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Jorge Martinez-Vazquez
Ming-Hung Yao

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

Phone: (404) 651-1144
Fax: (404) 651-4449
Email: ispaysps@gsu.edu
Internet: http://isp-aysps.gsu.edu

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Fiscal Decentralization and Public Sector Employment: A Cross-Country Analysis

Jorge Martinez-Vazquez[*]

Department of Economics, Georgia State University, Atlanta, Georgia

Ming-Hung Yao[+]

Department of Economics, Tunghai University, Taichung, Taiwan

Abstract

This paper investigates the relationship between public sector employment and fiscal decentralization. We develop a theoretical framework modeling the interactions between the central and sub-national executives regarding the level of public employment at the central and sub-national government levels. In our empirical work, based on a large cross-country dataset, we find that, *ceteris paribus*, the level of total public sector employees in a country increases with its level of fiscal decentralization. Even though central government employment decreases with decentralization, this is more than fully offset by the increase in employment at the sub-national level accompanying decentralization. Our empirical results also indicate that the relationship between GDP per capita and public sector employment is not monotonic but quadratic, that total public sector employment is higher in unitary countries vis-à-vis federal countries, and that public employment increases with the country's international economic openness.

Keywords: *fiscal decentralization; public sector employment; public sector size*

JEL classification**:** H30; H50; H77

[*] Director of International Studies Program and Regents Professor, Department of Economics, Andrew Young School of Policy Studies, Georgia State University. E-mail address: jorgemartinez@gsu.edu.

[+] Corresponding author; Assistant Professor, Department of Economics, Tunghai University, Taichung, Taiwan. E-mail address: mhyao@thu.edu.tw.

Introduction

Public sector employment accounts for a considerable share of public expenditures and it represents also a significant share of total employment in most countries. For these reasons, trends in a public sector employment have attracted a great deal of attention over the past two decades (Gregory & Borland, 1999). At present, it is commonly believed that bloated bureaucracies and over-staffed public enterprises represent a significant problem for many developing and transitional countries. Over-staffing takes many forms, from an excessive number of agencies and ministries, to duplications of functions at different levels of government, or even the existence of ghost workers (Rama, 1997). Consequently, it is not surprising that retrenchment in public sector employment has come to the forefront of the reform agenda in many countries.

In this paper we investigate what role decentralization reforms around the world in recent times may play in the observed trends in public sector employment. Although decentralization may be seen as a cause for the increase in public sector employment through the proliferation of different levels of government, there are also a priori reasons to expect that decentralization may help contain the increase in public employment. An economic argument for decentralization is that it increases allocative efficiency in the public sector because some public expenditure decisions can be made by a level of government that is closer and more responsive to the needs and preferences of local residents. This means that possibly fewer resources (including public employees) may be needed to satisfy certain levels of needs (Martinez-Vazquez & McNab, 2003). In addition, decentralization has the potential of improving competition of governments at the same time that it enhances innovations, thus furthering greater efficiencies in overall expenditures (Ford, 1999). These potential effects of decentralization suggest that fiscal

decentralization reform could work as therapy for the problem of bloated bureaucracies and over-staffed public enterprises in transitional and developing countries.

In reality, over the last two decades, public sector employment has grown in some countries but it has shrunk in others. Appendix A shows the evolution of public sector employment as a percentage of total population for 74 countries covering the period 1985-2005.[1] We can call these changes the time series variation in public employment. The data also show that the size of public sector employment in some countries is larger than that in other countries in any period. We can call this the cross-sectional variation in public sector employment. As we review below, three main hypotheses have been developed in the economics literature to explain these variations across countries and over time in public sector employment and the size of the public sector: Wagner's law, the rent-seeking hypothesis, and the social insurance hypothesis. While these three hypotheses help explain different aspects in the variation of public sector employment levels across countries and over time, none of these hypotheses provides a clear rationale for how public employment is affected by the level of government decentralization in a country. In fact, to the best of our knowledge, no previous theoretical or empirical work in the literature has examined directly the vertical structure dimension of public sector employment.[2] That is the central question addressed in this paper: do higher levels of decentralization across countries and over time lead to higher overall public sector employment?

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[1] The data on public sector employment used in this paper are obtained from the International Labor Organization (ILO) bureau of statistics, at the website http://laborsta.ilo.org/, accessed last March 26, 2009. The data are available since 1985. Before 1996, the data are available every five years. After 1996 the data are available annually. The latest year for which data are available is 2006. In order to compare the data before and after 1996, we calculate the unweighted five-year averages for the periods 1996-2000 and 2001-2005.

An essential part of fiscal decentralization reform is the transfer of expenditure responsibilities from the central government to the sub-national governments. If we assume that decentralization does not lead to any change in the demand for public services, but just to a change in how (or where) the same public services are delivered, as a result of more decentralization we would expect that the number of public sector employees at the central government level would decrease and that this number would increase at the sub-national level. In addition, decentralization may not leave the demand for public services unchanged. If the efficiency of public services delivery is increased, citizens may demand more of certain services and the overall provision of other services may be reduced; for example, there may be less demand and spending on some national goods or even reductions in national programs involving redistribution and so on.[3] The overall impact of fiscal decentralization on total public sector employment depends on: (i) the relative magnitude of the two opposing substitution effects for the same level and composition of public services, and (ii) what changes in demand and spending on public services decentralization may bring. For example, if decentralization were to lead to an increase in demand for labor-intensive services, such as education and health, vis-à-vis other less labor-intensive services, total public sector employment as a result would also experience an increase. Thus a number of scenarios may be built for both the retrenchment and expansion in public sector employment due to decentralization.

In this paper we develop a theoretical model to analyze explicitly the relationship between decentralization and public sector employment. The predictions of the

[2] However, two previous papers reviewed below have studied in the context of a single country the evolution of sub-national public employment following changes in decentralization.

[3] See, for example, Shelton (2007) and Arze del Granado *et al.* (2008)

theoretical model are tested empirically using a panel data set for a large number of developed and developing countries over the period 1985-2005.

The rest of the paper is organized as follows. In Section 2 we review the previous relevant literature. In Section 3 we develop the theoretical model. In Section 4 we describe the dataset and present the empirical results. In Section 5 we conclude.

Literature Review

In this section we first review the previous economics literature on public sector employment and then we take a look at what has been said about decentralization and public sector employment.

Three Hypotheses on Public Sector Employment

As already mentioned above, there are three main hypotheses in the public finance literature that were designed to understand the evolution of government size and public sector employment. Below, we briefly outline the main features of the hypotheses while the empirical literature and main findings under the three hypotheses are summarized in Table 1.

Wagner's law

The most conventional view of public sector employment is related to Wagner's law, which argues that economic development creates demand for new types of government services, and that these government services will tend to rise at a faster pace

than economic development.[4] These predictions have been tested either within a particular country or across countries, where the size of the public sector is measured in terms of the share of government expenditures in gross domestic product (GDP) or the share of government employees in the total population or the labor force. Some of the recent empirical studies that have tested Wagner's law are summarized in Table 1. An interesting finding in this literature is that public sector employment grows with economic development but that this relationship is not monotonic. Beyond a certain level of development, the relationship between development level and public sector employment becomes insignificant and Wagner's law becomes inoperative (Schiavo-Campo *et al.*, 1997). In this respect, Rama (1997) estimates that the turning point is 14,000 dollars per capita at 1985 purchasing power parity (PPP) prices.

The Rent-Seeking Hypothesis

Wagner's law works better in explaining the levels of public employment across countries, but it is less helpful in explaining the distribution of employment within countries. For example, Alesina *et al.* (2001) find that the number of public employees in the poorer regions of Italy (the south) is significantly larger than in the richer regions (the north). Therefore, there would appear to be some factors other than the level of economic development influencing the level of public employment within a country. Gelb *et al.* (1991) theorize that the public sector differs from the private sector in the extent to which it is subject to political pressures for employment and that rent seeking and rent creating behavior can give rise to a wasteful diversion of resources into the public sector over and

[4] Shelton (2007) presents a new explanation for Wagner's law: richer countries are older and spend more on social security which boosts total public expenditure.

above the derived demand for resources. Robinson and Verdier (2002) further argue that public sector employment is a good commitment device between politicians and voters and that clientelism is a relatively attractive political strategy in situations with high inequality and low productivity. Alesina *et al.* (2000), Alesina *et al.* (2001), and Gimpelson and Treisman (2002) are several of the studies that have examined empirically the rent-seeking hypothesis (see Table 1.)

[Insert TABLE 1 here]

Social Insurance and Economic Hypotheses

Rodrik (1997) suggested an alternative hypothesis to explain differences in public sector employment: relatively safe government jobs represent partial insurance against un-diversifiable external risk faced by the domestic economy. He argues that countries with great exposures to external risk are likely to have higher levels of public employment. His empirical work shows that exposure to external risk, measured as the share of the sum of imports and exports of goods and services on GDP, is robustly associated with levels of government employment across countries.

Public Employment and Fiscal Decentralization in the Previous Literature

With the exception of two recent papers, the discussion in the public finance literature of the relationship between decentralization and the size of the public sector has been in terms of overall expenditures (or revenues) and not in terms of public employment. Nevertheless, as we review below, the impact of decentralization on the size of public expenditures is far from settled. Much less is known about the impact of decentralization on the size of government when size is measured by public employment.

The earliest argument to address the impact of fiscal decentralization on the public sector size goes back to Musgrave (1959). He argued that, under a highly decentralized public sector, we may expect a smaller budget because there is likely to be comparatively little in the way of assistance to the poor: sorting would lead to relatively income-homogeneous jurisdictions with less scope for redistribution and the fear of attracting the mobile poor would also deter the adoption of redistributive programs.

Brennan and Buchanan's (1980) Leviathan hypothesis is another classic argument in the discussion of the relationship between decentralization and public sector size. In their view, the decentralization of tax and spending decisions introduces competition among governmental units seeking to attract citizens and other mobile resources, and thereby constrains the reach and size of the Leviathan.[5]

However, several arguments have been made from the view point of economic efficiency that public sector size is likely to increase with the degree of fiscal decentralization. A first argument made by Oates (1985) is that greater decentralization may result in the loss of certain economies of scale with the consequent increase in administration costs.[6] A second argument by Prud'homme (1995) is that the relative poorer quality of local bureaucrats is likely to weaken public expenditure management and result in higher supply costs of public services. From the viewpoint of political participation, economic historian John Wallis argued that decentralization can lead to a larger public sector because as individuals have more control over public decisions at the

[5] Empirically, no consistent evidence has been found to support or reject the Leviathan hypothesis, where government size is measured as government tax revenues or expenditures as a fraction of personal income. While Oates and Wallis (1988) and Zax (1989) find supporting evidence for the Leviathan hypothesis, Giertz (1983), Oates (1985), Nelson (1987), and Forbes and Zampelli (1989) reject it.

[6] See also Stein's (1998) discussion of this point for Latin America.

sub-national level they may wish to empower the public sector with a wider range of functions and responsibilities.[7]

Two recent papers have studied empirically the relationship between decentralization and public employment in the context of particular countries, Marques-Sevillano and Rossello-Villallonga (2004) for the case of Spain, and Rajaraman and Saha (2008) for the case of India. For the case of Spain, it was found that the increase in the number of public employees at the regional government level was 1.6 times the reduction in the number of public employees at the central government during the period of decentralization covering 1990-2003. For the case of India, it was found that horizontal splintering of the federation into smaller sub-national governments (where size is measured as population or Gross State Domestic Product) increased the total size of the sub-national civil service across all sub-national governments. From our perspective it is interesting to point out that these two papers discuss the impact of decentralization on sub-national employment in a single country over time; in the current paper we are interested in examining how decentralization affects the aggregate level of public sector employment (at the sub-national and central levels) across countries and over time.

The Theoretical Model

With the process of fiscal decentralization, among other things, a central government transfers some expenditure responsibilities to the sub-national governments, which should drive to an increase in the number of sub-national government employees and lead to a reduction in the number of central government employees. Assuming for the

[7] Wallis's argument has been quoted in Oates (1985). Oates (1985) does not provide a reference for Wallis's hypothesis, and we have not found any other references to it except in Forbes and Zampelli (1989), who do not provide a reference either.

time being that those are the only changes brought by decentralization, its impact on total public sector employees would depend on the relative strength of those two opposing effects.

In this section we develop a theoretical model, building on the work by Gimpelson and Treisman (2002), in which the level of public employment is the result of a two-stage game played between the central government and sub-national governments. Politicians at both levels of government are assumed to behave as utility maximization bureaucrats (Niskanen, 1968).

The model is set up as follows. Assume there is a country composed of one central government with an executive and n sub-national jurisdictions, $i = 1, 2, ..., n$, each with a governor and the same number of residents. The total amount of tax resources in the country are denoted by $\overline{R}$, raised by a national proportional income tax, $t \cdot Y$, where t is the fixed tax rate and Y is the real GDP. For simplicity we assume that only the central government raises taxes, and it provides sub-national governments with transfers. In period 1, the central government sets the degree of fiscal decentralization, θ, which is defined as the share of $\overline{R}$ that is allocated on an equal basis to the sub-national governments; remaining resources share, $(1-\theta)$, is kept by the central government.[8] We denote the amount of resource allocated to jurisdiction i as r_i, where $r_i = \theta \cdot \overline{R}/n$. Thus the budget constraints for the central and each of the sub-national governments are $(1-\theta) \cdot \overline{R}$ and $\theta \cdot \overline{R}/n$, respectively. In period 2, the sub-national governor in jurisdiction i receives the transfers, $\theta \cdot \overline{R}/n$, and sets the level of public

[8] This assumption might be especially true in developing countries, where generally sub-national governments have less autonomy in revenue matters.

employees in its jurisdiction, denoted by m_i. We assume that there are two types of public goods: local public goods and national public goods. Local public goods are only provided to the residents in the particular jurisdiction following the decision of the governor in this jurisdiction. National public goods are provided to all residents in the country following the decision of the central authorities. The production functions of both public goods are of a Cobb-Douglas form with two inputs, labor (public sector employment) and capital, which could be represented mathematically as $f(m,K)=m^{\alpha}\cdot K^{\beta}$, where m is input of public sector employment and K is capital input.[9] We further assume that the production technologies of local pubic goods in each jurisdiction are identical across jurisdictions in the country. All public expenditures go to pay the wages of the public employees and the capital rental costs.

The governor's utility function in each sub-national jurisdiction is a function of the level of local public goods provided to the residents and the sub-national government fiscal deficit, and it is increasing the former term and decreasing with the latter. Thus, the utility function of the sub-national governor in jurisdiction i, $E(V_i)$, can be shown as $E(V_i)=f(m_i)-(1-\sigma)\cdot\pi(c_i)$, where m_i and $f(m_i)$ are the number of public employees and the production function for the local public goods, respectively, and where the sub-national government fiscal deficit ratio in jurisdiction i, c_i, is defined as the ratio of fiscal deficit to revenue. The parameter σ captures how much of the negative political costs of the fiscal deficit can be shifted to the central government and it is discussed in detail below. The sub-national governor in jurisdiction i chooses to hire the amount of m_i public employees to maximize his utility and provide the level of

[9] In reality, the public sector might have a certain level of control over the prices of labor and capital; however, for simplicity, we assume the prices are fixed and we normalize them to 1.

$f(m_i)$ local public goods to the residents in this jurisdiction. We assume the production function is concave with $f'(m_i) > 0$ and $f''(m_i) < 0$, $\forall m_i > 0$. The level of local public goods of jurisdiction *i* is given by $f(m_i, K_i) = m_i^{\alpha} \cdot K_i^{\beta}$. In equilibrium, we have $K_i^* = m_i^* \cdot \beta/\alpha$, and the total expenditure of jurisdiction *i* is $m_i^* \cdot (1+\beta/\alpha)$. In addition, the production function can be expressed solely as a function of m_i as $f(m_i) = m_i^{\alpha} \cdot (m_i \cdot \beta/\alpha)^{\beta} = (\beta/\alpha)^{\beta} \cdot m_i^{\alpha+\beta}$.

In the function of the typical governor $\pi(c_i)$ is the political cost of running a sub-national fiscal deficit, which is caused by over-staffing in this jurisdiction. We assume that the sub-national governments are able to finance their fiscal deficit via other sources, for example, borrowing from sub-national-government-own banks. Therefore sub-national governments have so-called "soft budget" constraints.[10] The fiscal deficit ratio of jurisdiction i, c_i, is equal to $[m_i \cdot (1+\beta/\alpha) - r_i]/r_i$, where $[m_i \cdot (1+\beta/\alpha)]$ are local expenditures and r_i are the revenues of the jurisdiction i; $c_i > 0$ means that there is a fiscal deficit, $c_i < 0$ that there is a fiscal surplus, and $c_i = 0$ means in the budget of jurisdiction i is balanced. We assume the political costs function $\pi(c_i)$ is equal to zero for $c_i \le 0$ and it is a positive and a convex function for $c_i > 0$; that is, $\pi(c_i) > 0$, $\pi'(c_i) > 0$ and $\pi''(c_i) > 0$, $\forall c_i > 0$.[11]

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[10] The term "soft budget" constraint was first introduced by Kornai (1992) to describe how state-owned enterprises could rely on increased subsidies even if they operated with losses. Rodden *et al.* (2003) describe a soft budget constraint as a situation where an entity (say, a sub-national government) can manipulate its access to funds in an undesirable way.

[11] To assure the existence of a solution and to avoid a corner solution, we need several additional assumptions for this utility maximization problem: $f'(m_i) \to \infty$ as $m_i \to 0$, $f'(m_i) \to 0$ as $m_i \to \infty$, $\pi'(c_i) \to 0$ as $c_i \to 0$, and $\pi'(c_i) \to \infty$ as $c_i \to \infty$.

An important implication of the soft budget constraints is that sub-national governments can increase their expenditures without eventually facing the full costs of these actions. Some of these costs may be shifted to the central government (Rodden, *et al.*, 2003). The coefficient, σ, which takes values between 0 and 1, captures the political relationship between the central and sub-national governments in the country. This coefficient represents the share of the political cost, $\pi(c_i)$, that is shifted from the sub-national governor to the central executive. So, $(1-\sigma)\cdot\pi(c_i)$ captures the political costs that remain with the sub-national government.

The sub-national government bureaucrat's utility function, $E(V_i)$, shows two properties. First, if the sub-national government provides higher level of public goods, the sub-national governor obtains a higher level of utility. Second, hiring employees to a high enough level leads to a fiscal deficit, which in turn decreases the utility of sub-national governors. In our model, the penalty for profligate behavior (over-staffing) is $(1-\sigma)\cdot\pi(c_i)$. In this context, a rational governor would set $m_i = m_i^*$, such that $c_i^* = \left\{\left[n\cdot m_i^*\cdot(1+\beta/\alpha)\right]/\theta\cdot\overline{R}\right\}-1>0$, where m_i^* and c_i^* are the reaction function of the governors of jurisdiction i with respect to the central executive's decision in period 1.[12] The intuition behind this result is that since the over-staffing cost to the sub-national government is proportionally shared by the central government, a rational sub-national governor would choose to over-staff until the marginal benefit of providing public goods equals the marginal cost he needs to bear which is only a part of the total costs otherwise covered by the central executive authorities. It is quite intuitive that the level of c_i^*

[12] The proof is shown in Appendix B.

depends on the value of σ and that the higher the value of σ, the higher the level of c_i^*.[13]

The coefficient σ plays an essential role in the model and so it warrants some further discussion. Within the country the extent of the political cost to the governors depends on whom voters blame for the sub-national government deficit. The public may perceive the positive fiscal deficit at the sub-national level as a failure of the negotiation and crisis management skills of the central government, even if objectively sub-national governments are more directly to be blamed. In effect, the coefficient σ can be interpreted as the propensity of voters to blame the central government rather than the sub-national government for the fiscal deficit in their jurisdiction. Several institutional factors can affect the size of the parameter σ. In particular, we can expect the value of σ to be higher in countries where sub-national governments have less autonomous power, especially in their ability to raise their own revenues. The lack of revenue autonomy at the sub-national level heightens the perception that sub-national governments only execute the expenditure policies of the central government and that overall they act more like an agent of the central government executive. Under these circumstances, sub-national governments can more easily shift the political costs of sub-national fiscal deficits to the central government.

Now let us turn our attention to the central government executive's utility maximization problem. The central government executive's utility depends positively on the level of national public goods provided to all residents in the country subject to a budget constraint and negatively on sub-national governments' fiscal deficit. The central

[13] The proof is shown in Appendix B.

government executive's utility function, $E(V_c)$, can be represented as $E(V_c) = g(1-\theta) - \sigma \cdot \sum_{i=1}^{n} \pi(c_i)$. The first component on the right hand side, $g(1-\theta)$, can be interpreted as the production function of national public goods.[14] The coefficient σ is the share of the political cost of sub-national government fiscal deficit that the central executive bears, and $\sum_{i=1}^{n} \pi(c_i)$ is the total of the sub-national governments' fiscal deficits in the country. An in the case of the sub-national governments, we assume the production function is concave with $g(1-\theta)' > 0$ and $g(1-\theta)'' < 0$, $\forall\, 0 < (1-\theta) < 1$. The central executive chooses a degree of fiscal decentralization to maximize his utility.[15] In equilibrium, the optimal degree of fiscal decentralization can be shown as $\theta^* = \theta(\sigma, \alpha, \beta, n, \overline{R})$.[16] Once θ^* is determined, the optimal level of central government employees, m_c^*, is also determined, and it is given by $m_c^* = [\alpha/(\alpha+\beta)] \cdot (1-\theta^*) \cdot \overline{R} = m_c(\sigma, \alpha, \beta, n, \overline{R})$.

The central executive's utility function also shows two important properties. First, utility increases with the provision of national public goods, $g(1-\theta)$. Second, the central executive suffers a decline in utility by bearing part of the political cost caused by sub-national fiscal deficits. The share that the central government has to bear is σ for

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[14] We assume that there is no budget deficit problem at the central government level, and, therefore, the total expenditure for the central government is $(1-\theta) \cdot \overline{R}$. Releasing and allowing the central government to have a limited budget deficit does not change our results.

[15] To assure the existence of an interior solution, we further assume that $g(1-\theta)' \to \infty$ as $\theta \to 1$, and $g(1-\theta)' \to 0$ as $\theta \to 0$.

[16] The proof is shown in Appendix B.

each sub-national government and therefore for the entire sector too. The penalty function for the central government is given by $\sigma \cdot \sum_{i=1}^{n} \pi(c_i)$.

In order to investigate the interaction of hiring decisions at the two levels, we use a game theoretic approach. The two-period-two-player game is solved by applying backward induction.[17] In period 2, the sub-national governor in jurisdiction i sets the level of public employees in this jurisdiction at m_i in order to maximize his utility function:

$$\max_{\{m_i\}} E(V_i) = f(m_i) - (1-\sigma)\cdot\pi(c_i) \quad \text{subject to} \quad c_i = \frac{n \cdot m_i \cdot (1+\beta/\alpha)}{\theta \cdot \overline{R}} - 1. \qquad (1)$$

By solving the maximization problem, we have the following first order condition:[18]

$$F = \frac{\partial E(V_i)}{\partial m_i} = f'(m_i) - (1-\sigma)\cdot\pi'(c_i)\cdot\left[\frac{n\cdot(1+\beta/\alpha)}{\theta\cdot\overline{R}}\right] = 0. \qquad (2)$$

From this we can set the reaction function of the sub-national governor in jurisdiction i as $m_i^* = m_i(\theta, \sigma, \alpha, \beta, n, \overline{R})$ and, therefore, we have $c_i^*(\theta, \sigma, \alpha, \beta, n, \overline{R}) = \frac{n \cdot m_i^* \cdot (1+\beta/\alpha)}{\theta \cdot \overline{R}} - 1$.

In period 1, the central government executive sets the degree of fiscal decentralization, θ, to maximize his utility function:

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[17] Since we assume that the *n* sub-national jurisdictions are all identical, we can focus on one particular sub-national governor's reaction to the central executive's decision. Of course, this assumes that sub-national governments do not collude among themselves and that every sub-national government is too small to really affect what happens to other sub-national governments.

[18] The second order condition, $\frac{\partial F}{\partial m_i} = f''(m_i) - (1-\sigma)\cdot\pi''(c_i)\cdot\left[\frac{n\cdot(1+\beta/\alpha)}{\theta\cdot\overline{R}}\right]^2$, can be shown to be negative and satisfied for the utility maximization problem, which assures the existence of the solution.

$$\max_{\{\theta\}} E(V_c) = g(1-\theta) - \sigma \sum_{i=1}^{n} \pi(c_i) \quad \text{subject to} \quad c_i^* = \frac{n \cdot m_i^* \cdot (1+\beta/\alpha)}{\theta \cdot \overline{R}} - 1. \tag{3}$$

Inserting the constraint into the utility function of the central government executive's we have:

$$\max_{\{\theta\}} E(V_c) = g(1-\theta) - \sigma \sum_{i=1}^{n} \pi\left(\frac{n \cdot m_i^* \cdot (1+\beta/\alpha)}{\theta \cdot \overline{R}} - 1 \right),$$

with the corresponding first order condition as[19]

$$G = \frac{\partial E(V_c)}{\partial \theta} = -g'(1-\theta) - \sigma \sum_{i=1}^{n} \pi' \cdot \frac{n \cdot (1+\beta/\alpha)}{\theta \cdot \overline{R}} \cdot \left(\frac{\partial m_i}{\partial \theta} - \frac{m_i}{\theta} \right) = 0. \tag{4}$$

From the first order condition, we find the solution to the central government executive's utility maximization problem as $\theta^* = \theta(\sigma, \alpha, \beta, n, \overline{R})$ and, therefore, the level of central government employment is determined

by $m_c^* = \left[\alpha \cdot \overline{R} / (\alpha + \beta) \right] \cdot (1 - \theta^*) = m_c(\theta^*, \sigma, \alpha, \beta, n, \overline{R})$.

The total level of public sector employment and the degree of fiscal decentralization in the country are simultaneously determined by this system of equations:

$$\begin{cases} m^* = m_c^* + n \cdot m_l^* = m_c(\theta^*, \sigma, \alpha, \beta, n, \overline{R}) + n \cdot m_l(\theta^*, \sigma, \alpha, \beta, n, \overline{R}) = m^*(\theta^*, \alpha, \beta, \sigma, n, \overline{R}) \\ \theta^* = \theta(\alpha, \beta, \sigma, n, \overline{R}) \end{cases} \tag{5}$$

Both the level of central and sub-national government employees in the country are a function of fiscal decentralization. Once the degree of fiscal decentralization is determined, the optimal level of total public sector employment is determined. Applying the implicit function theorem to the utility maximization problem, it can be shown that

[19] We assume that the second order condition is satisfied for this utility maximization problem, which implies $\frac{\partial G}{\partial \theta} < 0$. This assumption assures the existence of the solution of the central government.

the level of sub-national public employment increases and this number decreases at the sub-national government level as the degree of fiscal decentralization grows.[20] The overall impact of fiscal decentralization on total public employment level depends on the relative magnitude of these two opposing effects.

The Empirical Analysis

Defining Public Sector Employment

Our first task of empirical analysis is to define the term "public sector employment". For our empirical analysis, we use the *International Labor Organization (ILO) Public Sector Dataset*. Public sector employees in the ILO dataset consist of the employees in the general government sector and the public corporation sector. The general government sector includes all government units,[21] social security funds,[22] and other nonprofit institutions that are controlled and primarily financed by the public authority.[23] The public corporation sector comprises all of the institutional units which produce for the market and are controlled and primarily financed by public authority. Figure 1 shows the components of public sector employment according to the ILO.[24]

[Insert FIGURE 1 here]

[20] The proof is shown in Appendix B.

[21] The government units carry out government functions, and they include all bodies, departments, and establishments of any level of government (central, state or provincial, local) which engage in administration, defense, maintenance of public order, health, education and cultural, recreational and other social services.

[22] The social security funds are social insurance schemes covering the community as a whole or large sections of the community, and are imposed, controlled, and financed by government units. They can operate at each level of government.

[23] The non-profit institutions are legal entities which are autonomous from government units. They are classified under the general government only if they are non-market, as well as financed and controlled by the public authority.

[24] See Hammouya (1999).

The *International Labor Organization Public Sector Dataset* covers over one hundred countries since 1985.[25] Table 2 shows the unweighted average of total public sector employees as a percentage of total population for the Organization for Economic Co-operation and Development (OECD hereafter) and non-OECD countries for the years 1985, 1990, 1995, 2000, and 2005.[26] From Table 2, we find that the average level of public sector employment in OECD countries is higher than that for non-OECD countries for all periods. The average level of public sector employment for OECD countries is quite stable over time at around 10 percent of the total population. However, for non-OECD countries public employment as percent of total population has increased over time, except for the period 1990-1995, from 4.88 percent of total population in 1985 to 9.31 percent in 2005. The difference in average level of public sector employment between OECD and non-OECD countries has been decreasing over time, from a difference of 5.08 percentage points of total population in 1985 to 1.13 percentage points in 2005. Figure 2 depicts the time trend of average level of public sector employment for both OECD and non-OECD countries over the 1985-2005 period.

[Insert TABLE 2 here]

[Insert FIGURE 2 here]

The Definition of Fiscal Decentralization

The second task is to define fiscal decentralization and how we measure it in empirical analysis. Decentralization appears to be so widespread because there is often

[25] Please refer to Footnote 1.

[26] OECD membership information is obtained from the website, http://en.wikipedia.org/wiki/OECD, accessed March 26, 2009. Five countries, Mexico (1994), Czech Republic (1995), Hungry (1996), Poland (1996), and Slovakia (2000) in our sample became OECD members during the sample period.

confusion in terminology (Martinez-Vazquez & McNab, 1997). Three varieties of fiscal decentralization are distinguished, corresponding to the degree of independent decision-making exercised at the sub-national government level (Bird & Vaillancourt, 1998): (i) in the case of deconcentration, responsibilities within a central government are dispersed to regional branch offices or sub-national administrative units; (ii) in the case of delegation, the central government gives the sub-national governments the power to perform functions and to raise resources but constrains that power with explicit norms and rules; (iii) in the case of devolution, sub-national governments have discretion to govern their own affairs with no meddling by the central authorities. In practice it is difficult to differentiate between delegation and devolution and the measure of decentralization used in most of the literature is the sub-national share of total government spending or revenue. However, many authors have warned that sub-national government expenditure or revenue shares can be misleading (see Bird (2000), Ebel & Yilmaz (2002), and Martinez-Vazquez & McNab (2003)). Internationally comparable data that provide the kind of information in the OECD dataset are not available from other sources. Therefore, the sub-national government share of public expenditure or revenue from the *Government Finance Statistics Yearbook* (*GFS* hereafter) of the International Monetary Fund (IMF hereafter) still constitutes the only source of cross-country data.

Table 3 presents the unweighted average of sub-national government shares of public expenditure for OECD and non-OECD countries for five year averages between 1985 and 2005. The average of sub-national shares of expenditure for OECD countries is higher than that for non-OECD countries in each period. However, the difference in sub-national shares of public expenditure between OECD and non-OECD countries was

reduced from 21.7 percentage points in 1985 to 16.7 percentage points in 2005. Figure 3 depicts the time trend of the average of the sub-national government share of public expenditure for both OECD and non-OECD countries since 1985. The trend in both cases has been one of increased decentralization, something of great potential significance for the evolution of public sector employment.

[Insert TABLE 3 here]

[Insert FIGURE 3 here]

Measuring the Political Variable

In our theoretical model, we introduce a political variable, σ, which measures the ability of the sub-national government to shift the political cost of the fiscal deficit incurred at the sub-national government level to the central government. The higher the value of σ, the higher the ability of the sub-national government to shift the political cost to the central government. In the discussion of our theoretical model we showed that the sub-national government employee level of a country is positively correlated to the value of σ and the central government employee level is negatively correlated to that variable.[27] The overall impact of the political variable on total public sector employment depends on the relative importance of these two opposing effects.

Empirically, of course, there are no data on the ability of the sub-national government to shift the political cost of sub-national fiscal deficits to the central government. Therefore, we need to find proxy variables. One potential proxy variable could be the pressure and extent of a "soft budget" constraint for sub-national government but unfortunately we have no data on this either. Our proxy variable for the

[27] The proof is shown in Appendix B.

ability of the sub-national governor to shift the political cost of the sub-national fiscal deficit to the central government is a dummy variable for unitary countries versus federal countries. Although there are exceptions, in unitary countries there is more delegation than decentralization, and thus sub-national governments in unitary countries tend to act more as an agent of the central government executive. For this reason we could expect sub-national governments in unitary countries to be more likely to shift the political cost of sub-national fiscal deficits to the central executive than sub-national governments in federal states.[28] The dummy variable will be coded as equal to one if the country is a unitary state and zero if it is a federal state.[29] Although this dummy variable has not been used with this purpose in the previous literature, Khemani (2004) for India and Gimpelson and Treisman (2002) for Russia use dummy variables representing political links between the central and sub-national levels to analyze the ability of the sub-national governments to shift the political costs of sub-national deficits to the central government.

The Empirical Approach and Estimation Results

As we saw in our theoretical model, the overall effect of fiscal decentralization on total public sector employees depends on the magnitudes of two opposing effects: one is the reduction in central government employment and the other one is the increase in sub-national government employment. If the amount of the reduction in central government employment overwhelms the increase in the sub-national government employment, total public sector employment decreases with the degree of fiscal

[28] In federal systems (as opposed to unitary systems) central and sub-national authorities are more separately identified along several dimensions: sub-national governments have a constitutionally separate source of authority from the central government; central and sub-national governments may run clearly separate election campaigns on substance issues and even on timing; budget and fiscal issues are generally more de-linked between central and sub-national authorities as are administrative and civil service issues.

decentralization. This would be in line with Brennan and Buchanan's (1980) Leviathan hypothesis, if we measure the government size as total public sector employees as a percentage of population.

On the other hand, if the amount of the increase in the sub-national government employment overwhelms the reduction in the central government employment, total public sector employment would increase with the degree of fiscal decentralization, thus supporting Oates' (1985) and others' points of view that the public sector tends to be larger with more fiscal decentralization.

Estimating Specification

The particular specification of Equation System (5) in the theoretical model we estimate is

$$PSE_{i,t} = \beta_0 + \beta_1 \cdot DEC_{i,t} + \beta_2 \cdot UNI_i + \beta_3 \cdot OECD_{i,t} + \beta_4 \cdot OECD_{i,t} \cdot DEC_{i,t} + \beta_5 \cdot W_{i,t} + a_i + \varepsilon_{i,t}. \quad (6)$$

where the dependent variable, $PSE_{i,t}$, is alternatively the level of total public sector employees as a percentage of population or the labor force, or general government employment as a percentage of population in country *i* in year *t*. The choice of dependent variable is discussed below. The independent variables, $DEC_{i,t}$, measure the degree of fiscal decentralization in country i in year t; UNI_i is a dummy variable for unitary countries; $OECD_{i,t}$ is a dummy variable for country *i* being an OECD member in year *t*; additionally, a slope dummy, $OECD_{i,t} \cdot DEC_{i,t}$, is introduced to allow for the possible differential impact of fiscal decentralization on public sector employment in OECD and

[29] The list of federal countries, as shown in Appendix A, is based on Griffiths and Nerenberg (2005).

non-OECD countries. The vector $W_{i,t}$ represents a set of control variables which include the level and the square of GDP per capita, the degree of urbanization, and the degree of openness in the economy. The term a_i is the unobserved country effect, which can be thought of as an omitted variable and is time invariant within a country. Since the number of time periods is small relative to the number of observations, we could include a dummy variable for each time period to account for secular changes that are not modeled.[30] The last term, $\varepsilon_{i,t}$, is the idiosyncratic error.

The most important coefficient in our estimation is that for decentralization, *DEC*. But as we have seen from our model and in the review of the literature, there are multiple effects of fiscal decentralization on public employment and therefore it is not possible to anticipate a particular sign for β_1. For the dummy political variable UNI_i, we expect unitary countries, other things the same, to have significantly higher levels of public employment. For the impact of GDP per capita, Wagner's law states that economic development creates demand for new types of government services, which leads the public sector to hire more employees to provide these services. Consequently, from Wagner's law we would expect the sign of the GDP per capita coefficient to be positive. In addition, following Rama (1997) we may expect the relationship between GDP per capita and the level of public sector employment to be non-monotonic and to allow for that we include GDP per capita squared in our vector of control variables. Urbanization, which is measured as the share of the urban population in the total population, can be expected to stimulate the demand for additional public services which, in turn, could drive public sector employment up (Kraay & van Rijckeghem, 1995). In addition,

[30] See, for example, Wooldridge (2002).

exposure to external risk, measured as the sum of imports and exports divided by GDP, may lead governments to use public jobs as a partial insurance mechanism against the risk faced by the domestic economy (Rodrik, 1997).

Data Sources

For the dependent variable we use the *ILO Public Sector Dataset*, which is an unbalanced panel dataset covering 111 countries for the following years: 1985, 1990, 1995, 2000, and 2005. The data of fiscal decentralization is extracted from the *GFS* of the IMF. And we use the *World Development Indicators* (*WDI*, 2007) for the data on the control variables including, GDP per capita, degree of urbanization and the index for openness. In Table 4 we list all the variables with their label, definition, units of measurement, and source. Table 5 shows the descriptive statistics for the variables. Due to problems with data availability for all the variables, we ultimately end up with a panel dataset covering 74 countries for various years between 1985 and 2005, with a sample size of 214 observations.

[Insert TABLE 4 here]

[Insert TABLE 5 here]

Instrumental Variables Estimation

Our estimation equation (6) is based on the system of equations in (5). Since level of public employment m^*, and, the level of decentralization, θ^* are jointly determined, there might be an endogeneity problem in regressing $PSE_{i,t}$ on $DEC_{i,t}$. This endogeneity problem arises from the correlation between the degree of fiscal

decentralization and the error term in (6). If endogeneity is present, then our estimators will be biased. To address this problem, we need to find instrumental variables (IV) for this potential endogenous variable. A suitable IV must be uncorrelated with the error term and correlated with the endogenous variable in the model. According to Panizza (1999), the degree of fiscal centralization is negatively correlated with ethnic fractionalization. Empirically, three fractionalization indices are often used: besides ethnic fractionalization, there are linguistic and religious fractionalization indices (Alesina *et al.*, 2003). The fractionalization index is measured by the probability of two randomly chosen individuals belonging to different groups, and it is represented by:

$$Fractionalization\ Index = 1 - \sum_{i=1}^{N} \left(\frac{POP_i}{POP_T} \right)$$

where POP_T is the total population and POP_i is the number of people belonging to group *i*. In our estimation, we use these three fractionalization indices as the IVs for the degree of fiscal decentralization.

To estimate equation (6), we conduct a two-stage least squares (2SLS) procedure.[31] In the first stage using the full sample of countries, the coefficient for the religious fractionalization index is positively and significantly associated with the degree of fiscal decentralization, a result that is in line with that obtained by Panizza (1999). The coefficients of the three IVs are jointly significantly different from zero at the 1% level, which indicates that these three variables are correlated with the potentially endogenous variable, and, therefore, are suitable IVs.[32]

[31] See Wooldridge (2002) for the 2SLS estimation procedure.

[32] Similar results are obtained in the first stage estimation when using the subsample of non-OECD countries.

Estimation Results

Besides the 2SLS approach we also apply the Generalized Method of Moments (GMM) approach for the estimation of equation (6). Tables 6 and 7 present our estimation results for the 2SLS and GMM approaches respectively using several definitions of the dependent variable: public sector employment as a percentage of population, and labor force and general government employees as a percentage of population.

The issue of the quality of data is always present in doing empirical work, especially when developing countries are included in the analysis. In order to ascertain the robustness of our results, we run two separate sets of regressions for the groups of OECD and non-OECD countries, and also use both definitions of decentralization: the sub-national governments' shares in public expenditures and revenues.

[Insert TABLE 6 here]

[Insert TABLE 7 here]

We first discuss the determinants of public sector employment as a percentage of population. The estimation results from the 2SLS approach and the GMM approach are consistent and show that fiscal decentralization, measured on the expenditure side, has a significant positive impact on the level of public employment in a country.[33] A ten-percentage point increase in the sub-national government share in public expenditures results in an increase of 6 percentage points in public employment. In our theoretical model, fiscal decentralization leads to an increase in sub-national government

[33] With the GMM approach, fiscal decentralization on revenue side also has a positive and statistically significant result on public employment.

employment and to a reduction in the level of employment at the central government level. Our empirical results show that for the sample of countries and the period covered the magnitude of the increase in the sub-national government employment is greater than that of the reduction in the central government employment. As a result, our main finding is that total public sector employment increases with the degree of fiscal decentralization. In the context of the previous literature on Leviathan and the size of the public sector, our main result supports Oates' (1985) view that the public sector (at least measured by total public employment) tends to be larger with more fiscal decentralization.

We now turn our attention to the results for the control variables. As expected, the political dummy variable, UNI_i, is positive and significant at the 5 percent level in the regressions based on the 2SLS approach; thus, it would appear that sub-national governments in unitary countries have an easier time expanding public employment than those in federal countries. The coefficients of GDP per capita are positive and significant at the 5% level under both estimation approaches. This result is in line with the predictions of Wagner's law. Our result also supports Rama's (1997) previous finding that the relationship between GDP per capita and the level of public sector employment is quadratic. Rama calculates that the turning point is 14,000 dollars per capita at 1985 PPP prices; we obtain the turning point at around 27,000 dollars per capita, at 2000 PPP prices. The difference in the two estimations is likely due to the use of a different base year for the price index, different sample sets and different time periods.

For the other control variables, we find that the degree of openness index, measured by the sum of exports and imports of goods and services as a share of GDP, is positive and significant at the1% level when the sub-national share of public expenditure is used as the measure of fiscal decentralization. This finding supports Rodrik's (1997)

argument that relatively safe government jobs represent partial insurance against external risk faced by the country. The level of urbanization is significant in the regressions for the sub-sample of OECD countries; this means that urbanization may add to higher levels of public employment only at certain levels of economic development.

Using public sector employment as a percentage of labor force as the dependent variable yields quite consistent results with those where the public employment is defined as percent of population. All the coefficients in the two sets of estimations tend to have the same sign and similar levels of statistical significance.

When the general government employees as a percentage of population is used as the dependent variable fiscal decentralization measured o the expenditure side is positive and significant for the sub-sample of non-OECD countries using the GMM approach. Several control variables remain significant in these sets of regressions, in particular, GDP per capita and the political dummy variable, UNI_i.

Summary and Conclusions

In this paper we explore the relationship between public sector employment and fiscal decentralization. Theoretically, we develop a political economy model that sheds light on the interactions between the central and sub-national government decisions on their respective levels of public employment. Fiscal decentralization policy generally shifts central government employees to the sub-national government level. The question is whether the decrease in central government employment is more or less than the increase in sub-national government employment. Our empirical work shows that the increase in public employment at the sub-national government level overwhelms the decrease in public employment at the central level. As a result, the level of total public

sector employees unambiguously increases with the degree of fiscal decentralization of a country. Our empirical results also indicate that the relationship between GDP per capita and public sector employment is not monotonic but quadratic. We also find that total public sector employment is higher in unitary countries vis-à-vis federal countries and it increases with the country's exposure to risk.

Typically, more public employment is associated with bloated central government bureaucracies and unresponsive and unproductive spending. On the other hand, fiscal decentralization policy is generally thought to result in an increase in allocative efficiency, since decisions on public expenditures made by sub-national governments are closer and more responsive to the demands and needs of local residents. In addition, decentralization is generally thought of as having the potential to improve competition among governments and to facilitate technical innovations. However, decentralization does not appear to retrench public sector employment but, rather, it seems to expand it. This overall result could be the reflection of some wrong reasons, such as sub-national governments not taking full responsibility for their budget decisions and being less efficient managers. On the other hand, the overall result of an increase in employment may reflect some more positive reasons, such as, for example, a shift in the composition of public expenditures from decentralization toward more labor intensive public services, such as education and health services.

However, we also provide evidence that decentralization policy can have quite different impacts on public employment depending on the institutional environment and the level of development in a country. The overall conclusion that decentralization empirically leads to increases in public sector employment, of course, does not imply anything about the final impact on welfare. In fact, if more decentralization is chosen as

an improved way to provide services to citizens, all our finding may imply is that the increase in welfare produced by decentralized governance comes at the price of larger labor inputs in the production of those services.

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TABLE 1
Summary of Empirical Studies of Public Sector Employment

Author (Year)	Sample	Dependent Variable	Findings
Kraay and van Rijckeghem (1995)	34 developing countries and 21 OECD countries from 1972-1992 (Panel data estimation)	General government employees per 1,000 population for OECD countries and central government employees for developing countries	Government employment is positively associated with the relaxation of resource constraints (the revenue-to-GDP ratio and foreign financing in the case of developing countries and GDP per capita in the case of OECD countries), urbanization, the level of education, and certain countercyclical pressures for government hiring (the real effective exchange rate for developing countries and private employment for OECD countries).
Schiavo-Campo *et al.* (1997)	80-100 countries in the early 1990s (OLS estimation)	Government employees per 100 population	Government Employment as percent of population is positively associated with per capita income and negatively with relative wages. The linkage between government employment and per capita income is not significant for the subsample of OECD countires.
Rama (1997)	90 countries for the general government employment and 41 countries for the public sector employment in 1970s, 1980s, and 1990s (Pooled OLS estimation)	(1) General government employment, and (2) public sector employment of total labor force	General government employment as percent of total labor force increases with per capita income, and the relationship is quadratic with the turning point of 14,000 dollars per capita. It also increases with exposure to external risk and urbanization. Regional features may also explain some portion of the variance in government employment across countries.
Rodrik (1997)	72 countries for the general government employment and 44 countries for the public sector employment in mid-1980s (Cross-section estimation)	(1) General government employees, and (2) public sector employment per 100 population	Public employment increases with per capita income, exposure to external risk and urbanization.
Alesina *et al.* (2000)	U.S. cities with population greater than 25,000 in 1991 (Cross-section estimation)	City government employment per 1,000 population/working age population	City government employment increases as income inequality and ethnic fragmentation increase.
Alesina *et al.* (2001)	Italian provinces in 1995 (Cross-section estimation)	Government employees including national and local employees per 100 employed population at the provincial government level	Estimate the public employment in the North region as the benchmark model, and conclude that public employment has been used as a subsidy from the North to the poorer South region.
Gimpelson and Treisman (2002)	Russian regions from 1993 to 1998 (Pooled OLS estimation with panel-corrected standard error)	(1) Public employees, (2) employees in health, sport, social protection, (3) employees in education culture and art, (4) employees in administration per 1,000 residents at the regional government level, and (5) public employees per 100 employed	The number of public employees per 1,000 regional residents decreases in the first year after a new governor was elected, and is positively associated with larger federal transfers and loans. This number is also higher in a region with a governor in the opposition.
Marques-Sevillano and Rossello-Villallonga (2004)	Spanish regions from 1990-1999 (Panel data with AR(1) estimation)	(1) Regional and (2) central government employees and (3) the aggregate number per 100 employed at the regional government level	The numbers of central government employees per worker in regions where those regions receive more responsibilities from the central government are smaller, and the numbers of regional government employees of these regions are larger. The numbers of central government employees per worker are higher in regions with lower per capita GDP. The numbers of regional government employees per worker are positively associated with higher per capita GDP, higher dependency ratios and a dummy for the regions with left-wing and region-wide oriented parties as opposed to the right-wing oriented parties. The aggregate public employees of a region increases with dependency ratio, and decreases if there is a political shift from the coincidence of political orientation with the ruling national party.
Rajaraman and Saha (2008)	Indian 21 states for the year of 1991-1992 (OLS estimation)	General government employees per 100 population	General government employees as percent of population decreases with the size of the state, measued relative to population or gross state domestic product.

TABLE 2
Unweighted Average of Total Public Sector Employment (% of total population)

Country	1985	1990	1995	2000	2005
OECD Countries	9.97	9.92	9.35	9.82	10.44
	(11)	(13)	(17)	(22)	(7)
Non-OECD Countries	4.88	9.84	7.83	7.86	9.31
	(16)	(28)	(39)	(46)	(15)
All Countries	6.96	9.87	8.29	8.49	9.67
	(27)	(41)	(56)	(68)	(22)

Figures in parentheses represent the number of observations.
Source: *International Labor Organization Public Sector Dataset.*

TABLE 3
Unweighted Averages of Subnational Government Shares of Public Expenditure for OECD and Non-OECD Countries

Country	1985	1990	1995	2000	2005
OECD Countries	30.93	30.12	29.87	29.57	37.48
	(11)	(13)	(17)	(22)	(7)
Non-OECD Countries	9.23	14.25	14.56	18.72	20.79
	(16)	(28)	(39)	(46)	(15)
Whole Sample	18.07	19.28	19.21	22.23	26.10
	(27)	(41)	(56)	(68)	(22)

Figures in parentheses represent the number of observations.
Source: *Government Finance Statistics* (IMF).

TABLE 4
Description of Variables

Variable	*Label*	Definition	Units	Source
Public Sector Employees	*PSE*	Total Public Sector Employees as % of Population	%	*International Labor Organization Public Sector Dataset* Website[a]
Fiscal Decentralization	*DEC*	Subnational Shares of Public Expenditures or Revenues	%	*Government Finance Statistics* (IMF)
Unitary Country	*UNI*	1 for Unitary Countries	0/1	Griffiths and Nerenberg (2005)
OECD Country	*OECD*	1 for OECD Countries	0/1	OECD Website[b]
GDP per capita	*GDPPC*	PPP, Constant 2000 US$	1,000	World Development Indicators (2007)[c]
GDP per capita squared	*GDPPC*	PPP, Constant 2000 US$	1,000,000	Calculate based on World Development Indicators (2007)[c]
Population Density	*POPDEN*	People per sq. km	1	World Development Indicators (2007)[c]
Openness	*TRADE*	Sum of Exports and Imports of Goods and Services Measured as a Share of GDP	%	World Development Indicators (2007)[c]
Urbanization Ratio	*URB*	Share of Urban Population on Population	%	World Development Indicators (2007)[c]

a. http://laborsta.ilo.org/, accessed March 26, 2009.
b. The OECD member information is obtained on the website, http://en.wikipedia.org/wiki/OECD, accessed February 20, 2009. Five countries, Mexico (1994), Czech Republic (1995), Hungry (1996), Poland (1996), and Slovakia (2000) in our sample became OECD members during the sample period.
c. Variables which resource from the World Development Indicators have standard World Bank definitions.

TABLE 5
Descriptive Statistics for the Estimation Equation (6)

Variable	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
Public Sector Employees (% of Total Population)	214	8.63	6.48	0.41	42.40
Public Sector Employees (% of Labor Force)	214	18.68	12.83	0.93	80.49
Fiscal Decentralization	214	20.75	15.75	1.05	60.28
GDP per capita	214	10.73	8.77	0.52	32.78
GDP per capita squared	214	191.66	260.55	0.27	1074.46
Poulation Density	214	100.84	112.44	2.00	667.00
Openness	214	73.80	37.60	14.04	204.67
Urbanization Ratio	214	57.50	22.15	8.94	96.98

TABLE 6
Estimated Coefficients on Public Sector Employment by the 2SLS Approach

	Dependent Variable																	
	Public Sector Employment (% of Total Population)						Public Sector Employment (% of Labor Force)						General Government Employees (% of Total Population)					
	All Countries		OECD Countries		Non-OECD Countries		All Countries		OECD Countries		Non-OECD Countries		All Countries		OECD Countries		Non-OECD Countries	
Expenditure Decentralization	0.603** (3.41)	- -	0.412 (1.06)	- -	0.652** (3.09)	- -	1.072** (2.91)	- -	0.745 (0.96)	- -	1.190** (2.92)	- -	0.093 (0.57)	- -	0.348 (1.30)	- -	0.141 (0.77)	- -
Revenue Decentralization	- -	0.141 (0.15)	- -	-0.041 (0.31)	- -	0.971 (1.62)	- -	0.137 (0.08)	- -	-0.241 (0.77)	- -	1.712 (1.51)	- -	0.043 (0.36)	- -	0.062 (0.66)	- -	0.050 (0.33)
GDP per capita	0.976* (2.42)	1.189** (3.24)	-0.595 (0.86)	-0.343 (0.80)	1.867** (2.57)	2.222** (2.66)	1.788* (2.13)	2.386** (3.46)	-1.359 (0.98)	-0.381 (0.50)	3.971** (2.75)	4.430** (2.78)	0.2302* (2.22)	0.316* (2.10)	-0.514 (0.69)	0.296 (1.17)	0.111 (0.65)	0.384 (1.88)
GDP per capita squared	-0.011 (0.45)	-0.220** (2.62)	0.010 (0.92)	0.015 (1.48)	-0.050 (1.35)	-0.059 (1.39)	-0.011 (0.21)	-0.044** (2.78)	0.022 (0.99)	0.018 (1.03)	-0.121 (1.65)	-0.124 (1.53)	-0.004 (1.53)	-0.004 (0.71)	0.009 (0.70)	-0.004 (0.63)	0.006 (0.77)	-0.007 (0.66)
Population Density	-0.005 (0.52)	0.007 (0.43)	0.006 (0.44)	-0.011 (1.52)	-0.003 (0.37)	0.007 (0.56)	-0.014 (0.67)	0.008 (0.28)	0.018 (0.61)	-0.021 (1.27)	-0.005 (0.35)	0.012 (0.56)	-0.003 (0.61)	-0.005 (1.08)	-0.001 (0.12)	-0.010 (1.77)	0.000 (0.05)	-0.001 (0.20)
Openness	0.056** (3.43)	0.001 (0.04)	0.023 (0.98)	0.021 (1.25)	0.051* (2.21)	0.038 (1.02)	0.109** (3.16)	-0.002 (0.04)	0.031 (0.69)	0.028 (0.77)	0.100* (2.24)	0.067 (0.96)	0.001 (0.19)	0.010 (1.11)	0.026 (0.92)	0.002 (0.13)	0.010 (0.82)	0.011 (0.85)
Urbanization	-0.023 (0.41)	0.024 (0.37)	0.123 (1.70)	0.091 (1.68)	-0.060 (0.92)	-0.084 (0.94)	-0.042 (0.36)	0.029 (0.24)	0.165 (1.16)	0.113 (0.50)	-0.096 (0.75)	-0.140 (0.79)	2.751 (1.64)	0.033 (1.52)	0.157 (1.76)	0.129* (2.52)	0.018 (0.49)	0.031 (0.95)
Unitary Country	7.116* (1.97)	8.558 (1.18)	9.288 (1.94)	3.625 (1.79)	10.089** (3.18)	10.246* (2.00)	10.812 (1.44)	13.711 (1.00)	16.768 (1.75)	4.626 (1.03)	19.505** (3.14)	19.267* (1.99)	2.751 (1.56)	2.361* (2.15)	7.499 (1.94)	4.111** (2.62)	1.105 (0.71)	0.821 (0.82)
OECD Country	4.952 (0.46)	-10.804 (0.56)	- -	- -	- -	- -	15.759 (0.71)	-14.942 (0.41)	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
OECD Country × Decentralization	-0.635 (1.04)	0.391 (0.35)	- -	- -	- -	- -	-1.547 (1.22)	0.450 (0.21)	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Constant	-12.720 (1.75)	-8.045 (0.43)	-10.866 (1.01)	3.443 (0.51)	-17.238** (2.99)	-20.041 (1.62)	-17.350 (1.15)	-7.066 (0.20)	-8.239 (0.41)	18.022 (1.27)	-31.011** (2.77)	-34.056 (1.46)	-1.974 (0.50)	-1.039 (0.34)	-13.758 (1.61)	-8.295 (1.51)	-0.707 (0.20)	-0.013 (0.01)
Observations	214	186	70	62	144	124	214	186	70	62	144	124	144	126	51	44	93	82
Number of countries	74	70	23	22	55	51	74	70	23	22	55	51	57	53	21	19	40	37
R-squared	0.277	0.174	0.453	0.330	0.297	0.258	0.209	0.137	0.277	0.113	0.276	0.235	0.484	0.526	0.529	0.546	0.224	0.382

Absolute value of z-statistics is given in parentheses.
In each regression model we include a set of time dummies, but we do not report the coefficients on those dummies.
* and ** denote significance at 5% and 1% level respectively.
The 2SLS estimation is used. The instrumental variables for decentralization and the interaction term of decentralization and OECD dummy variables are ethnic, language and religion fractionalization indices. The first stage estimation results are not reported here, and available upon request.

TABLE 7
Estimated Coefficients on Public Sector Employment by the GMM Approach

	Dependent Variable																	
	Public Sector Employment (% of Total Population)						Public Sector Employment (% of Labor Force)						General Government Employees (% of Total Population)					
	All Countries		OECD Countries		Non-OECD Countries		All Countries		OECD Countries		Non-OECD Countries		All Countries		OECD Countries		Non-OECD Countries	
Expenditure Decentralization	0.603** (2.92)	- -	0.200 (1.93)	- -	0.662** (2.77)	- -	1.072* (2.46)	- -	0.171 (085)	- -	1.215* (2.49)	- -	0.053 (0.79)	- -	0.069 (0.81)	- -	0.146* (2.18)	- -
Revenue Decentralization	- -	0.767* (2.37)	- -	-0.007 (0.07)	- -	0.872* (2.17)	- -	1.300* (2.05)	- -	-0.184 (0.87)	- -	1.611* (2.01)	- -	0.033 (0.34)	- -	-0.057 (0.82)	- -	0.253 (1.46)
GDP per capita	0.976* (2.35)	1.174** (2.62)	-0.584 (1.47)	-0.329 (0.76)	2.229** (2.91)	2.758** (2.63)	1.788* (2.11)	2.216** (2.63)	-1.004 (1.37)	-0.523 (0.59)	4.731** (3.20)	5.700** (2.84)	0.367* (2.49)	0.358* (2.15)	-0.343 (1.67)	-0.253 (0.80)	1.276** (5.46)	1.307** (3.52)
GDP per capita squared	-0.011 (0.47)	-0.017 (1.04)	0.013 (1.48)	0.015 (1.62)	-0.076* (2.54)	-0.108* (2.35)	-0.011 (0.22)	-0.027 (084)	0.026 (1.61)	0.027 (1.44)	-0.175** (2.97)	-0.235** (2.63)	-0.005 (0.85)	-0.004 (0.66)	0.014* (2.44)	0.017* (2.16)	-0.046** (4.58)	-0.047** (3.12)
Population Density	-0.005 (0.57)	-0.003 (0.29)	-0.002 (0.45)	-0.011 (1.85)	-0.004 (1.18)	0.000 (0.05)	-0.014 (0.74)	-0.011 (0.56)	-0.008 (0.75)	-0.026 (1.88)	-0.007 (1.13)	0.001 (0.13)	-0.003 (1.14)	-0.003 (0.82)	-0.010* (2.24)	-0.016** (3.29)	-0.001 (0.76)	0.002 (0.45)
Openness	0.056** (3.18)	0.055* (2.46)	0.036** (2.96)	0.030* (2.23)	0.056** (3.03)	0.058** (2.71)	0.109** (2.85)	0.105* (2.24)	0.074** (3.70)	0.068* (2.33)	0.107** (2.73)	0.112* (2.47)	0.015 (1.95)	0.013 (1.52)	0.019* (2.50)	0.009 (0.79)	0.02** (2.68)	0.026* (2.54)
Urbanization	-0.023 (0.39)	-0.033 (0.55)	0.134** (3.19)	0.090 (1.66)	-0.068 (0.90)	-0.087 (0.93)	-0.042 (0.33)	-0.060 (0.51)	0.184* (2.25)	0.101 (0.87)	-0.113 (0.76)	-0.151 (0.83)	0.013 (0.75)	0.013 (0.79)	0.124* (2.34)	0.056 (0.95)	-0.042 (1.95)	-0.049 (1.27)
Unitary Country	7.116 (1.94)	6.328 (1.68)	6.469** (4.42)	3.742* (2.29)	12.155** (2.86)	11.209* (2.24)	10.812 (1.41)	9.043 (1.21)	9.112** (3.21)	4.115 (1.17)	23.251** (2.76)	21.425* (2.19)	2.328** (3.16)	1.939* (2.12)	3.764* (2.73)	1.341 (1.01)	2.013 (1.50)	1.710 (1.30)
OECD Country	4.952 (0.47)	4.561 (0.89)	- -	- -	- -	- -	15.759 (0.70)	11.286 (1.05)	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
OECD Country × Decentralization	-0.635 (1.04)	-0.810 (1.85)	- -	- -	- -	- -	-1.547 (1.18)	-1.755 (1.94)	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Constant	-12.720 (1.77)	-12.780 (1.52)	-5.162 (1.14)	1.440 (0.28)	-19.849** (3.22)	-20.971* (2.54)	-17.350 (1.15)	-16.155 (0.96)	3.255 (0.39)	14.186 (1.30)	-36.029** (2.91)	-37.932* (2.32)	-1.472 (0.69)	-0.629 (0.21)	-4.642 (0.78)	3.660 (0.70)	-3.424 (1.83)	-4.317 (1.53)
Observations	214	186	70	62	144	124	214	186	70	62	144	124	144	126	51	44	93	82
Number of countries	74	70	23	22	55	51	74	70	23	22	55	51	57	53	21	19	40	37
R-squared	0.651	0.593	0.954	0.935	0.557	0.437	0.657	0.632	0.960	0.931	0.612	0.516	0.885	0.887	0.957	0.927	0.845	0.748

Absolute value of robust z-statistics is given in parentheses.
In each regression model we include a set of time dummies, but we do not report the coefficients on those dummies.
* and ** denote significance at 5% and 1% level respectively.
The instrumental variables for decentralization and the interaction term of decentralization and OECD dummy variables are ethnic, language and religion fractionalization indices.

FIGURE 1
The Main Components of Public Sector Employment According to ILO

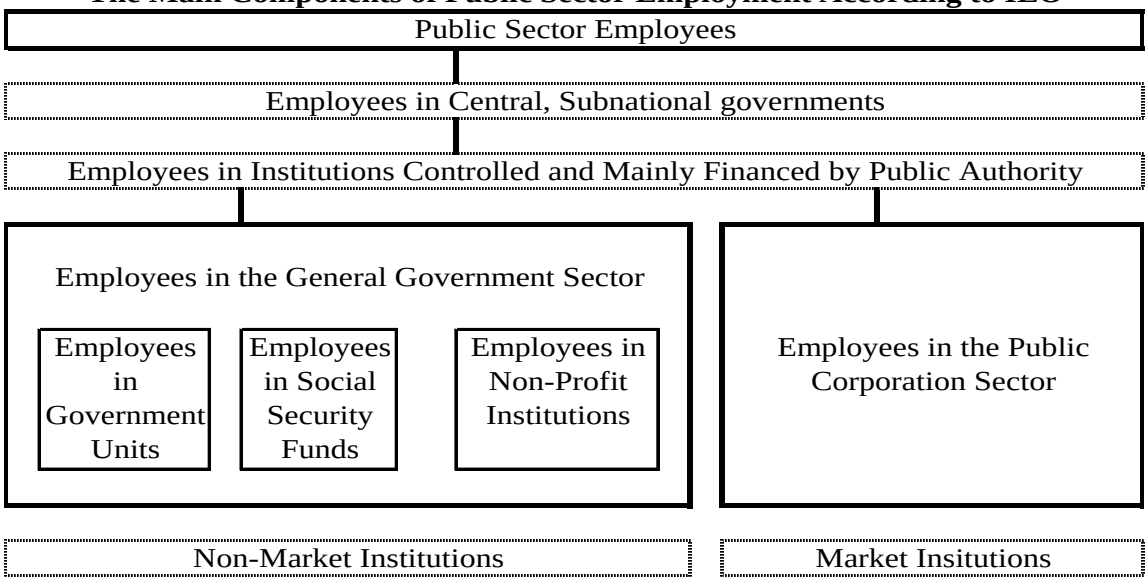


FIGURE 2
Time Trend of Unwieghted Average of Total Public Sector Employment as % of Population

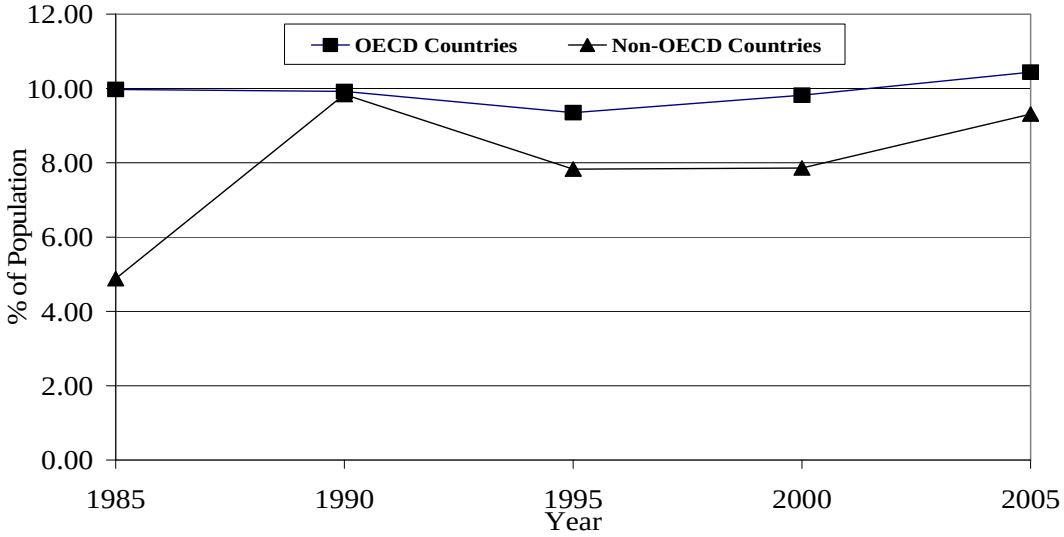
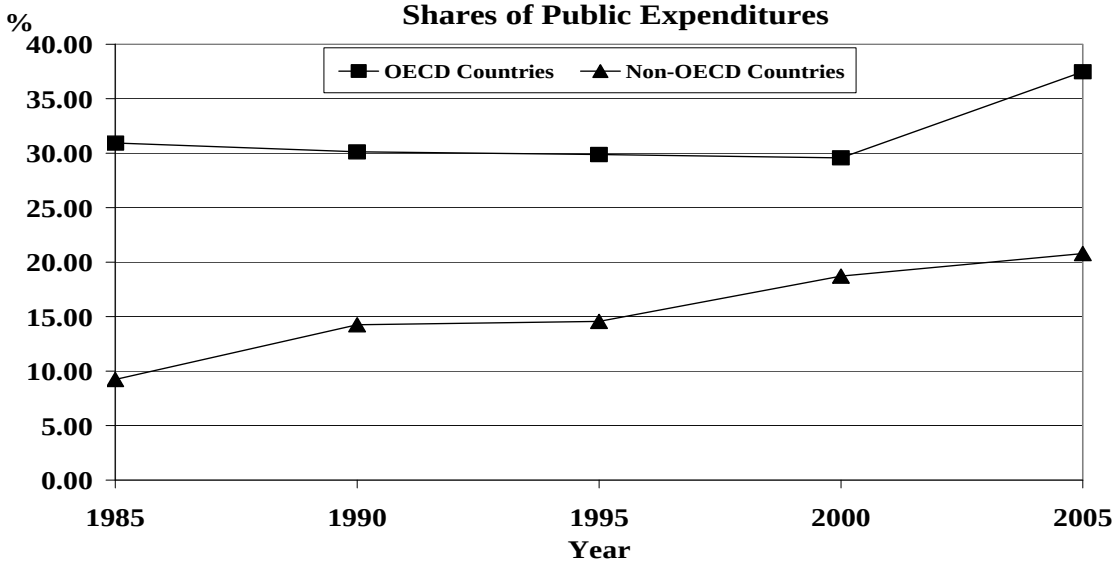


FIGURE 3
Time Trend of Unweighted Average Level of Subnational Shares of Public Expenditures



APPENDIX A
Total Public Sector Employment (% of Total Population)

Country	OECD Country[a]	Unitary Country[b]	1985	1990	1995	2000	2005
Albania	0	1			8.58	6.96	
Argentina	0	0				3.55	4.28
Australia	1	0	10.8	10.54	8.75	7.79	7.46
Azerbaijan	0	1			27.08	19.96	
Bahrain	0	1		13.05			
Belarus	0	1		35.11	25.82	25.35	23.79
Belgium	1	0	9.13	9.62	10.08	10.23	
Bolivia	0	1			2.81	2.63	
Botswana	0	1		5.66	6.44		
Brazil	0	0		5.22	5.01	4.65	
Bulgaria	0	1				15.24	9.41
Burkina Faso	0	1	0.45	0.41			
Canada	1	0	11	11.23	10.27	9.25	9.15
Chile	0	1				3.33	3.49
China	0	1			9.56	8.42	
Colombia	0	1		1.3	1.17	1.08	
Costa Rica	0	1			5.19	4.62	5.25
Croatia	0	1				15.68	12.25
Cyprus	0	1	6.9	7.31	8.18	7.99	
Czech Republic	1	1				10.89	10.47
Denmark	1	1				17.76	17.34
Dominican Republic	0	1			3.62	4.07	
Ecuador	0	1		4.19	3.52	3.2	
Estonia	0	1			16.51	13.82	
Ethiopia	0	0			1.31		
Fiji	0	1	5.82	5.83			
Finland	1	1	13.87	14.34	12.34	12.16	
France	1	1				11.04	
Georgia	0	1				11.3	9.17
Germany	1	0			8.79	8.22	
Greece	1	1	7.55	7.82	7.89	7.87	
Guatemala	0	1	1.46	1.6	1.61	1.51	
Hungary	1	1			7.92	9.26	
India	0	0	2.35	2.3	2.19	1.98	
Iran, Islamic Rep. of	0	1	7.9	8.4		6.89	5.67
Ireland	1	1		7.73	7.88	7.77	
Italy	1	1		6.65	6.46	6.36	
Kazakhstan	0	1				11.41	
Kenya	0	1	3.65	3.17	2.68	2.35	
Kyrgyzstan	0	1				8.66	7.21
Latvia	0	1			16.3	14.82	13.62
Lithuania	0	1			16.1	14.76	
Madagascar	0	1		1.08	0.92	0.74	
Malawi	0	1	1.89	1.49	1.55		
Malaysia	0	0	4.76	4.12	3.47	3.26	
Mauritius	0	1	8.35	8.21	7.78	7.36	
Mexico	1	0		5.85	5.22	4.95	
Moldova, Republic of	0	1		29.98		9.75	8.53
Netherlands	1	1			9.63	10.2	
New Zealand	1	1	6.62	8.79	6.86	6.34	
Norway	1	1			18.52	18.69	
Panama	0	1	7.12	5.93	5.77	5.49	
Paraguay	0	1			3.03	3.03	
Philippines	0	1	3.23	3.29	3.18	2.98	
Poland	1	1		23.61	14.45	12.83	9.98
Romania	0	1		34.31	24.54	17.78	10.19
Russian Federation	0	0		42.4		16.58	
Senegal	0	1				1.04	
Slovakia	1	1			16.51	13.39	10.47
Slovenia	0	1			12.18	12.18	11.94
South Africa	0	0			4.42	4.13	
Spain	1	0	4.71	5.44	5.67	5.94	
Sri Lanka	0	1	4.73	4.22	4.18	4.12	
Sweden	1	1	19.55	19.55	14.48	13.96	
Switzerland	1	0	8.41	9.72	9.36	8.37	8.19
Thailand	0	1	3.28	3.49	4.26	4.28	4.45
Trinidad and Tobago	0	1	12.39	10.65	10.39	9.97	
Uganda	0	1			0.8	0.69	
Ukraine	0	1				15.96	10.43
United Kingdom	1	1	11.06	10.05	9.25	8.89	
United States	1	0	7.01	7.48	7.48	7.27	
Uruguay	0	1			7.22	5.9	
Venezuela, Bolivarian Rep. of	0	0			6.43	5.91	
Zimbabwe	0	1	3.8	3.43	2.76	2.66	

a. 1 indicates OECD country and 0 otherwise. Mexico (1994), Czech Republic (1995), Hungry (1996), Poland (1996), and Slovakia (2000) became OECD members during the sample period.
b. 1 indicates unitary country and 0 otherwise.

Appendix B

Footnote 12:

The utility maximization problem for the governor of jurisdiction i is defined as:

$$\max_{\{m_i\}} E(V_i) = f(m_i) - (1-\sigma)\cdot\pi(c_i) \qquad \text{subject to} \quad c_i = \frac{n\cdot m_i \cdot (1+\beta/\alpha)}{\theta\cdot\overline{R}} - 1.$$

Solving the utility maximization problem, we have the following first order condition:

$$\frac{\partial E(V_i)}{\partial m_i} = f'(m_i) - (1-\sigma)\cdot\pi'(c_i)\cdot\left[\frac{n\cdot(1+\beta/\alpha)}{\theta\cdot\overline{R}}\right] = 0.$$

Since $f'(m_i^*)>0$, $(1-\sigma)>0$ and α, β and r_i are all positive, we have $\pi'(c_i^*)>0$.

Because $\pi(c_i)$ is a positive and convex function for $c_i>0$ and $\pi(c_i)=0$ as $c_i\le 0$, the inequality $\pi'(c_i^*)>0$ implies $c_i^*>0$.

Footnote 13:

In equilibrium, we have $c_i^* = \frac{n\cdot m_i^*\cdot(1+\beta/\alpha)}{\theta\cdot\overline{R}} - 1$. Therefore, $\frac{\partial c_i^*}{\partial\sigma} = \frac{n\cdot(1+\beta/\alpha)}{\theta\cdot\overline{R}}\cdot\frac{\partial m_i^*}{\partial\sigma}$. The sign of $\frac{\partial c_i^*}{\partial\sigma}$ is determined by the sign of $\frac{\partial m_i^*}{\partial\sigma}$. Let function F denotes the first order condition of the utility maximization problem of the subnational governor in jurisdiction *i*, and we have

$$F = \frac{\partial E(V_i)}{\partial m_i} = f'(m_i) - (1-\sigma)\cdot\pi'(c_i)\cdot\left[\frac{n\cdot(1+\beta/\alpha)}{\theta\cdot\overline{R}}\right] = 0.$$

Applying the implicit function theorem, we have

$$\frac{\partial m_i^*}{\partial\sigma} = -\frac{\partial F/\partial\sigma}{\partial F/\partial m_i} = -\frac{\pi'\cdot\frac{n\cdot(1+\beta/\alpha)}{\theta\cdot\overline{R}}}{f''-(1-\sigma)\cdot\pi''\cdot\left[\frac{n\cdot(1+\beta/\alpha)}{\theta\cdot\overline{R}}\right]^2} > 0.$$

Since $\frac{\partial m_i^*}{\partial \sigma} > 0$, we know $\frac{\partial c_i^*}{\partial \sigma} > 0$.

Footnote 16:

Inserting the constraint $c_i^* = \frac{n \cdot m_i^* \cdot (1+\beta/\alpha)}{\theta \cdot \overline{R}} - 1$ into the central government executive's utility maximization objective function, we have

$$\max_{\{\theta\}} E(V_c) = g(1-\theta) - \sigma \sum_{i=1}^{n} \pi \left(\frac{n \cdot m_i^* \cdot (1+\beta/\alpha)}{\theta \cdot \overline{R}} - 1 \right).$$

The corresponding first order condition is

$$\frac{\partial E(V_c)}{\partial \theta} = -g'(1-\theta) - \sigma \sum_{i=1}^{n} \pi' \cdot \frac{n \cdot (1+\beta/\alpha)}{\theta \cdot \overline{R}} \cdot \left(\frac{\partial m_i}{\partial \theta} - \frac{m_i}{\theta} \right) = 0.$$

We assume that the second order condition is satisfied for this utility maximization problem. The optimal degree of fiscal decentralization to the central government executive's utility maximization problem can be shown as $\theta^* = \theta(\sigma, \alpha, \beta, n, \overline{R})$.

Footnote 20:

Let function F denotes the first order condition of the utility maximization problem of the subnational governor in jurisdiction *i*, and we have

$$F = \frac{\partial E(V_i)}{\partial m_i} = f'(m_i) - (1-\sigma) \cdot \pi'(c_i) \cdot \left[\frac{n \cdot (1+\beta/\alpha)}{\theta \cdot \overline{R}} \right] = 0.$$

Applying the implicit function theorem, we have

$$\frac{\partial m_i^*}{\partial \theta} = -\frac{\partial F / \partial \theta}{\partial F / \partial m_i}$$

$$= -\frac{-(1-\sigma)\cdot\left[\pi''\cdot\frac{n\cdot(1+\beta/\alpha)}{\theta\cdot\overline{R}}\cdot\left(-\frac{n\cdot m_i\cdot(1+\beta/\alpha)}{\theta^2\cdot\overline{R}}\right)+\pi'\cdot\left(-\frac{n\cdot(1+\beta/\alpha)}{\theta^2\cdot\overline{R}}\right)\right]}{f''-(1-\sigma)\cdot\pi''\cdot\left[\frac{n\cdot(1+\beta/\alpha)}{\theta\cdot\overline{R}}\right]^2} > 0.$$

The inequality implies the level of subnational public employment increases with the degree of fiscal decentralization.

We assume that there is no budget deficit problem at the central government, and, therefore, the total expenditure for the central government $(1-\theta)\cdot\overline{R}$. Since there are only two inputs in the production function of public goods, the total expenditure of the central government can be expressed as $m_c^*\cdot(1+\beta/\alpha)$. Given the no central government deficit problem assumption, we have $m_c^* = \frac{\alpha\cdot\overline{R}}{\alpha+\beta}\cdot(1-\theta^*)$. From this we can see the that level of central government employees, m_c^*, moves inversely with the level of fiscal decentralization, θ^*.

Footnote 27:

First, we show that the subnational government employee level of a country is positively correlated to the value of σ. Applying implicit function theorem to the first order condition of the utility maximization problem of the subnational governor in jurisdiction *i*, we have

$$\frac{\partial m_i^*}{\partial \sigma} = -\frac{\partial F / \partial \sigma}{\partial F / \partial m_i} = -\frac{\pi' \cdot \frac{n \cdot (1+\beta/\alpha)}{\theta \cdot \overline{R}}}{f'' - (1-\sigma) \cdot \pi'' \cdot \left[\frac{n \cdot (1+\beta/\alpha)}{\theta \cdot \overline{R}}\right]^2} > 0 .$$

Next, we want to show that the central government employee level is negatively correlated to the value of σ. Since $m_c^* = \frac{\alpha \cdot \overline{R}}{\alpha + \beta} \cdot (1 - \theta^*)$, we have

$$\frac{\partial m_c^*}{\partial \sigma} = -\frac{\alpha \cdot \overline{R}}{\alpha + \beta} \cdot \frac{\partial \theta^*}{\partial \sigma} .$$

By the chain rule, we have

$$\frac{\partial \theta}{\partial \sigma} = \frac{\partial \theta}{\partial m_i} \cdot \frac{\partial m_i}{\partial \sigma} .$$

We have shown that $\frac{\partial m_i}{\partial \sigma} > 0$ above and $\frac{\partial m_i^*}{\partial \theta} > 0$ in footnote 19, which implies that $\frac{\partial \theta}{\partial \sigma} > 0$. Since $\frac{\partial m_c^*}{\partial \sigma} = -\frac{\alpha \cdot \overline{R}}{\alpha + \beta} \cdot \frac{\partial \theta^*}{\partial \sigma}$, we know that $\frac{\partial m_c^*}{\partial \sigma} < 0$.