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Does urbanization mean bigger governments?☆

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Abstract

This paper proposes urbanization as a determinant of government size. As people move to cities, their demand for a more defined set of regulations, but also for basic health, education, and income standards rises. Our theoretical framework determines how the regional distribution of the population affects government size. We test this theory on panel data of 175 countries from 1960 to 2010 and two state-level samples from Colombia and Germany. Results demonstrate a strong positive effect from urbanization on government spending, with a 1 percent increase in the amount of urban citizens leading to a 0.2 percent rise in public expenditure. Our findings indicate that public sectors may become more important as worldwide urbanization is progressing. This result underlines why government effectiveness and the quality of public goods provision will be even more important in the future.

Keywords: Government Size, Urbanization, Population Concentration
JEL codes: H10, H50, H75, R50

"What I like about cities is that everything is king size, the beauty and the ugliness." Joseph Brodsky (1940 – 1996), Russian poet and essayist.

1. Introduction

The global population has more than doubled since 1960, from 3 billion to over 6.8 billion people. At the same time, rapid urbanization has taken place. Today, half of the

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world population lives in cities, compared to 37 percent in 1975. As population is predicted to keep growing, so is urbanization. The U.N. anticipates the global urbanization rate to hit 57 percent for the year 2025 (see figures 1 – 3).[1] At the same time, global government spending relative to GDP has steadily been rising, from an average of 11.7 percent in 1960 to 16.5 percent in 2009.[2] The following pages will argue that there exists an intimate connection between urbanization and the shape of the public sector.

In the related public economics literature, Alesina and Wacziarg (1998) show why total population growth can *lower* government consumption per capita. With consumption of pure public goods being non-rival, per capita costs decrease when spread out over more people. Our paper asks what happens to public spending if people are increasingly living in urban areas.

A city lifestyle differs fundamentally from living in a rural area. Being surrounded by more people in a densely populated area, the opportunity for interaction increases, in professional as well as in private settings. The average urban citizen interacts with more people, but also faces more anonymity. In fact, somebody living in an urban apartment building may cross paths with her in-house neighbors every day, yet never know their names. Daily interactions are bound to be more formal, whereas the traditional small town is oftentimes characterized by "everybody knows everybody." We argue that as people are living closer together, they naturally seek a more structured and detailed organization of society.

Consider the example of playing loud music at home. If one lives in a rural house surrounded by a spacious yard, the first neighbors likely do not live close enough to potentially be bothered. Yet in an inner-city apartment complex the chances of complaints increase substantially. In the latter case, society is eventually more likely to enforce existing regulations and to create new ones. As another example, imagine a minor traffic accident. In a small town, both parties possibly know each other and may settle the dispute without involving authorities. An accident on Times Square however involves the police, shutting off the street, and maybe a sequel in court. The difference lies in the involvement of public institutions. Many issues in a small town do not carry externalities

[1] See Dugger (2007) for a more detailed exposition in the NY Times. The detailed urbanization maps can be found at `http://esa.un.org/unpd/wup/maps_1_2025.htm`.

[2] Numbers derived from a balanced worldwide data set on national government spending (World Bank). These numbers only report public spending on the national level, without considering regional or local government spending.

and are more likely to be resolved informally, whereas the anonymity of a city requires well-defined public institutions. Other goods, which gain relevance in urban areas and are usually provided by the public sector include transportation (e.g. a metro system and airports) or dealing with environmental issues. For instance, Henderson (2005) notes that cities require enormous public infrastructure investments. Setting up and maintaining a public transportation system is a costly job which governments are bound to execute in most societies. As for the environmental aspect, problems with pollution generally arise in urbanized areas first.

Another notable distinction between urban and rural areas lies in the awareness of income gaps, but also differences in health and education standards. Taking the metro, one likely sees several different neighborhoods, in addition to the variety of people in the metro itself.[3] The visibility of people with lower income, health, and education levels may naturally result in a stronger urge for security, but also in a heightened sense for redistribution. In addition, there are substantial external factors at play, specifically regarding health care. In a densely populated area, a universal health standard comes with increased positive externalities, as diseases can be passed along much quicker. In summary, city life differs fundamentally from a rural lifestyle and the demand for public goods may be bigger in urban areas, everything else equal.

Notice that these implications are neither related to population size nor to population density. For example, consider two countries with similar land areas and population sizes, like Denmark and Slovakia. Denmark counts 4 cities with more than 100,000 people, whereas Slovakia only counts 2. Population density is very similar, yet the concentration in cities is more prevalent in Denmark. Thus, Denmark should have higher per capita government spending as a fraction of GDP (which it has), if everything else were equal. Finally, one cannot rule out a potential element of self-selection in this context. Somebody who chooses to live in a city may well differ from a rural habitant in terms of her genuine understanding of the social contract. Thus, people's personal attitude could affect both the urbanization rate and the size of government.

There exists an extensive literature discussing urbanization. For instance, Ravallion (2002) and Glaeser et al. (2008) discuss poverty in the context of urbanization, whereas Glaeser and Gottlieb (2009) provide an excellent analysis of urbanization in the United

[3]For instance, trains in Tokyo move 8 million people everyday with so-called "trainpackers" trying to fit as many people into wagons as possible.

States. Other region-specific analyses include Hope (1998) for Africa, Weber and Puissant (2003) for Tunis, Zhang and Song (2003) and Chen (2007) for China. Henderson (2003) argues for an ideal individual degree of urbanization, depending on size and development of a country. Further, urbanization has been labeled as a growth engine (Zhang, 2002, or Bertinelli and Black, 2004), although Henderson (2005) or Bloom et al. (2008) find a weaker effect on growth. For a detailed analysis of urbanization and growth, one might consider Henderson (2005).

Similarly, the literature on government size suggests a list of potential determinants. Several political aspects have been considered, as well as deindustrialization, openness to trade, or the increase in female labor force participation.[4] Looking at living standards, Wagner's Law comes to mind, suggesting that higher income is accompanied by a bigger government.[5] Meltzer and Richard (1981) provide a theoretical model relating income inequality to government size, challenged by Gouveia and Masia (1998) in an empirical framework. In a comprehensive empirical analysis, Shelton (2007) compares the relative importance of various determinants of government size. The paper closest to our approach however is Alesina and Wacziarg (1998), who argue that more populated countries benefit from economies of scale, therefore incurring lower public spending on a per capita basis. We extend this analysis in distinguishing between the urban and rural population, suggesting an independent effect from the regional distribution of population on government spending.

We derive a general theoretical framework modeling the demand for public and private goods, both by urban and rural citizens. We then provide a theoretical example, employing a CES utility function. Our results suggest that urbanization increases the size of government, irrespective of the degree of substitutability between public and pri-

[4]Mueller and Murrell (1986) analyze the influence of interest groups and Pettersson-Lidbom (2012) suggests that the size of the legislature might be negatively related to government size. Recently, Brender and Drazen (2013) look at the effect of elections on changes in government spending. Lind (2007) considers inequality within versus across groups. Regarding the argument for fiscal decentralization, one might consider Marlow (1988), Grossman (1989), Persson and Tabellini (1994), Jin and Zou (2002), and Cassette and Paty (2010). Iversen and Cusack (2000) propose deindustrialization as a driver of government expenditure. Cavalcanti and Tavares (2011) discusses the increased participation of women in the labor force as a potential determinant. Finally, Rodrik (1998) started the discussion on trade openness as a potential determinant of government size, which has since been debated heavily.

[5]For instance, Durevall and Henrekson (2011) find mixed results for Wagner's Law in a long-time study of government spending in Sweden and England. Brückner et al. (2012) uses oil price shocks to analyze the elasticity of government spending and its components over time.

vate goods.[6]

Our empirical section consists of two main parts: (1) an international panel data analysis from 1960 – 2010 and (2) two state-level samples from Colombia and Germany. Our theoretical predictions receive strong support in all three samples as urbanization has a positive and significant effect on government spending. In terms of magnitude, our results suggest that a 1 percent increase in the number of urban people raises government spending by 0.15 – 0.30 percent. Although strongly significant in either specification, government spending seems to respond with over three times the impact in OECD countries (elasticity of up to 0.65) versus non-OECD countries (elasticity of 0.18). Further, urbanization seems to increase public spending on health and education, but has no impact on military spending. Finally, our state-level panel data analyses of Colombia and Germany confirm our general result: urbanization seems to make governments bigger.

The remainder of the paper is organized as follows. Section 2 presents our theoretical framework, followed by the empirical methodology in section 3. Section 4 discusses our data and their sources. Finally, section 5 presents our empirical findings and section 6 concludes.

2. Theory

This section proposes a basic theoretical framework, focusing on society's demand for the public good (g) and the private good (c). The novel feature of the model lies in the distinction between urban and rural citizens. We first introduce a general framework and then provide a theoretical application, using a CES utility framework. We want to be clear in stating that our focus is neither explaining *why* people move to the city nor providing a complete list of government size determinants.[7]

2.1. General Model

Think of a country with two distinct geographical regions: an urban area populated by s citizens and a rural area with a population of n people. Thus, total population of our model country is $s + n = P$. To facilitate readability, a reverse upper hat will denote variables concerning the urban area (e.g. $\breve{g}$), whereas variables from the rural area are

[6] The model introduced by Alesina and Wacziarg (1998) suggests that the effect of population size on government spending per capita depends on the substitutability between public and private goods.

[7] For theoretical frameworks on explaining rural-urban migration and the developments of cities, one might consider Lucas Jr (2004) or Duranton (2007).

marked by a dot (e.g. $\dot{g}$). The urban area is defined by a limited geographical space of size $\breve{\Phi}$, whereas the rural area is characterized by an unlimited geographical space of size $\dot{\Phi}$ with $\dot{\Phi} \to \infty$.

Suppose further that any person interacts with a fraction of people in their respective area in a given period. We label this fraction ϵ (with $0 < \epsilon < 1$) and, if available space plays a role in how many people one interacts with, then $\epsilon = \epsilon(\Phi)$, where $\epsilon \in \{\breve{\epsilon}, \dot{\epsilon}\}$ and $\Phi \in \{\breve{\Phi}, \dot{\Phi}\}$.[8] With space being infinite in the rural area, we impose that $\dot{\epsilon}$ converges to

$$\dot{\epsilon} = \frac{k}{n}, \tag{A.1}$$

where k denotes a positive constant. Thus, the total amount of personal interactions by a rural citizen becomes $\dot{\epsilon}n = k$. We further assume that there exists an urban population threshold $s = s^*$ after which urban citizens have more interactions than rural citizens and

$$\breve{\epsilon}s > k. \tag{A.2}$$

With our previous discussion about differences between urban and rural areas in mind, we consider the case of $s > s^*$, fulfilling A.2.

2.1.1. An Urban Citizen

All urban citizens are equivalent in preferences and budget constraint with a typical urban citizen choosing $\breve{g}$ and $\breve{c}$ to maximize

$$U = U\Big[\breve{g}(\breve{\epsilon}, s), \breve{c}\Big]. \tag{1}$$

Following our discussion, we impose that the demand for the public good is a positive function of the amount of interactions ($\breve{g}_{\breve{\epsilon}} > 0$ and $\breve{g}_s > 0$), but this effect diminishes with size ($\breve{g}_{\breve{\epsilon}\breve{\epsilon}} < 0$ and $\breve{g}_{ss} < 0$). We establish the usual conditions of diminishing marginal utility with $U_j > 0$ and $U_{jj} < 0$ for $j \in \{\breve{c}, \breve{g}\}$. The sign of $U_{\breve{c}\breve{g}}$ determines whether public and private goods are substitutes or complements.[9] An urban person's budget constraint

[8] To simplify the analysis, we exclude the possibility of interactions across areas. Without loss of generality, one could allow for interactions across regions and our general results remain unaffected.

[9] For a recent theoretical framework on this question, one might look at Galí et al. (2007). For empirical approaches concerning the substitutability of public and private goods, consider Karras (1994), Evans and Karras (1996) or Fiorito and Kollintzas (2004) among others.

is given by

$$\breve{y} = p\breve{g} + q\breve{c} \tag{2}$$

with $\breve{y}$, p, and q representing the individual income of an urban citizen and universal prices of the respective goods. Finally, we include the intuition of the non-rival public good (following Alesina and Wacziarg, 1998), which translates to its price being a function of total population size:

$$p = p(s + n), \tag{3}$$

where $p_{s+n} < 0$. Given the non-rivalry of public good consumption, a bigger population lowers the price for the individual. Maximizing (1) with respect to (2) then defines the optimal demand for both goods, which can be expressed by the general form of

$$\frac{U_{\breve{c}}}{U_{\breve{g}}} = \frac{q}{p}. \tag{4}$$

2.1.2. A Rural Citizen

A rural citizen faces a similar problem, maximizing

$$V = V\left[\dot{g}(k), \dot{c}\right] \tag{5}$$

subject to

$$\dot{y} = p\dot{g} + q\dot{c}. \tag{6}$$

Here again, the importance of the public good increases with the amount of interactions ($\dot{g}_k > 0$ and $\dot{g}_{kk} < 0$). The assumption of the non-rival public good from equation (3) holds on the countryside as well. From here, the ideal basket of goods will be determined by the optimality condition

$$\frac{V_{\dot{c}}}{V_{\dot{g}}} = \frac{q}{p}. \tag{7}$$

2.1.3. The Effect of Urbanization on Government Spending

Our equation of interest is relative government size, i.e. the relative demand for the public good. Labeling total consumption of the public good with pG and total income with Y, we can write government spending as a fraction of GDP as

$$\frac{pG}{Y} = \frac{p\big(s\breve{g} + n\dot{g}\big)}{s\breve{y} + n\dot{y}}. \tag{8}$$

Now consider an urbanization process: $\Delta s = -\Delta n$. Notice that the effect of population size on the price of the public good from equation (3) cancels out as overall population remains unchanged.[10] The change in relative government spending then comes out to be

$$(\frac{G}{Y})_s - (\frac{G}{Y})_n = \frac{1}{Y}\left[s\breve{g}_s + \frac{P\breve{y}\dot{y}}{Y}\left(\frac{\breve{g}}{\breve{y}} - \frac{\dot{g}}{\dot{y}}\right)\right]. \tag{9}$$

We can distinguish two effects:

- The first term, $s\breve{g}_s$, is positive by definition and stems from all urban citizens, who now feel the city getting more crowded. As a consequence, they raise their demand for the public good.
- The second term, $\frac{P\breve{y}\dot{y}}{Y}\left(\frac{\breve{g}}{\breve{y}} - \frac{\dot{g}}{\dot{y}}\right)$, comes from the relative importance of the public good in both areas. For instance, if urban citizens generally devote a larger fraction of their income to the public good than rural citizens ($\frac{\breve{g}}{\breve{y}} > \frac{\dot{g}}{\dot{y}}$), this term becomes positive.

Although we cannot draw conclusive results regarding the net effect from urbanization on the size of the public sector, this exercise gives us an idea of the forces at work. The following example will provide further insights.

2.2. A Theoretical Example

The theoretical example follows Alesina and Wacziarg (1998) in assuming constant elasticity of substitution (CES utility) between both goods. We first need to define how the amount of interactions enters preferences. To this end, we introduce the parameter δ (with $0 < \delta < 1$), measuring the importance of security, redistribution, regulation or generally the definition of the social contract to any individual. We assume all citizens to be equal in their δ.

[10] So we can simplify equation (7) to $\frac{G}{Y} = \frac{s\breve{g}+n\dot{g}}{s\breve{y}+n\dot{y}}$ for this exercise. Please also see the appendix for exact derivations.

2.2.1. An Urban Citizen – CES Example

An urban citizen has to choose $\breve{g}$ and $\breve{c}$ to maximize

$$U = \left[\left(\breve{\epsilon} s \right)^{\delta} (\breve{g})^{\alpha} + (\breve{c})^{\alpha} \right]^{\frac{1}{\alpha}}, \tag{10}$$

where α denotes the degree of substitutability between both goods.[11] When the city becomes more crowded (s increases) the importance of the public good increases, but at a decreasing rate (since $\delta < 1$). With the non-rivalry condition of the public good in mind, we denote the price for the public good by $p = \frac{\gamma}{s+n}$ and the price for the private good by $q = \mu$. γ and μ (with $\gamma, \mu > 0$) represent exogenous production parameters, determined by capital or technology for instance. The typical urban citizen's budget constraint becomes

$$\breve{y} = \frac{\gamma}{s+n} \breve{g} + \mu \breve{c}. \tag{11}$$

The urban citizen's optimal demand for the public good in terms of her income is then given by

$$\frac{p\breve{g}}{\breve{y}} = \frac{1}{1 + (\frac{\gamma}{\mu})^{\frac{\alpha}{1-\alpha}} \left(\breve{\epsilon} s \right)^{\frac{\delta}{\alpha-1}} \left(s+n \right)^{\frac{\alpha}{\alpha-1}}} = \frac{1}{1+A}, \tag{12}$$

where we adopt the notation of A to facilitate readability in the upcoming results.

2.2.2. A Rural Citizen – CES Example

Similarly, a rural inhabitant chooses $\dot{g}$ and $\dot{c}$ to maximize

$$V = \left[(k)^{\delta} (\dot{g})^{\alpha} + (\dot{c})^{\alpha} \right]^{\frac{1}{\alpha}} \tag{13}$$

subject to

$$\dot{y} = \frac{\gamma}{s+n} \dot{g} + \mu \dot{c}. \tag{14}$$

[11] We assume $\alpha < 1$. For $\alpha \to \infty$ goods are complements, whereas $\alpha = 1$ corresponds to the case of a unit elasticity of substitution.

Thus, income levels may differ across regions, but prices are the same. Also note that the public good is non-rival nationwide.[12] Maximization of (13) leads to

$$\frac{p\dot{g}}{\dot{y}} = \frac{1}{1 + (\frac{\gamma}{\mu})^{\frac{\alpha}{1-\alpha}} (k)^{\frac{\delta}{\alpha-1}} \left(s+n\right)^{\frac{\alpha}{\alpha-1}}} = \frac{1}{1+B}, \tag{15}$$

where B is introduced to simplify notation. We can already tell that an urban citizen has a higher relative consumption of the public good than a rural citizen, as assumption A.1 leads to $A < B$ for any $\alpha < 1$.

2.2.3. The Effect of Urbanization on Government Spending – CES Example

As in our general model, consider the case where people move from the countryside to the city: $\Delta s = -\Delta n$. Using the general form of (9), we can rewrite the effect of urbanization as

$$(\frac{G}{Y})_s - (\frac{G}{Y})_n = \frac{1}{Y}\left[s\breve{g}_s + \frac{P^2 \breve{y}\dot{y}}{\gamma Y}(\frac{p\breve{g}}{\breve{y}} - \frac{p\dot{g}}{\dot{y}})\right] \tag{16}$$

where the first term picks up the increased importance of the public good for all urban citizens after the city becomes more crowded.[13] The second term in brackets represents the switch of the moving citizens from consuming $\dot{g}$ to $\breve{g}$.

Using our results from (12) and (15) and deducting $\breve{g}_s$ from (12) allows us to specify the result from urbanization. Since $\breve{g}_s > 0$ for any $\alpha < 1$ and $A < B$, urbanization causes government spending as a fraction of GDP to increase for any degree of substitutability. For the demonstration why $\breve{g}_s > 0$, please see the appendix. This non-dependence on the elasticity of substitution is a more explicit result than the effect of total population on government size, suggested by Alesina and Wacziarg (1998). The following empirical section will now take our theoretical predictions to the data.

[12]This assumption could be relaxed if one focuses on a federal republic like the United States or Germany, where states carry a stronger role in the provision of public goods. Since our main empirical part only contains a small fraction of such federal systems, we focus on the public good being non-rival across domestic regions.

[13]Notice that $\dot{g}_s - \dot{g}_n = 0$ since total population P remains unchanged in the case of a strict urbanization, a move from the rural area to an urban area: $\Delta s = -\Delta n$. The same argument holds for the term $(s+n)$ in the denominator of $\breve{g}$, derived from equation 12.

3. Empirical Methodology

Although the general theoretical framework only provides an intuition on the effects of urbanization, the CES example is more concrete to predict a positive effect of urbanization on government spending. Our estimable equation is derived directly from the definition of government spending in (8). Using the results from (12) and (15), total government spending becomes

$$pG = \frac{s\breve{y}}{1 + (\frac{\gamma}{\mu})^{\frac{\alpha}{1-\alpha}} (\breve{\epsilon}s)^{\frac{\delta}{\alpha-1}} (s+n)^{\frac{\alpha}{\alpha-1}}} + \frac{n\dot{y}}{1 + (\frac{\gamma}{\mu})^{\frac{\alpha}{1-\alpha}} (k)^{\frac{\delta}{\alpha-1}} (s+n)^{\frac{\alpha}{\alpha-1}}}. \tag{17}$$

Thus, we can express government spending in the following way:

$$gov = F\big(\breve{\epsilon}s, s+n, s\breve{y}, n\dot{y}\big) = F\big(urban, pop, gdp\big), \tag{18}$$

where *gov* stands for total government spending; *pop*, *gdp*, and *urban* represent total population, overall GDP, and the amount of urban people. From equation (17), we predict positive effects from income and urban population, yet the effect from the overall population depends on the degree of substitutability (α), as in Alesina and Wacziarg (1998). We estimate the following panel model across countries (or regions in the national samples):

$$lgov_{it} = \beta_0 + \beta_1 lurban_{it} + \beta_2 lpop_{it} + \beta_3 lgdp_{it} + \beta_4 X_{it} + \alpha_i + \lambda_t + \epsilon_{it}. \tag{19}$$

In order to simplify comparison and interpretation of the obtained coefficients, all variables are taken in natural logarithm (indicated by an l before a variable name). *lgov* and *lurban* stand for total government expenditure and the urban population, whereas *lpop* and *lgdp* represent the overall population and overall GDP.

X_{it} contains additional control variables, which have been found to be important in determining government size. In the international sample we use openness to trade (*lopen*), life expectancy ($llife$), the fractions of people over 65 years of age ($pop65$) and under 15 ($pop15$) in society, and the Polity IV index (*polity*), measuring a country's degree of democratization.[14] α_i and λ_t capture country- and time-fixed effects. These dummy variables seem particularly important, given the vast differences in terms of history, ge-

[14] For an excellent overview of why these variables can determine government spending, one might look at Shelton (2007).

ography, and any other unique national aspects of every individual country around the world. For the Colombian and German samples, data availability does not include *lopen*, *pop*65, *pop*15, and *polity*, although these variables may not differ substantially across regions and time in a domestic setting anyway. In addition, we do not have state-level information of $llife$ for Germany.

4. Data Sources and Description

Overall, we are using 3 distinct data sets, which are summarized in table 1. The following sections discuss each data set separately.

4.1. International Data

All our international data comes from the World Development Indicators, with the exception of the Polity IV index. We use final general government consumption expenditure (in constant 2000 US$), which exclusively contains data for the central government, as our dependent variable. Our preferred measurement would be overall government spending, including public administration on the local and regional level. Although imperfect, we have several reasons to believe that using central government spending is a close proxy for total government size. First, only 17 countries in our sample are federal republics – a state form which allows for stronger decentralization of government decisions. Second, most of our above described effects should go through the national arm of public spending as opposed to a regional district, such as the extent of universal health care or redistributional policies.[15] Third, the distinction between regional and national government spending should matter mostly in rich and populous countries, since smaller and poorer countries cannot allow for several layers of public administration, simply owed to their size and the setup costs for government institutions. Fourth, fixed effects should partially control for some of the international variation in terms of the distribution of government spending between central and regional administration.

The World Bank measures the urban population as the number of people living in urban areas, as defined by national statistical offices.[16] We use total urban population as opposed to the urbanization rate given that the urbanization rate is missing for many

[15] The United States might be a popular exception.

[16] Although there could be differences across countries and time in the interpretation of an urban area, fixed effects should be able to control for this variation.

countries in the database even though urban population is not. Further, the use of the absolute measure or the relative measure will provide exactly the same coefficient estimate in a linear model. Population is the total population of a country. Regarding additional control variables, the World Bank measures GDP as total GDP (in constant 2000 US$), openness as exports plus imports divided by GDP, and life expectancy as life expectancy at birth. Further, we use the population shares over the age of 65 and under the age of 15. Finally, the Polity IV index measures a country's degree of democratization from -10 (totally autocratic) to $+10$ (total democracy).

In an extension to our general estimations, we also look at specific areas of government size. Specifically, we use public spending on education, health, and military to see whether our suggested effect from urbanization holds across different sections of government spending.

A preview of our international data in figure 4 confirms that average cross country urbanization has been increasing constantly over time, as well as average national government spending as a fraction of GDP. While this graph is purely suggestive, it does intimate that these two variables may be closely associated.

Lastly, in addition to about 5,000 yearly observations, we also create a sample applying five year averages to all variables. This follows previous works, such as Shelton (2007) or Ram (2009), and aims at controlling for potential problems of measurement error, business cycles, and exogenous shocks. As some observations might suffer from measurement error (especially older observations and data points from developing economies), averaging provides a useful control for results from using annual values. In addition, if some regressors move slowly over time, then using annual data might not provide enough variation to filter out the respective effect, especially when controlling for country- and time-fixed effects.[17]

4.2. National Data Sets

Our national samples use state-level data from within Colombia and Germany. Data for Colombia is extracted from the DANE website (Departamento Administrativo Nacional de Estadística), whereas data from the German Statistical Office (Statistisches Bundesamt) and Eurostat allow us to analyze the formation of regional government spend-

[17] Shelton (2007) provides a detailed explanation why using averaged observations can be helpful in this context.

ing in Germany.[18]

The Colombian sample ranges from 1985 – 2007 for all 25 regions and we are using current government spending (in millions of pesos) to measure the size of the public sector.[19] We use the amount of people living in the main city of the specific state to proxy for urbanization. Although not equivalent to the general definition of urbanization, it captures the concept – especially given the strong concentration in one city for most Colombian regions.[20] Finally, we control for state-level population and GDP (measured nominally in millions of pesos).

In the case of Germany, we have data from 1996 – 2010 for 13 out of 16 federal states, missing Berlin, Bremen, and Hamburg, although their inclusion would not add much information anyway with their respective urbanization rates being at 100 percent by definition. The extent of the state-level public sector is measured as total government spending in Euros. The amount of households living in densely-populated areas, defined as areas with at least 500 inhabitants per square kilometer, provides us with a measurement for urbanization. Although this variable strays from the definition of urbanization counting individuals, one could easily think of our theoretical model being derived for households. For consistency, we also employ the overall amount of households as our variable defining population size. Finally, we control for state level GDP in Euros.

5. Empirical Findings

In this section, we present our main cross country findings along with several robustness checks, followed by the Colombian and German country-specific studies. Throughout all tables, we subsequently add control variables moving from left to right.

5.1. Cross Country Analysis of Government Spending

Table 2 displays our benchmark results. We see that in the generic pooled model both urban and total population have large and statistically meaningful effects on government

[18]For Colombia, the data is available at `http://www.dane.gov.co/`. Our German data comes from `https://www.regionalstatistik.de`, `https://www-genesis.destatis.de/genesis/online?nsc=true&https=1`, and `http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/`.

[19]Technically, Colombia consists of 32 regions, but 8 of them are summarized in the DANE data set to one remaining region. These regions are Amazonas, Arauca, Casanare, Guainia, Guaviare, Putumayo, San Andrés and Providencia, Vaupés, and Vichada.

[20]Ades and Glaeser (1995) provide potential reasons why especially South American societies tend to be focused in few large cities. Another prominent theory regarding the distribution of cities is derived from Zipf's Law and discussed in Gabaix (1999).

spending. Taken literally, a 1 percent increase in the urban (total) population size leads to a 2.2 percent increase (1.3 percent decrease) of government spending in specification (2). It is interesting to note that once we include fixed effects these magnitudes drop substantially, while remaining statistically significant. In an analysis on the impact of population on government spending by Ram (2009) (using Penn World Table data), the inclusion of country- and time-specific effects rendered population's effect statistically meaningless and changed its sign. Here this is not occurring. Thus, our model, and by extension Alesina and Wacziarg (1998) in a panel data setting, is robust to accounting for country- and time-specific heterogeneity. Including various control variables, as discussed by Shelton (2007), leaves the positive effect from urban population significant at the 1 percent level with elasticities established around 0.2. The negative effect from total population settles for a slightly larger magnitude.

Table 3 replicates table 2, using five year averages of all variables. We notice a remarkable similarity between both tables throughout the different specifications, especially for the urban and the population coefficient.[21] Although the population effect briefly loses significance along the way, it recovers its importance in the final and most complete specification. The lower significance levels in general might be owed to the stronger restrictions of imposing fixed effects when using averages. As the number of observations per time and country decreases substantially (e.g. from 51 to 10 observations if all information is available for a country), less freedom remains for the coefficients to move. In general, we note that the magnitude of the population effect appears to be stronger than the effect from urbanization.

Overall, the main insights from our theoretical intuition are confirmed: urbanization increases government spending, while pure population growth has a negative effect on government spending, confirming Alesina and Wacziarg (1998). As people live closer together, more money is devoted to provide public amenities, whereas with just more people the types of amenities being provided can be spread more evenly with fewer resources.

Further insights from tables 2 and 3 confirm that richer citizens demand more services from their governments. However, this is not surprising as we are using total values, not fractions. So, this finding merely confirms that public goods are normal goods. Openness to trade is suggested to reduce government spending, which is interesting, especially given the literature surrounding Rodrik (1998), who used cross-country data, and Ram (2009),

[21] Ram (2009) also found this strong similarity between using annual values and averages over time.

who used panel data. We are using more countries and have a longer time frame than Ram (2009). Finally, a larger share of the population being over 65 is suggested to increase government spending and the same holds true for the fraction of people under 15. This confirms findings by Shelton (2007) and one could speculate that people over 65 are in favor of strong public retirement benefits and good health care coverage. As for people under 15 years of age, one may argue that parents with children are probably in favor of public funding for education, public safety, child benefits, and publicly funded sports and leisure activities.

Two interesting extensions of our baseline model immediately come to mind. Following the cross country growth literature (e.g. Masanjala and Papageorgiou, 2008), we now explore parameter heterogeneity on a regional level and investigate aggregation effects, looking at specific forms of government spending, in this case education, health care, and military expenditures.

5.1.1. Differences Across Regions

Table 4 presents regional estimates for our model, both using annual values and five year averages. We focus on differences across what might mostly be considered as developing regions – Africa, Asia, and Latin America (LAC) – as well as differences stemming directly from OECD and non-OECD countries. The results for the regional models using annual data suggest that both Africa and Asia confirm to the baseline predictions, whereas the LAC region has flipped its sign (though still statistically significant). Aside from the OECD estimates, we see the same relative magnitudes across regions: the estimated effect of urban population size on government spending is smaller than that of the estimated effect from total population size. The relative magnitude difference between urban and total population across OECD and non-OECD countries is striking. In OECD nations the effect of urbanization is three times as large as the total population effect, while in non-OECD nations this relationship is basically reversed. Although speculative, this might suggest a potential development threshold in how total population size impacts government spending, but also an increased importance of the effect from urbanization as countries grow richer.

Considering five year averages mostly confirms these results, although on lower significance levels. As above, a potential explanation could be less time variation when using averages, in addition to a lower number of observations caused by splitting the sample into regions.

Beyond these two main estimated effects, we see that the impact of other control variables mostly confirm our baseline results from tables 2 and 3. However, a couple of interesting anomalies are standing out. Openness to trade seems to decrease government size in Latin America and the OECD nations, whereas there is no clear relationship in the rest of the world. Further, a higher population share under 15 years of age significantly increases government spending all around the world, with the stark exceptions of Africa and the OECD countries, where this relationship is reversed. With respect to Africa, this might point to the argument of children being part of the retirement plan, which is especially prevalent in very poor regions. Finally, democracy seems to raise government spending in the OECD nations, while lowering it in Asia. Even though these results are not the main focus of this paper, they do raise interesting questions. From looking at regional differences, we now move to a detailed look at various forms of government spending.

5.1.2. Differences Across Forms of Public Spending

Table 7 presents estimates based on specific categories of government spending, both for annual values and five year averages. Consistent with the majority of our total government spending findings, when we estimate our model subdividing government spending by category (education, health care, military), we see for education and health care spending the same pattern: a positive and statistically significant effect for urban population and a negative and statistically significant effect for total population. We do not find estimated population effects that are statistically significant for government spending on military. These insights are consistent with five year averaging as well.

These baseline estimates are not surprising given our initial theory: living closer to other people might either make one more compassionate to support better public health and education programs or more concerned about one's own health if we think about transmittable illnesses and diseases. Yet military spending should mostly not be affected by the geographical restrictions of the area one lives in.

Beyond these main results, it is noteworthy that whereas our earlier results yielded little evidence in favor of the openness argument championed by Rodrik (1998) and buttressed by Ram (2009)'s panel data analysis, here subdividing by type of government spending suggests that openness does have a positive and statistically significant effect on both government spending for education and health care. Acknowledging this, we also notice that the estimated effects for urban and total population swamp these openness effects, consistent with the main implications from Alesina and Wacziarg (1998). Further, income seems to lose its importance in the context of all three categories of public spending, even returning negative significance when predicting public spending on health. Also interesting from these government type results is the fact that life expectancy has a strong positive impact on public spending. An intuition for this result could be that expecting a longer life increases the expected future benefits from education. As expected, people over 65 value public health benefits stronger than education.[22] Surprisingly, we find the same result for young people under 15 – a result that leaves room for interpretation. Finally, democratic societies seem to value public spending on education and health, whereas they tend to decrease their focus on the military.

However, these results from different sectors of government spending should be interpreted with some degree of caution. Switching from total government spending to categorical government spending has reduced the available sample size considerably. In the regression using educational spending our sample size has decreased by 65 percent. One should also keep in mind that the majority of countries that did not have data on specific categories of government spending are developing countries.

5.1.3. Robustness Checks

Table 6 presents results for several robustness checks, using specification (5) from table 2 as our baseline reference point.[23] Column (1) uses ten year averages for all variables, which allows to further control for measurement error and short-run fluctuations, similar to the argument above for five year averages. Specifications (2) and (3) address potential problems from reverse causality as we regress averages of government spending over five and ten years (average from year t to year $t+5$ or to year $t+10$ respectively) on initial annual observations of all explanatory variables (taken at time t). This should address causality problems between the independent variables and the level of government spending. Especially in the cases of urbanization, income per capita, and openness to trade, one could imagine that government size could affect these variables. Using future values of the dependent variable should control for this problem.

Further, specification (4) displays our baseline regression excluding small countries

[22] Figlio and Fletcher (2012) also finds that the percentage of elderly adults relates negatively to the support for public schooling.

[23] We choose specification (5) because it allows us to keep the grand majority of observations without losing explanatory power, since the inclusion of the Polity IV index in specification (6) of table 2 is not significant. However, all robustness checks return very similar results when including the Polity IV index.

with a population of under one million. Given the general contemporary understanding of urbanization thresholds, small countries with no or little potential of urbanization could skew our results both in terms of significance and magnitude. Moving to specification (5), we focus on the way we measure our variables. So far, we used the natural logarithm of levels of government spending, the urbanized population, and also openness to trade. However, various analyses measure government size as the share of government spending in GDP. Similarly, oftentimes the urbanization rate is used as opposed to levels. Thus, specification (5) uses rates as opposed to levels for the following variables: government spending (fraction of GDP), urbanization (urban people divided by total population), the logarithm of GDP per capita, trade (as percentage of GDP), and the population over 65 and under 15 as a percentage of total population (no logarithm).[24] All other variables remain unchanged.

Finally, column (6) replicates our baseline model with a balanced sample from 1960 until 2010. Thus, we are only using countries for which we have information for all 51 years of government spending, urbanized and total population, total GDP, openness to trade, and life expectancy. We exclude both the population shares of people over 65 and under 15 years of age, because of their reduced data availability. Specifications (4) and (6) should make sure that our results are not driven by small countries or countries for which we have little or no information. The latter point also relates to measurement error, as most countries with complete information from 1960 to 2010 are the countries where data reliability is potentially better and more consistent.

Looking at all the above described robustness checks in table 6 confirms our initial results, as the coefficient associated with the urban population remains positive and significant. Similarly, we confirm that plain population size has significantly negative effects on government size. Also, the relative magnitudes of the effects from urbanization and total population size are mostly confirmed with the exception of excluding small countries (column 4) and the balanced sample (column 6). In these cases, urbanization comes out to be at least as important as overall population size in predicting government size. This result and the strong findings for OECD countries above suggest that urbanization might be at least as strong as population in predicting government size for bigger and richer countries.

[24] As mentioned before, the number of observations for the urbanization rate in the World Development Indicators is substantially lower than the observations for urbanized and total population. We construct the urbanization rate as number of urbanized people divided by total population.

In summary, our baseline results are confirmed across various robustness checks, focusing on longer time frames (10 year averages), reverse causality between dependent and independent variables, excluding small countries, using shares as opposed to levels, and balancing our sample. We now move to our two national samples, in order to see whether our theoretical predictions are also confirmed on a regional level within a country.

5.2. Country Specific Analyses

Studying government behavior on a country-specific level is useful in several dimensions. Generically, it provides a further robustness check to our model's main predictions. Comparing states across time allows us to look at regional public administrations and this serves as a useful aggregation check. Additionally, a change in the demand for some public services is potentially first addressed on the state level, as opposed to the national stage. We study both Colombia and Germany – countries with sizeable populations (47 and 82 million, respectively), which allows for regional urbanization rates. It is interesting to see whether the urbanization effect prevails in both a growing as well as a developed nation on the state level.

5.2.1. Analysis of Colombian Government Spending

Turning to Colombia, figure 5 shows that average urbanization across regions has been rising consistently from under 60 percent in 1985 to over 68 percent in 2007. Regional government size as a fraction of GDP has been fluctuating between under 8 percent and 16 percent, with its peak coming in 1995. Notice that government size is measured here as public expenditure on the regional level, thus not including any government services provided by the Colombian national government.

Table 7 looks at government spending amongst states (called departments in Colombia). Columns 1 – 3 show results when using annual values and columns 4 – 6 display results for five year averages. As in our international analysis, we find a strong positive effect from urbanization on government spending with substantially higher magnitudes. This is especially interesting since we did not find a positive effect for South American countries in general – in fact, urbanization seemed to significantly decrease government spending there. Further, we find no effect at all from overall population in our regional sample for Colombia.

Other results from table 7 are in line with conclusions from our international sample. Life expectancy has a negative influence on government spending, whereas higher GDP relates to bigger public sectors. Additionally, we must be careful to draw direct connections on the magnitude of the estimated effect of urban population in our Colombian estimates. Recall that urbanization in this data set is measured as the number of people living in the largest city in a state. Given this, it is not surprising that we witness a larger impact of 'urban' population on government spending. As cities grow, regardless of size, we expect that local governments will spend more to improve the city. As a robustness check we re-estimated our model only using the largest cities in Colombia that exceeded 750,000 people.[25] Doing so still yielded urban population to have an estimated effect of 0.87 in our baseline model.

5.2.2. Analysis of German Government Spending

Moving to our second state-level analysis, we now consider Germany in figure 6 and table 8. Remember that our variables differ from our main specifications, as urbanization is now measured as the amount of urban families. The total population of a state is measured as total households, which could produce skewed urbanization rates when dividing urban families by the number of overall households.[26] However, if the average size of families and households did not change over time and across regions, then we can reasonably proxy for urbanization. Figure 6 displays the average regional development of the urbanization rate (approximated as urban families divided by all households) and relative government spending. Both variables move closely together before 2000, with no clear correlation emerging after that. Public spending is relatively low throughout the entire time frame, with a peak of about 9.2 percent. As in the Colombian sample however, this measures public spending on the state level only, excluding any spending from the national government.

After this general overview of the German regional data, we now turn to the regression results in table 8. Notice that the German sample is smaller than the Colombian, with a shorter time frame (16 versus 27 years) and fewer states (16 versus 25 in Colombia, with data only being available for 13 German states). As in the Colombian table, columns 1 – 3 display results for annual values, whereas columns 4 – 6 display results for averages over several years. Given the availability of data we decide to use 3-year averages, since otherwise our sample would be too small to infer any reasonable conclusions. The same reason led us to include regional dummies (East, North, and South with West being the

[25] 750,000 has been used in another context as a threshold for urban areas by the World Bank.

[26] A family can live in various households, as well as a household could contain several families.

omitted dummy) as opposed to state-specific fixed effects.

The German data confirms our intuition on any given level – adding regional dummies and GDP for either annual or averaged values of public spending leaves the urban coefficient positive and highly significant. The fact that magnitudes are only slightly lower compared to our global results strengthens not only our qualitative, but also the basic quantitative interpretations. As in the international results, it appears as if a 1 percent increase in the amount of urban people would roughly lead to a 0.15 – 0.29 percent rise in public spending.[27] To illustrate the importance of this effect, consider Baden-Württemberg as an example: in this state, the amount of urban households increased from 2.252 million in the year 2007 to 2.477 million in 2010. Given that state government spending was 20.8 billion Euros in 2007, our results imply that urbanization caused an increase of 0.31 – 0.62 billion Euros.

Consistent with our cross country analysis we see that total population size statistically influences government spending, albeit in the opposite direction. Here the total population effect dwarfs that of urbanization, being up to four times the magnitude. A possible explanation here might be the unique dynamic of Germany, just years after reunification and right around the time of the creation of the European Union, which opened borders across Europe substantially. Further, as in most of our previous regressions, more income means more government spending.

Overall, both national samples from Colombia and Germany draw conclusions in line with our main results from the international sample. Urbanization appears to have a consistent positive effect on the size of government, even in a state-level analysis. However, one should not forget the smaller sample sizes from our Colombian and German data. Because of this, we see these two country-level exercises as an addition to our main results.

6. Conclusions

This paper proposes urbanization as a driver of government size. In an urban area, people live closer together and feel a stronger urge for a structured and detailed organization of society. Our model extends the connection between population size to government

[27] Given the German involvement in the European Union and its switch to the EURO, we also tested for the effect before or after the currency change. However, there were no significant differences in the urban coefficient before or after. Similarly, in our international data set, it does not matter whether we distinguish between EU and non-EU nations.

spending provided by Alesina and Wacziarg (1998), adding the distinction between urban and rural citizens. We assume that the urban lifestyle exposes a person to more interactions with more people, in addition to an increased sense of anonymity. This raises the importance of many goods, which are typically provided by the government. For instance, the importance of basic health standards is much more pronounced in a city because contagious diseases could spread quickly, given the proximity to others (e.g. in public transportation systems). The paper also discusses other publicly provided goods in the context of urbanization, such as safety, education, income redistribution, public transportation, or regulations. Using a CES utility framework, the model suggests a positive effect from urbanization on the relative size of government spending.

The empirical section uses three samples to test our theory. First, we use an international sample of 175 countries from 1960 – 2010 and find that urbanization does have a positive and significant effect on government spending. A closer look at regional differences reveals that the effect holds with the exception of Latin America, but is over three times as large in OECD countries. In addition, we test whether this effect differs across parts of government spending. Urbanization seems to raise public spending on education and health care, but has no effect on military spending. Finally, we use state-level samples from Colombia and Germany to analyze our main theory on a more disaggregated level. These results further strengthen the claim that urbanization is a positive and significant predictor of government spending.

In addition to the general conclusions, our results also provide a hint towards another anomaly prevailing in many countries: the distinct voting pattern of urban areas. For example, in the United States most urban areas are voting for the Democratic candidate in presidential elections, whereas rural areas tend to be more balanced or favor the Republican candidate. In fact, 49 of the 50 most dense counties voted Obama in 2012, whereas 49 of the 50 least dense counties voted Romney.[28] Given that Democrats are generally in favor of stronger government involvement in many issues, such as health care, education or income distribution, our paper suggests a potential explanation for these regional differences in voting behavior. The urban lifestyle changes relative preferences towards goods which are typically provided by the public sector. Another baffling example of cities voting differently is Germany: even though the current national government is a coalition of the Christian Democratic Party (mostly seen as relatively conservative, center-right) and

[28] Discussed here for example: Florida and Johnson (2012).

the Free Democratic Party (described as center-right and marked by free-market ideas), the situation is very different in German cities. In fact, 9 out of the 10 biggest German cities are currently governed by mayors associated with the center-left Social Democratic Party or the Green Party, which are known to propose more government involvement in numerous topics, such as health care, education, re-distributional policies etc.

Overall, our results imply that an increase in the amount of urban citizens by 1 percent would cause a 0.15 to 0.3 percent rise in government spending, everything else equal. These findings not only explain previous changes in government size, but also predict future relationships. Given the United Nation's prediction of the steady increase in worldwide urbanization from 50 percent to about 57 percent within the next 12 years, the magnitude of our results are considerable and suggest a worldwide increase in government spending by 2.8 percent, ceteris paribus.

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Figures

Figure 1: Urban Agglomerations in 1975, proportion urban of the world: 37.2 %. World Urbanization Prospects, the 2009 Revision.

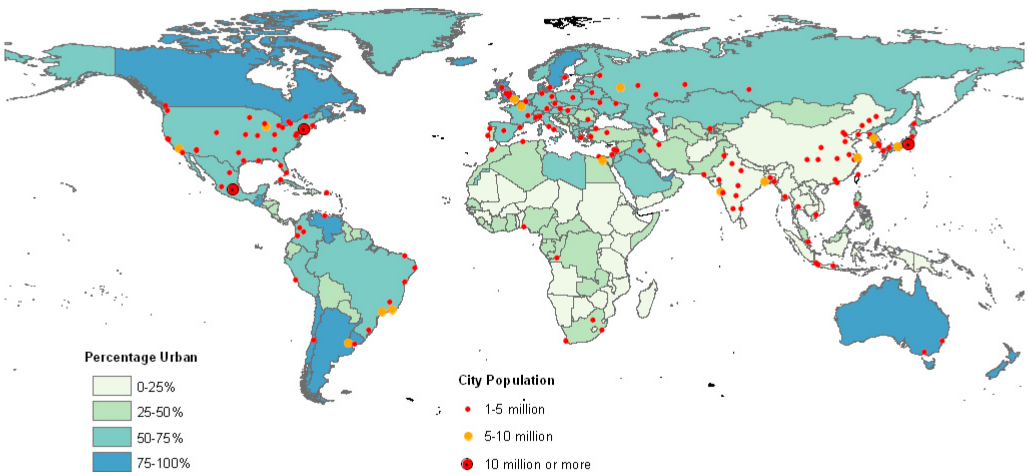


Figure 2: Urban Agglomerations in 2009, proportion urban of the world: 50.1 %. World Urbanization Prospects, the 2009 Revision.

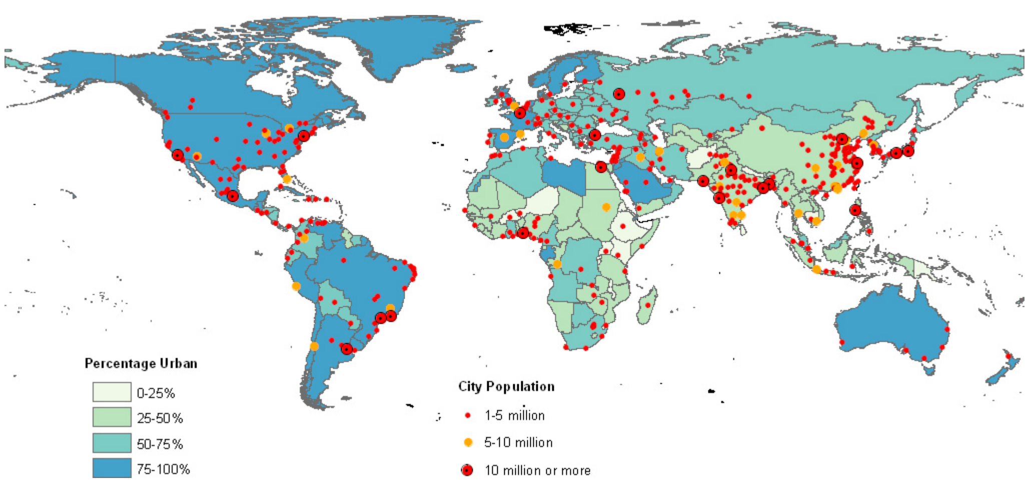


Figure 3: Urban Agglomerations in 2025, proportion urban of the world: 56.6 %. World Urbanization Prospects, the 2009 Revision.

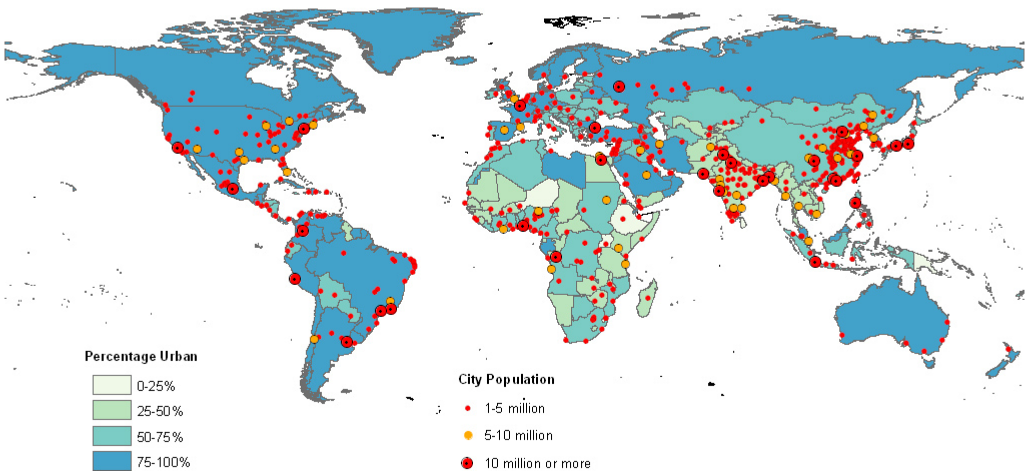


Figure 4: Average urbanization and average government size

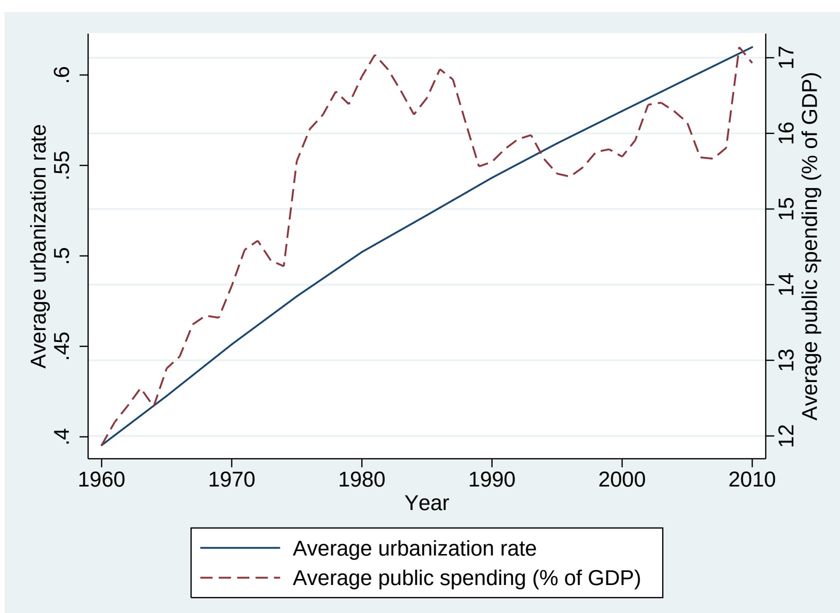


Figure 5: Urbanization and government size across Colombian regions, using the balanced sample from 1985 − 20070

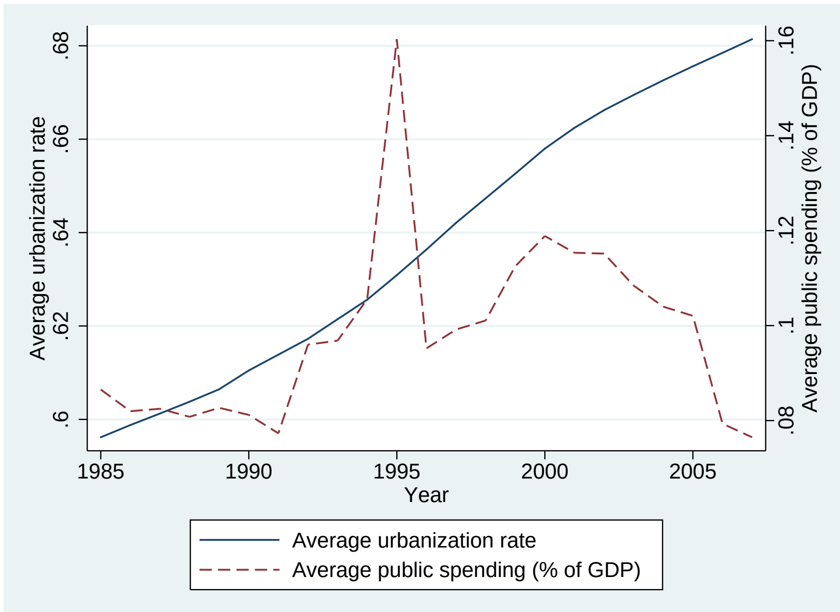
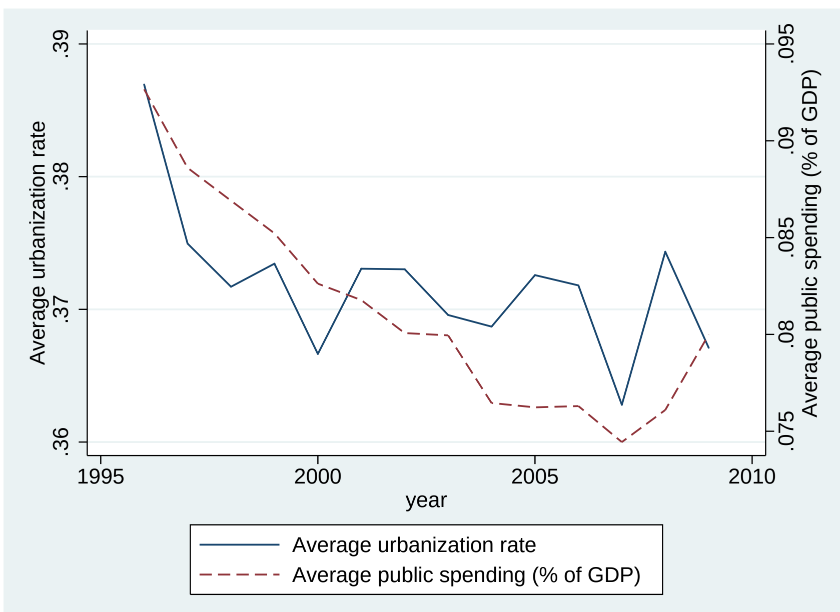


Figure 6: Urbanization and government size across German regions, using the balanced sample from 1996 − 2010



Tables

Table 1: Summary Statistics

Variable	Mean	(Std. Dev.)	N	Source	Description
International data set, 175 countries, 1960 − 2010					
lgov	21.823	(2.242)	5,049	WDI	ln(General government final consumption expenditure in constant 2000 US$)
lurban	15.203	(1.792)	5,049	WDI	ln(urban population)
lpop	15.97	(1.729)	5,049	WDI	ln(population)
lgdp	23.744	(2.147)	4,970	WDI	ln(GDP in constant 2000 US$)
lopen	4.138	(0.604)	4,982	WDI	ln(trade as % of GDP)
llife	4.168	(0.179)	5,006	WDI	ln(life expectancy)
lpop65	1.763	(0.631)	5,079	WDI	ln(fraction of population over 65 years of age)
lpop15	3.437	(0.363)	5,079	WDI	ln(fraction of population under 15 years of age)
polity	2.615	(7.163)	4,552	Polity IV	level of democracy, ranging from −10 (totally autocratic) to +10 (total democracy); variable *polity*2 in Polity IV
lgovedu	6.046	(0.581)	1,413	WDI	ln(public spending on education in % of GDP)
lgovhea	5.715	(0.639)	1,969	WDI	ln(public spending on health in % of GDP)
lgovmil	5.266	(0.739)	2,517	WDI	ln(public spending on military in % of GDP).
Colombian regional data set, 25 regions, 1980 − 2007					
lgov	11.885	(1.637)	552	DANE	ln(current government spending in millions of pesos)
lurban	13.480	(0.857)	552	DANE	ln(amount of people living in the main city)
lpop	13.963	(0.708)	552	DANE	ln(population)
lgdp	14.278	(1.626)	552	DANE	ln(GDP in millions of pesos)
llife	4.244	(0.047)	552	DANE	ln(life expectancy)
German regional data set, 13 states, 1995 − 2010					
lgov	22.800	(0.862)	189	Stat. Bundesamt	ln(total government spending in Euros)
lurban	6.695	(0.906)	189	Eurostat	ln(amount of households living in densely-populated areas with at least 500 inhabitants per square kilometer)
lpop	7.608	(0.779)	189	Stat. Bundesamt	ln(total amount of households)
lgdp	25.309	(0.943)	179	Stat. Bundesamt	ln(GDP in Euros)

Notes:

WDI = World Development Indicators, provided by the World Bank; DANE = Departamento Administrativo Nacional de Estadística (National Bureau of Statistics Colombia); Statistisches Bundesamt = Statistisches Bundesamt Deutschland (Federal Statistical Office Germany)

Table 2: OLS results for annual values. Dependent variable is the logarithm of government consumption (*lgov*).

	(1)	(2)	(3)	(4)	(5)	(6)
lurban	0.989***	2.200***	0.563***	0.199***	0.227***	0.218***
	(0.011)	(0.035)	(0.056)	(0.048)	(0.048)	(0.047)
lpop		-1.326***	-0.511***	-0.265***	-0.262***	-0.229***
		(0.032)	(0.091)	(0.075)	(0.075)	(0.075)
lgdp				0.858***	0.849***	0.836***
				(0.020)	(0.023)	(0.024)
lopen				-0.038**	-0.041**	-0.005
				(0.019)	(0.019)	(0.020)
llife				-0.117	-0.195*	-0.142
				(0.11)	(0.112)	(0.112)
lpop65					0.277***	0.328***
					(0.043)	(0.046)
lpop15					0.221***	0.249***
					(0.057)	(0.064)
polity						0.001
						(0.001)
Two-way fixed effects			yes	yes	yes	yes
N	5049	5049	5049	4883	4867	4441
R^2	0.626	0.735	0.986	0.991	0.991	0.992

Standard errors in parentheses. All regressions use robust standard errors.
Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Variables: lgov = ln(General government final consumption expenditure (constant 2000 US$));
lurban = ln(urban population); lpop = ln(population); lgdp = ln(GDP in constant 2000 US$);
lopen = ln(Trade as % of GDP); llife = ln(life expectancy);
lpop65 = ln(fraction of pop. over 65 years of age); lpop15 = ln(fraction of pop. under 15 years of age)

Table 3: OLS results using five year averages of all variables. Dependent variable is the logarithm of government consumption (*lgov5*).

	(1)	(2)	(3)	(4)	(5)	(6)
lurban5	0.977***	2.172***	0.553***	0.195*	0.221*	0.243**
	(0.023)	(0.076)	(0.133)	(0.115)	(0.115)	(0.115)
lpop5		-1.309***	-0.528**	-0.283	-0.288	-0.301*
		(0.071)	(0.213)	(0.176)	(0.175)	(0.177)
lgdp5				0.869***	0.863***	0.837***
				(0.049)	(0.052)	(0.056)
lopen5				-0.060	-0.062	-0.023
				(0.041)	(0.041)	(0.043)
llife5				-0.072	-0.151	-0.062
				(0.258)	(0.259)	(0.259)
lpop655					0.282***	0.331***
					(0.103)	(0.110)
lpop155					0.249*	0.275*
					(0.136)	(0.150)
polity5						0.001
						(0.003)
Two-way fixed effects			yes	yes	yes	yes
N	1041	1041	1041	1015	1002	911
R^2	0.631	0.738	0.988	0.993	0.993	0.993

Standard errors in parentheses. All regressions use robust standard errors.
Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Variables: lgov = ln(General government final consumption expenditure (constant 2000 US$));
lurban = ln(urban population); lpop = ln(population); lgdp = ln(GDP in constant 2000 US$);
lopen = ln(Trade as % of GDP); llife = ln(life expectancy);
lpop65 = ln(fraction of pop. over 65 years of age); lpop15 = ln(fraction of pop. under 15 years of age)

Table 4: OLS results by regions. Dependent variable is government consumption. Columns 6 – 10 use the five year average of all variables.

	Annual Values					5-year averages				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Africa	Asia	LAC	OECD	Non-OECD	Africa	Asia	LAC	OECD	Non-OECD
lurban	0.368***	0.184**	-1.118***	0.632***	0.177***	0.422**	0.299	-1.067***	0.649***	0.206*
	(0.071)	(0.091)	(0.085)	(0.068)	(0.051)	(0.163)	(0.222)	(0.170)	(0.160)	(0.124)
lpop	-1.167***	-0.280**	2.693***	-0.212**	-0.407***	-1.285***	-0.462	2.482***	-0.203	-0.541**
	(0.185)	(0.127)	(0.139)	(0.093)	(0.093)	(0.424)	(0.321)	(0.307)	(0.216)	(0.218)
lgdp	0.966***	0.999***	0.444***	0.257***	0.900***	0.959***	1.016***	0.448***	0.246***	0.901***
	(0.051)	(0.041)	(0.049)	(0.036)	(0.028)	(0.117)	(0.105)	(0.124)	(0.090)	(0.064)
lopen	0.041	0.038	-0.080**	-0.152***	0.005	-0.006	-0.034	-0.066	-0.173***	-0.0151
	(0.050)	(0.033)	(0.038)	(0.024)	(0.023)	(0.098)	(0.074)	(0.067)	(0.058)	(0.048)
llife	-0.380***	0.494	-1.612***	-0.552**	-0.212*	-0.345	0.623	-1.485***	-0.576	-0.144
	(0.131)	(0.372)	(0.218)	(0.245)	(0.120)	(0.301)	(0.788)	(0.496)	(0.559)	(0.276)
lpop65	0.052	0.347***	0.603***	0.166***	0.349***	0.066	0.373	0.503**	0.168**	0.340**
	(0.107)	(0.103)	(0.106)	(0.034)	(0.061)	(0.262)	(0.242)	(0.242)	(0.075)	(0.147)
lpop15	-0.341**	0.870***	0.732***	-0.245***	0.316***	-0.304	0.949***	0.659***	-0.222*	0.363*
	(0.171)	(0.123)	(0.117)	(0.054)	(0.091)	(0.396)	(0.309)	(0.237)	(0.124)	(0.211)
polity	0.004	-0.005**	0.002	0.012***	-0.000	0.006	-0.0106	0.003	0.013***	-0.000670
	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)	(0.007)	(0.00673)	(0.005)	(0.003)	(0.004)
Two-way fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
N	1265	962	887	1286	3155	271	199	178	253	658
R^2	0.971	0.993	0.989	0.996	0.982	0.976	0.994	0.990	0.996	0.985

Standard errors in parentheses. All regressions use robust standard errors.
Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Variables: lgov = ln(General government final consumption expenditure (constant 2000 US$));
lurban = ln(urban population); lpop = ln(population);
lgdp = ln(GDP in constant 2000 US$); lopen = ln(Trade as % of GDP); llife = ln(life expectancy);
lpop65 = ln(fraction of pop. over 65 years of age); lpop15 = ln(fraction of pop. under 15 years of age)

Table 5: Looking at government expenditures on education, health, and military (*lgovedu*, *lgovhea*, and *lgovmil*)

	Annual Values			5-year averages		
	(1) lgovedu	(2) lgovhea	(3) lgovmil	(4) lgovedu	(5) lgovhea	(6) lgovmil
lurban	0.550***	0.776***	-0.075	0.589***	0.693**	-0.025
	(0.080)	(0.151)	(0.151)	(0.104)	(0.341)	(0.290)
lpop	-0.809***	-0.802***	0.143	-0.742***	-0.833*	0.155
	(0.157)	(0.212)	(0.220)	(0.185)	(0.469)	(0.440)
lgdp	-0.021	-0.121**	-0.083	-0.037	-0.154	-0.0673
	(0.064)	(0.061)	(0.071)	(0.079)	(0.099)	(0.131)
lopen	0.096*	0.099**	0.038	0.181***	0.158*	0.091
	(0.055)	(0.040)	(0.040)	(0.066)	(0.087)	(0.090)
llife	0.861***	0.177	-0.336**	0.851***	0.426	-0.446
	(0.245)	(0.211)	(0.160)	(0.288)	(0.485)	(0.346)
lpop65	-0.221*	0.255**	0.099	-0.167	0.202	-0.005
	(0.117)	(0.103)	(0.115)	(0.158)	(0.240)	(0.312)
lpop15	-0.342**	0.453***	-0.108	-0.423*	0.471**	-0.062
	(0.168)	(0.116)	(0.145)	(0.229)	(0.217)	(0.295)
polity	0.011***	0.012***	-0.007**	0.008**	0.015**	-0.013**
	(0.003)	(0.003)	(0.003)	(0.004)	(0.007)	(0.006)
Two-way fixed effects	yes	yes	yes	yes	yes	yes
N	1561	2226	2858	725	454	657
R^2	0.573	0.919	0.853	0.787	0.954	0.871

Standard errors in parentheses. All regressions use robust standard errors.
Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Variables: lgov = ln(General government final consumption expenditure (constant 2000 US$));
lurban = ln(urban population); lpop = ln(population); lgdp = ln(GDP in constant 2000 US$);
lopen = ln(Trade as % of GDP); llife = ln(life expectancy);
lpop65 = ln(fraction of pop. over 65 years of age); lpop15 = ln(fraction of pop. under 15 years of age)

Table 6: Various robustness checks. Dependent variable is the logarithm of government consumption (*lgov*) in columns 1 – 4 and 6. Column 5 uses government spending as share of GDP.

	(1)	(2)	(3)	(4)	(5)	(6)
urban	0.304**	0.256**	0.310**	0.280***	2.656*	0.386***
	(0.154)	(0.107)	(0.134)	(0.056)	(1.444)	(0.0540)
pop	-0.441**	-0.293*	-0.368*	-0.282***	-5.837***	-0.264***
	(0.224)	(0.162)	(0.193)	(0.087)	(0.561)	(0.0793)
gdp	0.800***	0.772***	0.605***	0.810***	-0.663**	0.707***
	(0.077)	(0.049)	(0.066)	(0.025)	(0.323)	(0.0316)
open	-0.050	-0.014	0.053	-0.022	0.009**	-0.0374
	(0.071)	(0.038)	(0.054)	(0.020)	(0.003)	(0.0287)
life	-0.160	-0.105	0.112	-0.078	-3.741***	-0.618***
	(0.337)	(0.244)	(0.315)	(0.117)	(1.232)	(0.123)
pop65	0.287*	0.338***	0.416***	0.335***	0.214***	
	(0.155)	(0.099)	(0.157)	(0.045)	(0.063)	
pop15	0.260	0.239*	0.216	0.206***	-0.015	
	(0.208)	(0.132)	(0.201)	(0.064)	(0.023)	
Two-way fixed effects	yes	yes	yes	yes	yes	yes
N	539	983	511	4415	6534	2295
R^2	0.994	0.993	0.994	0.991	0.665	0.993

Standard errors in parentheses. All regressions use robust standard errors.
Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: Using the Colombian dataset, available time frame 1985 – 2007. Dependent variable is the logarithm of government consumption (*lgov*).

	Annual values			5-year averages		
	(1)	(2)	(3)	(4)	(5)	(6)
lurban	1.021***	0.882***	0.703***	1.043**	1.009**	0.824**
	(0.231)	(0.211)	(0.205)	(0.483)	(0.385)	(0.369)
lpop	0.201	-0.245	0.036	0.168	-0.173	0.094
	(0.281)	(0.243)	(0.244)	(0.587)	(0.421)	(0.416)
lgdp			0.142**			0.143
			(0.060)			(0.115)
llife			-3.425***			-3.273***
			(0.648)			(0.947)
Two-way fixed effects		yes	yes		yes	yes
N	552	552	552	120	120	120
R^2	0.383	0.990	0.990	0.405	0.994	0.995

Standard errors in parentheses. All regressions use robust standard errors.

Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Variables: lgov = ln(gov't spending in millions of pesos, nominal);

lurban = ln(# of people living in the main city or "headtown" (cabecera)); lpop = ln(population);

lgdp = ln(nominal GDP in millions pesos); llife = ln(life expectancy).

Table 8: Using the German dataset, available time frame 1995 – 2010. Dependent variable is the logarithm of government consumption (*lgov*).

	Annual values			5-year averages		
	(1)	(2)	(3)	(4)	(5)	(6)
lurban	0.277***	0.155***	0.144***	0.285***	0.168***	0.156***
	(0.029)	(0.033)	(0.032)	(0.049)	(0.055)	(0.052)
lpop	0.788***	0.901***	0.503***	0.775***	0.892***	0.481***
	(0.037)	(0.039)	(0.092)	(0.061)	(0.065)	(0.145)
east		-0.145***	-0.006		-0.124***	0.015
		(0.025)	(0.041)		(0.042)	(0.065)
north		-0.135***	-0.091***		-0.127***	-0.084***
		(0.018)	(0.021)		(0.027)	(0.030)
south		-0.092***	-0.146***		-0.098***	-0.146***
		(0.019)	(0.020)		(0.029)	(0.033)
lgdp			0.396***			0.406***
			(0.090)			(0.145)
N	189	189	179	65	65	65
R^2	0.986	0.990	0.991	0.987	0.991	0.992

Standard errors in parentheses. All regressions use robust standard errors.
Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Variables: lgov = ln(total public spending on the state level);
lurban = ln(households living in densely-populated areas); lpop = ln(population);
lgdp = ln(GDP).

Appendix A. Comparative Statics in the General Model

In order to derive 9, we first derive

$$(\frac{G}{Y})_s = \frac{(\breve{g} + s\breve{g}_s)(s\breve{y} + n\dot{y}) - \breve{y}(s\breve{g} + n\dot{g})}{Y^2} \tag{A.1}$$

from equation 8. Similarly,

$$(\frac{G}{Y})_n = \frac{\dot{g}(s\breve{y} + n\dot{y}) - \dot{y}(s\breve{g} + n\dot{g})}{Y^2}. \tag{A.2}$$

Now we can take the difference between $(\frac{G}{Y})_s$ and $(\frac{G}{Y})_n$ to get

$$(\frac{G}{Y})_s - (\frac{G}{Y})_n = \frac{1}{Y^2}\Big[s\breve{g}_s Y + \breve{g}n\dot{y} - \dot{g}n\breve{y} - \dot{g}s\breve{y} + \breve{g}s\dot{y}\Big]. \tag{A.3}$$

Simplifying terms and using the definition of $s + n = P$ then leads to

$$(\frac{G}{Y})_s - (\frac{G}{Y})_n = \frac{1}{Y}\Big[s\breve{g}_s + \frac{P}{Y}(\breve{g}\dot{y} - \dot{g}\breve{y})\Big] \tag{A.4}$$

and from there to equation 9.

Appendix B. The Effect of Urbanization on Government Spending – CES Example

Rearranging equations 12 and 15 from the CES example, we can write

$$\breve{g} = \frac{\breve{y}(s+n)}{\gamma(1+A)} \text{ and } \dot{g} = \frac{\dot{y}(s+n)}{\gamma(1+B)}. \tag{B.1}$$

Using these results in 9 then provides

$$(\frac{G}{Y})_s - (\frac{G}{Y})_n = \frac{1}{Y}\Big[s\breve{g}_s + \frac{P\breve{y}\dot{y}}{Y}\Big(\frac{P}{\gamma(1+A)} - \frac{P}{\gamma(1+B)}\Big)\Big], \tag{B.2}$$

from which we derive equation 16. To see that $\breve{g}_s > 0$, we can rewrite equation 12 as

$$\breve{g} = \frac{\breve{y}}{\gamma\Big(\frac{1}{s+n} + \frac{\gamma}{\mu}^{\frac{\alpha}{1-\alpha}}(\epsilon s)^{\frac{\delta}{\alpha-1}}(s+n)^{\frac{1}{\alpha-1}}\Big)}. \tag{B.3}$$

As the exponent in the denominator associated with ϵs is negative for any $\alpha < 1$ ($s + n$ remains unchanged since overall population does not change during the urbanization process), this confirms $\breve{g}_s > 0$.