greater access to external capital finance is associated with increased market scrutiny and improved fiscal discipline (de Mello 2005). Subnational credit risks are often intertwined with broader macroeconomic and institutional reforms (Canuto and Liu, 2013). "Debt sustainability of SNGs is determined by the interplay of the existing debt stock, economic growth, cost of borrowing, and primary balance" (Canuto and Liu 2013, 25–26), and macroconditions and policies affect this interplay.

The financial management and market dimension of institutional capacity, a subset of public economics that distinctly focuses on capital finance issues, broadly refers to market governance: policies regarding investor protection, risk assessment, and information management that affect the financial market's breadth and depth. At the system level, the financial management and market dimension of institutional capacity includes the organization and regulation of capital markets as well as the legal enforcement of contracts. Policies define legal rights and investor protections; the parameters on investment, instruments, frameworks for debt issuance and conduct, monitoring and reporting protocols, and clearing and settlement processes; and parameters, trading platforms, and settlement systems for primary and secondary markets (Kehew, Matsukawa, and Petersen 2005; Laeven 2014).

The political perspective of institutional capacity refers to the political conditions for government stability, accountability, and effectiveness. Empirical studies show support for the "weak government" hypothesis, holding that poor management due to fragmented political power increases fiscal imbalances (Roubini and Sachs 1989). Political ideology, political institutions, and political cycles could impact fiscal balance, though comparative empirical evidence is inconsistent (Roubini et al. 1989; Borrelli and Royed 1995; Blais, Blake, and Dion 1993; Seitz 2000; Alesina, Cohen, and Roubini 1993; Schneider 2006).

A perspective often very closely tied to the political angle is the legal dimension of institutional capacity, which refers to the legal rules and institutions that govern public-sector debt and SNG capital financing, and the degree to which the rule of law facilitates transactions (Awadzi 2015). The legal environment that governs subnational borrowing sets the parameters—and enforcement of those parameters—of what is politically feasible as well as allowed or prohibited for both governments and nongovernment market actors (M. E. Freire 2013; de Mello 2001;

Webb 2004; Aldasaro and Seiferling 2014; de Mello and Barenstein 2001; Bird and Smart 2002; Lewis 2003; Ahmad, Albino-War, and Singh 2005). The legal environment addresses the extent to which legal norms are upheld and the capacity in the system to enforce the rules. Excessive disregard for rules or outright corruption are found to have a detrimental impact on SNG borrowers (Butler, Fauver, and Mortal 2009; Depken and LaFountain 2006; Moldogaziev, Liu, and Luby 2017; C. Liu, Moldogaziev, and Mikesell 2017). The legal framework can encourage or discourage SNG market participation by allowing, or disallowing, access to market participants.

The extant body of research, while expertly discussing a range of institutional prerequisites and conditions, often based on single country or single region studies, fails to systematically develop and test theoretical frameworks of SNG capital market development around the world. This is somewhat problematic as such studies—while rich in detail and informative about individual markets—neglect to account for variations in national institutional capacities and their impact on administration of fiscal governance tasks. Such compartmentalization of expertise does not help in evaluating whether public policy and public finance theories and practices are portable to dissimilar institutional environments. To break from existing approaches, focusing on information resolution, we evaluate the link between institutional capacities and SNG debt in fifty-two countries.[1]

This research inquiry rests on the notion that the incidence of subnational credit markets and their levels are related to a nation's capacity to resolve information problems, controlling for other important dimensions of institutional capacity—economic, financial and market, political, and legal bases of institutional competence. Based on the theoretical framework regarding information capacity and its components, and the review of empirical literature on SNG debt, the following research hypotheses are formed:

Hypothesis 1: Information capacity has a relationship with SNG debt.
Hypothesis 2: Transparency/depth of credit information (item 1) has a relationship with SNG debt.
Hypothesis 3: Extent of disclosure (item 2) has a relationship with SNG debt.
Hypothesis 4: Regulatory quality (item 3) has a relationship with SNG debt.

Empirical Models of SNG Debt and Methods

In the regression models, the goal is to evaluate how the institutional capacity to resolve information problems relates to SNG debt markets in a sample of fifty-two countries during 2007 to 2014. The three alternative measures of SNG debt are the natural log of the SNG debt size (in billions of US dollars), the natural log of SNG debt per capita (in thousands of US dollars), and the natural log of SNG debt as percentage of gross domestic product (GDP). We employ linear regression models to estimate the relationships, controlling for year and country fixed effects, presented in the function below:

$$\text{SNG debt} = f\left(\begin{array}{l}\text{information capacity, economic capacity, financial and market capacity, political capacity,} \\ \text{legal capacity, service and economic pressures, two} \sim \text{way year} \sim \text{country FEs, error term}\end{array}\right).$$

Data and Measurement

Data on SNG debt variables are collected from a variety of sources. The sampling strategy is designed to identify all the countries where SNGs—at the regional level, the local level, or both—have capital market debt issuance authority and activity during the study period. Capital market debt refers to debt from private lenders, including private banks and bond markets; it excludes debt provided by or guaranteed by the central government. The single largest source of SNG debt data for twenty-six countries in our sample is Eurostat, an informational portal of the European Commission.[2] However, for a number of these countries, SNG debt data are available only from 2011 and on. To complete data on missing observations, when possible, SNG debt measures are collected from respective countries' governing institutions that are directly responsible for monitoring SNGs or for collecting and disseminating SNG fiscal and financial data. According to regulations of accounting classifications stipulated for the European Union countries,[3] general-purpose government debt consists of "debt securities" and "loans."

Data on SNG debt for the remaining twenty-six countries with debt issuance authority and activity are collected on an individual country basis using accounting classifications comparable to the Eurostat categories. In each country, the laws and statutes that govern SNG debt issuance authority, if any, are evaluated and governing institutions at a country level that are responsible for SNG units are identified. We then collected data on SNG debt (debt securities and loans) in these countries issued by states (or equivalents of states such as provinces) and general-purpose municipal

governments (such as cities, towns, or counties). Consequently, data were collected on a country-by-country basis from whatever sources available, including Ministries of Finance, Ministries of Regional or Local Self-Governance, Central Banks, Offices of Statistics, Auditors Offices, and/or Treasuries.

Data Processing

The study evaluates general government (general purpose) SNG long-term debt levels that are obtained/issued using market mechanisms of capital financing. General-purpose governments are entities with a broader specter of public service responsibilities such as cities, counties, and municipalities (the specific name for the jurisdiction depends upon the political organization of each country) or states/provinces (often labeled regional entities), as well as the hybrids between these two major classifications. There are two primary reasons for focusing on general-purpose SNGs. The first has to do with accounting conventions and standards governing debt around the world. In the countries where regional and local governments access credit directly, general-purpose debt (debt securities, loans, and other direct overlapping debt or coguarantees) is the most standardized way of accounting and reporting debt data.[4] The second reason is availability of reliable and comparable data.

Thus, the data on the aggregate of regional and local government general-purpose long-term debt directly attributable to SNG governments and created through capital market mechanisms are collected. The aggregate debt measures are all regional and local debt (usually reported in local currencies), which are converted to US dollars based on official currency exchange rates of the US Federal Reserve Bank. During the period under evaluation, we observe that the countries that authorized market-based capital financing to their SNGs also had freely floating currencies; thus, using official currency exchange rates is not expected to mask the effects of any currency control mechanisms that may often still exist in emerging economies.

Dependent Variables

The dependent variable for the levels of SNG debt size is measured using three alternative specifications. The first is an aggregate level of SNG debt in the country in billions of US dollars. Univariate measures show that the mean SNG debt size in the sample is US$97 billion, with a standard

deviation of US$214 billion. Both skewness and kurtosis in this variable show an excessive departure from normality. Descriptive statistics show that this departure is largely driven by the United States, Germany, Japan, and Canada, which is not unexpected, as the former three are the world's biggest advanced industrial economies with active SNG debt markets during the period that we evaluate, while Canada historically has required greater levels of capital financing due to its geographic and political characteristics. Table 1 presents descriptive properties of outcome variables and their covariates. The mean of the transformed measure of SNG debt size (natural log) is 1.80 with a logged US dollars standard deviation of 3.09, now more proximal to normality compared to the one we observe in the original scale.

The second specification for the levels of SNG general-purpose debt is the aggregate annual SNG debt per capita in each country. Statistics show that the mean SNG debt per capita in the sample is about US$2,283, with a standard deviation of US$3,885 However, this measure is also highly skewed and kurtotic, requiring proper transformations. In terms of per capita SNG debt levels, Canada, Germany, and Japan continue to have larger SNG debt levels compared to other countries in the sample. Norway, Belgium, Switzerland, the Netherlands, and Spain are other countries that have been or are lately above the US$5,000 per capita levels. Natural log transformations show much improved distribution for this measure. The mean of the transformed SNG debt per capita measure is 5.77, with a standard deviation of 2.77.

The third specification for SNG general-purpose debt is SNG debt as percentage of GDP (or SNG debt to GDP ratio). Descriptive statistics indicate that the mean debt to GDP ratio is 5.6 percent, with a standard deviation of 7.42 percent. Once again, the distribution is highly skewed and kurtotic, and the variable is converted to a natural log scale. Canada, Germany, and Japan remain as the countries with the largest SNG debt to GDP ratios, followed by Belgium, Switzerland, the Netherlands, and Spain. Natural log transformations show a significantly improved distribution for SNG debt as percentage of GDP, with a mean and standard deviation of 0.63 and 2.08, respectively.

Main Independent Variable

The central thesis is that the capacity of the financial system to resolve information asymmetry problems will be conducive to SNG debt, all other core factors of institutional capacity held constant. To test this empirically

Table 1. Descriptive Statistics for Measurement Constructs and Individual Variables.

Variables	Mean	Standard deviation	Minimum	Maximum
SNG debt size, in billions of US dollars	97.41	213.72	0.00	1,036.06
Ln(SNG debt)	1.80	3.09	−8.20	6.94
SNG debt per capita, in thousands of US dollars	2,282.52	3,884.83	0.01	22,943.07
Ln(SNG debt per capita)	5.77	2.72	−5.30	10.04
SNG debt as percentage of GDP	5.60	7.43	0.00	45.67
Ln(SNG debt as percentage of GDP)	0.63	2.08	−9.39	3.82
Info capacity index	0.57	0.51	−1.13	1.53
Transparency/depth of credit info	4.67	1.48	0.00	6.00
Extent of disclosure	5.98	2.73	0.00	10.00
Regulatory quality	0.83	0.73	−1.08	1.97
Economic capacity	0.85	0.80	−0.99	2.74
Gross domestic product	1.1E+12	2.37E+12	6.86E+09	1.74E+13
Gross national income	1.1E+12	2.41E+12	6.83E+09	1.78E+13
Gross savings	2.27E+11	4.09E+11	1.47E+09	2.95E+12
Gross national expense	1.06E+12	2.31E+12	8.03E+09	1.73E+13
Financial and market capacity	0.38	0.71	−1.39	2.38
Legal rights	6.35	2.19	0.00	10.00
Investor protections	5.73	1.49	2.70	9.70
Ease of investor suits	6.41	1.67	2.00	10.00
Political capacity	0.76	0.75	−0.78	2.01
Government effectiveness	0.81	0.78	−0.81	2.36
Political stability	0.34	0.77	−1.93	1.50
Voice and accountability	0.34	0.77	−1.93	1.50
Legal capacity	0.70	0.95	−1.00	2.29
Corruption control	0.67	0.99	−1.09	2.55
Rule of law	0.70	0.91	−1.14	2.12
Population density	124.38	127.47	2.69	517.35
Unemployment rate	8.77	5.88	0.70	36.00

Note: SNG = subnational government; GDP = gross domestic product.

at the system (country) level of analysis, a set of measures for the construct of information capacity is selected. There are three variables in the information capacity measure, which comport directly with how Rajan and Zingales (1998) conceptualize contractability along the dimensions of transparency, disclosure, and regulatory accountability.[5]

The first component of information capacity is "transparency/depth of credit information," which is an index measure constructed by the World Bank affiliate "Doing Business" project.[6] It consists of eight subcomponents that measure multiple facets of credit information availability in the country, such as distribution of information on both individuals and firms, availability of both positive and negative information on credit market participants, distribution of data from both retail and utility firms above and beyond financial institutions, the length of data storage for both good and bad credit performance information, data distribution on very small loans (less than 1 percent of per capita debt), availability of credit bureaus and registries and their cost, availability of multiple electronic access points to credit information, and, finally, availability of credit scoring public or private entities. The index varies from 0 to 8, with higher values in the index representing greater access to credit information. The mean level of the index in our sample is 4.67, with a standard deviation of 1.48.

The second component of information capacity is the "extent of disclosure," which is also an index constructed by the Doing Business project. This measure evaluates country-level disclosure quality for private firms that obtain credit from investors. The index ranges from 0 to 10 and represents the capacity of the capital market system to regulate the conflict of interests within major private-sector corporate firms. This component is important for accountability of financial intermediation between investors and firms but also firms and government entities. The five facets of the extent of disclosure measure are variations in internal controls on management power to approve transactions within firms, variations in whether external actors have a say in internal firm transactions, distributions in disclosure transparency between firm management and the boards, requirements of immediate disclosure of firm transactions to relevant external parties, and requirements on annual activity disclosures, including conflict of interest disclosures of corporate management. The mean value of the extent of disclosure index in the sample is 5.98, with a standard deviation of 2.73.

The final component of information capacity in the study is "regulatory quality." The multidimensional measure is developed by the "Worldwide Governance Indicators" (WGI) project, an affiliate of the World Bank. The measure was first applied in mid-1990s and has remained in use ever since, after going through rounds of validation and fine-tuning. According to WGI's definition, the measure of "Regulatory quality captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development."[7] This

final component of information capacity in the capital market system captures the qualities of regulatory capacity that are necessary for resolving information asymmetry problems. Regulatory quality holds information capacity of the financial system together by bridging information provision and monitoring of credit transactions of major firms in the financial system. Since "regulatory quality" is a standardized index, it ranges in our sample between −1.08 and 1.97 with a mean and standard deviation of 0.83 and 0.73, respectively.

Using principal component approach, the three individual components are drawn into a construct of information capacity, which ranges from −1.13 to 1.53. Its mean is 0.57, with a standard deviation of 0.51. The principal component approach employs the correlation matrix of the selected items in the measure and produces factor loadings based on the squared multiple correlations as estimates of communality between the items. Using both the individual items of information capacity in the capital market system—depth of credit information, extent of disclosure, and regulatory quality—and the construct of information capacity, we evaluate their impact on SNG debt levels in countries that experience SNG debt activity, conditional on a set of institutional control factors, in an unbalanced sample of fifty-two countries in 2007 to 2014.

Control Variables

Extant literature suggests that SNG debt markets are supported by fundamental institutional capacity factors, which often must precede incidences of SNG capital markets or reenforce them once they are established. For that reason, it is important to control for four broad dimensions or indices of institutional capacity—each discussed earlier in the Literature Review section as covariates of SNG debt levels.

The first control dimension, economic capacity, is an index consisting of four widely accepted proxies of country-level economic strength: GDP, gross national income, gross savings, and gross national expense, all in current US dollars. The lowest correlation coefficient between these four measures is .97; they load on a single factor, while Cronbach's scale reliability factor is .99. The mean value of the economic capacity index is approximately 0.85, with a standard deviation of 0.80, ranging from −0.99 to 2.74.[8] Favorable economic capacity is expected to be positively related to SNG debt market levels, all else constant.

The second control dimension, financial and market capacity, is an index consisting of three measures related to investor protections in credit

provision in each country: extent of investors' legal rights, strength of investor protections, and ease with which investors can file suits to protect their capital. The overall investor-friendly market environments will be conducive toward capital markets, broadly speaking, as well as toward SNG debt market activity and levels that we evaluate. Existing research utilized these measures in studies of private credit and debt enforcement around the world (Djankov, McLiesh, and Shleifer 2007; Djankov et al. 2008). The three items load well on a single eigenvalue, while Cronbach's scale reliability factor is .60. The average value of the financial and market capacity index is approximately 0.38, with a standard deviation of 0.71 and ranging between −1.39 and 2.38. The expectation is that institutional capacities protecting investor credit provision result in greater levels of SNG debt market levels, all else held constant.

The third control dimension, political capacity, is an index built using three items measuring political conditions: levels of government effectiveness, political stability and violence, and citizens' voice and government accountability. The three items capture overall political climates in the countries under review (e.g., Kaufmann, Kraay, and Mastruzzi 2007, 2010) and are a part of WGI. The three items load on a single factor, with Cronbach's scale reliability coefficient at .91. The average level of political capacity index in the sample is at about 0.76, with a standard deviation of 0.75. It ranges from −0.78 to 2.01, showing slight skewness to the left. Favorable political capacities are expected to be conducive to SNG debt markets, all else held constant.

The fourth control dimension, legal capacity, is an index comprised of two variables that measure the rule of law and corruption control at the country level of analysis. The two items are also from the "World Governance Indicators" project and are expected to proxy for legal climates in the countries in the sample. The items load on a single eigenvalue and their Cronbach's scale reliability coefficient is .96. The mean and standard deviation for legal capacity index is about 0.70 and 0.95, respectively, while the range varies between −1.00 and 2.29. Conditions with favorable legal capacities are expected to be positively related to SNG debt market incidence and levels, all other relevant variables held constant.

Finally, for proper model specification, regressions control for population density and unemployment rates as proxies for service and economic pressures in each of the countries in the final sample. While the first proxy is expected to capture the demands for public capital infrastructure at the subnational levels, the latter proxy is expected to appraise whether SNG capital financing policies respond to economic burdens. Average

population density in the sample is 124 persons per square kilometer, with a standard deviation of 127. The distribution is skewed significantly to the right, ranging from 3 to 517 persons per square kilometer, necessitating a logarithmic transformation. Average unemployment rate is about 8.77 percent, with a standard deviation of 5.88 percent. The distribution of this variable is relatively normal with a range between 0.70 percent and 36 percent.

Empirical Results

Models 1.1 to 1.3 are two-way year-country fixed effects models for the covariates of SNG debt size (natural logarithm), where information capacity is measured as a multifaceted index consisting of three items. Model 1.1 is a baseline regression of debt size on information capacity index along with year-country fixed effects. In models 1.2 and 1.3, covariates are added to the baseline model and the interpretations focus on coefficients from these models with additional covariates.[9] The coefficients for the index of information capacity have the expected direction and are statistically significant in models 1.2 to 1.3 ($\hat{\beta}_{ICF} = 1.194$ and 1.169; $p < .001$). Therefore, as the capacity to resolve information asymmetry problems improves, the compounded increase in SNG debt size is roughly equal to 122 percent to 130 percent ($e^{\hat{\beta}_{ICF}} - 1$). Alternatively, a one standard deviation increase in the measure of information capacity is expected to result in about a 210 percent to 223 percent increase in SNG debt size ($e^{\hat{\beta}_{ICF} \times s_{IGF}}$).

To further scrutinize the items in the index of information capacity, each of the three items is individually assessed in models 2.1 to 2.3. Of the three items, it appears that transparency and depth of credit information and extent of disclosure are the main drivers of the positive coefficient in models 2.2 to 2.3. Improvements in transparency/depth of credit information are found to result in a compounded increase in SNG debt size of about 12 percent to 13 percent ($\hat{\beta}_{DGI} = 0.115$ and 0.120; $p < .01$). For a standard deviation change in transparency/depth of credit information, the expected change in SNG debt size is 20 percent to 21 percent ($e^{\hat{\beta}_{DGI} \times s_{DGI}}$). At the same time, enhancements in the extent of disclosure appear to result in a compounded increase in SNG debt size of about 39 percent to 41 percent ($\hat{\beta}_{ED} = 0.341$ and 0.329; $p < .01$). A standard deviation change in the extent of disclosure translates to a 195 percent to 209 percent expected change in SNG debt size ($e^{\hat{\beta}_{ED} \times s_{ED}}$). The coefficient for regulatory quality, while positive, becomes statistically insignificant when we move from the baseline regression in model 2.1 to regressions with covariates in models 2.2 and 2.3. Table 2 displays results for models 1.1 to 1.3 and 2.1 to 2.3.

Table 2. Regression Models for the Covariates of SNG Debt Size (Natural Logarithms).

Variables		Outcome variable = ln(SNG debt)					
	Model 1.1	Model 1.2	Model 1.3	Model 2.1	Model 2.2	Model 2.3
	Baseline	M1.1 + controls	M1.2 – political + legal	Baseline	M2.1 + controls	M2.2 – political + legal
LI. Information capacity index	0.916*** (3.37)	1.194*** (3.40)	1.169*** (3.47)			
LI. Transparency/depth of credit information				0.0799* (2.36)	0.115** (2.77)	0.120** (2.91)
LI. Extent of disclosure				0.223* (2.28)	0.341** (2.79)	0.329** (2.64)
LI. Regulatory quality				0.600* (2.24)	0.555 (1.63)	0.385 (1.33)
LI. Economic capacity		−0.196 (−0.32)	−0.395 (−0.62)		0.094 (0.17)	−0.011 (−0.02)
LI. Financial and market capacity		−0.299 (−0.48)	−0.242 (−0.39)		−1.048 (−1.45)	−0.969 (−1.35)
LI. Political capacity		−0.179 (−0.40)			0.007 (0.02)	
LI. Legal capacity			0.799* (2.00)			0.702† (1.83)
LI. Population density, ln		4.453* (2.23)	4.970* (2.40)		4.220* (2.25)	4.713* (2.37)
LI. Unemployment rate		0.0008 (0.05)	0.0063 (0.45)		−0.0041 (−0.25)	−0.0017 (−0.10)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	−0.516** (−2.63)	−12.38** (−2.33)	−13.19** (−2.47)	−1.990** (−2.83)	−14.59** (−2.69)	−15.53** (−2.80)
N observations (2007 = base year)	377	377	377	377	377	377
N countries (Argentina = base country)	51	51	51	51	51	51
AIC	573.00	573.00	567.70	566.80	560.50	556.50
BIC	809.20	828.60	823.30	810.90	824.00	819.90
R^2	.979	.980	.980	.980	.981	.981
Adjusted R^2	.975	.976	.976	.976	.977	.977

Note: t statistics in parentheses (robust standard errors). SNG = subnational government.

Level of significance: *p < .05.

**p < .01.

***p < .001.

†p < .10.

Empirical findings for the associations between information capacity and two other specifications for the outcome of interest—SNG debt per capita and SNG debt as percent of GDP—are almost identical to the coefficients reported for SNG debt size regressions. The impact of information capacity on SNG debt per capita and SNG debt as percentage of GDP remains positive and significant in models 3.2 to 3.3 and models 5.2 to 5.3 ($\hat{\beta}_{ICF}$ = 1.195 and 1.169 and $\hat{\beta}_{ICF}$ = 1.161 and 1.137, respectively, all significant at conventional levels). The same is true for the associations between individual items of information capacity. The impact of transparency/depth of credit information on SNG debt per capita and SNG debt as percentage of GDP is positive and significant in models 4.2 to 4.3 and models 6.2 to 6.3 ($\hat{\beta}_{DGI}$ = 1.115 and 1.120 and $\hat{\beta}_{DGI}$ = 1.110 and 1.113, respectively, significant at conventional levels). The impact of extent of disclosure on SNG debt per capita and SNG debt as percentage of GDP also remains positive and significant in models 4.2 to 4.3 and models 6.2 to 6.3 ($\hat{\beta}_{ED}$ = 1.341 and 1.329 and $\hat{\beta}_{ED}$ = 1.344 and 1.388, respectively, again significant at conventional levels). Finally, the impact of regulatory quality on SNG debt per capita and SNG debt as percentage of GDP is positive but insignificant in models 4.2 to 4.3 and 6.2 to 6.3. Regression results for these models are shown in tables 3 and 4.

Consequently, without general evidence to the contrary, we conclude that a system's (nation's) capacity to resolve information problems has a significant and positive influence on SNG debt market activity. There is sufficient empirical evidence to conclude that institutions supporting information capacity matter, which is consistent with our ex ante theoretical framework.

Of the four measures for the dimensions of fundamental institutional capacity—economic, financial and market, political, and legal institutional measures—the legal factor appears to be significant for SNG debt size, SNG debt per capita, and SNG debt as percentage of GDP, all else equal (the coefficient is positive but below the level of significance in model 6.3, however). These results suggest that strong legal capacity in the nation's system may be conducive to greater levels of SNG debt. Consequently, enhancements in the rule of law and policies tackling corruption are likely to be important tools for SNG market activity. In the models for the covariates of SNG debt as percentage of GDP, economic capacity is found to be negative and significant in models 5.2 and 5.3 and marginally so in models 6.2 and 6.3. This may be an indication that countries with advanced economic capacities, all else held constant, are in lesser need for SNG debt as far as the percentage of GDP is concerned.

Table 3. Regression Models for the Covariates of SNG Debt per Capita (Natural Logarithms).

Variables	Outcome variable = ln(SNG debt per capita)					
	Model 3.1	Model 3.2	Model 3.3	Model 4.1	Model 4.2	Model 4.3
	Baseline	M3.1 + controls	M3.2 − political + legal	Baseline	M4.1 + controls	M4.2 − political + legal
L1. Information capacity index	0.961*** (3.56)	1.195*** (3.40)	1.169*** (3.47)			
L1. Transparency/depth of credit information				0.0878** (2.62)	0.115** (2.77)	0.120*** (2.91)
L1. Extent of disclosure				0.226* (2.32)	0.341** (2.79)	0.329** (2.64)
L1. Regulatory quality				0.580* (2.18)	0.554 (1.63)	0.384 (1.33)
L1. Economic capacity		−0.200 (−0.33)	−0.399 (−0.62)		0.091 (0.16)	−0.015 (−0.03)
L1. Financial and market capacity		−0.299 (−0.48)	−0.241 (−0.38)		−1.049 (−1.45)	−0.968 (−1.35)
L1. Political capacity		−0.177 (−0.40)			0.010 (0.02)	
L1. Legal capacity			0.804* (2.01)			0.707† (1.84)
L1. Population density, ln		3.518† (1.76)	4.037† (1.95)		3.285† (1.75)	3.782† (1.91)
L1. Unemployment rate		0.0014 (0.10)	0.0070 (0.50)		−0.0035 (−0.21)	−0.0010 (−0.06)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	2.683*** (13.93)	−6.662 (−1.26)	−7.482 (−1.40)	1.129 (1.61)	−8.881 (−1.64)	−9.826† (−1.77)
N observations (2007 = base year)	377	377	377	377	377	377
N countries (Argentina = base country)	51	51	51	51	51	51
AIC	569.80	573.20	567.80	563.80	560.60	556.60
BIC	806.00	828.80	823.40	807.90	824.10	820.00
R^2	.974	.974	.975	.974	.975	.976
Adjusted R^2	.969	.969	.969	.969	.970	.970

Note: t statistics in parentheses (robust standard errors). SNG = subnational government.
Level of significance: *p < .05.
**p < .01.
***p < .001.
†p < .10.

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Table 4. Regression Models for the Covariates of SNG Debt Ratio to GDP (Natural Logarithms).

Variables	Outcome variable = ln(SNG debt as percent of GDP)					
	Model 5.1	Model 5.2	Model 5.3	Model 6.1	Model 6.2	Model 6.3
	Baseline	M5.1 + controls	M5.2 – political + legal	Baseline	M6.1 + controls	M6.2 – political + legal
LI. Information capacity index	0.893** (3.27)	1.161** (3.22)	1.137** (3.26)			
LI. Transparency/depth of credit information				0.0783* (2.37)	0.110* (2.56)	0.113** (2.66)
LI. Extent of disclosure				0.255** (2.63)	0.344** (2.74)	0.338** (2.64)
LI. Regulatory quality				0.161 (0.59)	0.529 (1.51)	0.332 (1.12)
LI. Economic capacity		−1.353* (−2.11)	−1.560* (−2.31)		−1.051† (−1.79)	−1.150† (−1.93)
LI. Financial and market capacity		−0.325 (−0.51)	−0.275 (−0.43)		−1.092 (−1.48)	−1.036 (−1.41)
LI. Political capacity		−0.352 (−0.77)			−0.148 (−0.34)	
LI. Legal capacity			0.688† (1.67)			0.597 (1.48)
LI. Population density, ln		3.408† (1.69)	3.884† (1.86)		3.185† (1.67)	3.632† (1.81)
LI. Unemployment rate		0.0116 (0.77)	0.0170 (1.16)		0.0066 (0.38)	0.0083 (0.47)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	−1.959*** (−12.92)	−10.07† (−1.88)	−10.83* (−2.01)	−3.999*** (−5.81)	−12.33* (−2.24)	−13.27* (−2.36)
N observations (2007 = base year)	376	376	376	376	376	376
N countries (Argentina = base country)	51	51	51	51	51	51
AIC	592.10	587.60	584.50	582.20	575.10	572.50
BIC	827.90	843.00	839.90	825.90	838.40	835.80
R^2	.952	.954	.954	.954	.956	.956
Adjusted R^2	.943	.944	.945	.945	.946	.947

Note: t statistics in parentheses (robust standard errors). SNG = subnational government; GDP = gross domestic product.
Level of significance: *p < .05.
**p < .01.
***p < .001.
†p < .10.

Of the remaining proxies for service and economic pressures in all of the regression models, population densities are statistically significant at conventional levels for one-tailed tests, while unemployment rates are not. We must conclude that while the levels of SNG capital financing appear to be insensitive to greater intensities of economic burden, SNG capital financing levels appear to respond to greater population density. Finally, for reasons of robustness, regressions are extended to models that account for potential roles for form of government (federal vs. nonfederal states) and legal origins (results are omitted for brevity). These findings suggest that SNGs in federal countries incur greater levels of debt compared to their counterparts in unitary states, which is consistent with existing literature (e.g., G. Liu and Sun 2016). Results also show that countries with French legal origins are likely to issue lower levels of SNG debt compared to countries with English legal origins, while the coefficients for countries with German and Scandinavian legal origins are insignificant. This lends evidence to the argument that a country's legal origin has important consequences for national credit systems (e.g., La Porta, Lopez-de-Silanes, and Shleifer 2008).

Discussion and Conclusions

The empirical results support the argument that a nation's ability to resolve information problems—subject to economic, financial and market, political, and legal institutional capacity—directly relates to SNG capital market. This finding has important implications to both theory and practice. Consistent with our expectations, greater levels of information capacity indeed appear to matter for SNG debt. In particular, measures for transparency and depth of credit information and extent of disclosure drive the levels of SNG debt. Regulatory quality, while positively associated, is not statistically significant. This does not necessarily mean that regulatory quality does not matter; rather it suggests that proper regulatory quality does not harm SNG capital market activity. From a practical perspective, efforts to build better platforms for information generation and provision as well as disclosure on the firms, borrowing entities, and transactions in the system may be an essential and missing piece of institutional reforms in concert with other aspects of institutional capacity.

The results on the bases of fundamental institutional capacity require further discussion, however. Of the four bases, legal capacity is significant, showing that control of corruption and rule of law facilitate market activity. This finding is consistent with evidence in existing studies that, when left

unchecked, greater levels of corruption and substandard levels of the rule of law result in economic losses in a number of areas of capital market activity. These losses are linked to deterioration of SNG credit quality, increasing borrowing costs, and overall levels of indebtedness (Depken and LaFountain 2006; Butler, Fauver, and Mortal 2009; Moldogaziev, Liu, and Luby 2017; C. Liu, Moldogaziev, and Mikesell 2017). The positive coefficient also supports the argument that legal conditions are important for development of SNG capital markets, thus underscoring the importance of legal institutions for capital market participants.

As the coefficients for other factors of institutional capacity are generally insignificant, does it mean that they do not matter? Questions remain about whether the economic, financial and market, and political factors are truly insignificant or simply overwhelmed by the dominance of information capacity. Our theoretical framework and postestimation results suggest that is unlikely to be the case. Alternatively, the sample of countries included in the study may offer clues to this finding. The fifty-two countries we evaluate are the most advanced in the world along the key dimensions of governance and institutional capacity that we assess and are likely more homogenous along these factors than statistically desired. Nevertheless, based on the sample we evaluate, we must maintain the null hypothesis and conclude that, while we do not have evidence that remaining institutional factors play a positive role on SNG market activity, upholding them does not harm the SNG market prospects either.

Development of capital markets must be viewed as a complex governance task, where a broad range of actors may be capable of coproviding capital financing services. Efficiencies are achievable by allowing SNGs and other actors to participate in this fiscal governance task. The results of this research suggest that the resolution of information problems is fundamental to successfully involving a range of government and market actors in the financing of public-sector investments. Specifically, findings suggest that transparency and depth of credit information resolution and extent of disclosure, factors central to private and corporate credit, are also the dominant drivers of SNG capital market size, other institutional capacities held constant. Thus, the research contributes not only to the theory of information as it relates to capital market development in the public sector, it also contributes to our understanding of fiscal governance. Given the importance of transparency and disclosure, policy makers must pay attention to systems of information management and provision to overcome problems of information asymmetry to leverage a full range of actors—including SNGs,

firms, and individual investors—in the financing of long-term public goods and infrastructure.

Notes

1. These countries—as well as subnational government (SNG) debt statistics, units of SNG in the analysis, data sources, and the sampling strategy—are listed in Appendices 1 and 2 of the Online Supplementary Material. The online supplement is located at https://sites.google.com/site/tmoldogaziev/resources.
2. All information from this source is standardized to European monetary units (EMU) until the end of 1999 and is switched to Euros as EMU was retired in 1999.
3. *Official Journal of the European Union*, L 174, June 26, 2013. Available in multiple languages at http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=OJ%3AL%3A2013%3A174%3ATOC (accessed March 2017). Debt is reported for four sectors, two of which—state governments (S.1312) and local governments (S.1313)—are directly relevant for this study.
4. There are also classifications for nonmarket and indirect general-purpose debt available to SNGs, such as debt securities or loans with a full guarantee of the central government, loans from other governments (both higher-level governments and horizontal loan arrangements with other "peer" governments) or government authorities and enterprises, or direct and indirect nondebt guarantees, sometimes including liabilities of public funds. These nonautonomous and nonmarket arrangements will predominantly exist as a major source of SNG capital

financing mechanism in countries that do not possess sufficient levels of information capacity, conditional on necessary fundamental institutions. We also find that in a number of countries, debt issued by special-purpose SNG authorities or vehicles as well as public–private partnership projects with distinct SNG benefits do not always get properly recognized, monitored, regulated, and reported as SNG debt. At the same time, nondebt liabilities (nondebt security and nonloan guarantees) are outside of the scope of the current work.

5. Items and sources for the index of information capacity, as well as of the four indices of institutional capacity—control measures in the study, are listed in Appendix 3 of the Online Supplementary Material.

6. "Doing Business" project aims at collecting measures on regulations that enhance or diminish private-sector business activity, including regulations of private and corporate credit, in the countries around the world. More details about this project are available at http://www.doingbusiness.org.

7. Worldwide Governance Indicators (WGI) has seen critical reviews of its data quality in peer-reviewed and nonpeer-reviewed outlets (e.g., Thomas 2010; Arndt and Oman 2006). However, this data source is by far the most standardized and carefully constructed study of governance indicators for the past two decades (Arndt and Oman 2006; Kaufmann, Kraay, and Mastruzzi 2007, 2010; Andrews 2010). Additional details on the WGI project, data and data sources are available at http://info.worldbank.org/governance/wgi/index.aspx#home.

8. The factor indices constructed for the study are based on principal component factors for the items included in each index. There are *three reasons* for why factor indices must be preferred. The first one has to do with recognition that economic, political and legal, and financial and market capacity factors are multifaceted phenomena. Therefore, using multidimensional constructs is methodologically appropriate. The second one has to do with a need to capture each control factor as broadly as possible in order to accurately describe the associations of our main items of information capacity, as well as the overall construct of information capacity, with SNG debt market authority and activity levels. Hence, the interest is in robust control measures and not unique coefficients for each item in the control constructs. The third reason relates to the fact that severe levels of multicollinearity are present when variables capturing different dimensions of the economic, financial and market, political, and legal environments are included in the same regression models. When faced with multidimensionality of constructs, which by definition will be collinear, building indices from multiple items is the most appropriate statistical solution.

9. Models 1.2 and 1.3 differ in that the former includes political capacity, while the latter includes legal capacity. Measures of political and legal capacity exhibited high correlation in the data set; therefore, to avoid multicollinearity issues, they

are included in separate regression models. This concern for multicollinearity between political and legal capacity indices separates Models 2.2 versus 2.3, 3.2 versus 3.3, 4.2 versus 4.3, 5.2 versus 5.3, and 6.2 versus 6.3.

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