Decentralized Governance and Preferences for Public Goods.

Arze del Granado, F. Javier and Martinez-Vazquez, Jorge and McNab, Robert M.

International Monetary Fund, Andrew Young School of Policy Studies, Georgia State University, Naval Postgraduate School

18 October 2012

Decentralized Governance and Preferences for Public Goods

F. Javier Arze del Granado
International Monetary Fund
700 19th St. N.W.,
Washington D.C. 20431
202-623-9642
E: farzedelgranado@imf.org

Robert M. McNab (Contact Author)
Defense Resources Management Institute and
Global Public Policy Academic Group
Naval Postgraduate School
699 Dyer Road, Bldg 234
Monterey, CA 93933
831-656-3132
E: rmmcnab@nps.edu

Jorge Martinez-Vazquez
Economics Department and International
Center for Public Policy
Andrew Young School of Policy Studies
Georgia State University
Atlanta, GA 30303
404-651-3990
E: jorgemartinez@gsu.edu

Abstract

The theoretical and policy literature on decentralization has long asserted since Oates (1972) that decentralized governance increases allocative efficiency in the public sector. But, despite the colossal growth in the literature on decentralization and fiscally decentralized systems in the real world over the past four decades, this hypothesis has gone untested, largely because of the difficulties of deriving measures of allocative efficiency. In this paper we offer an indirect test of the allocative efficiency hypothesis by examining how decentralized governance affects the expression of preferences for public goods. Specifically, we examine the relationship between fiscal decentralization and the functional composition of public expenditures. Using a distance-sensitive representative agent model, we hypothesize that higher levels of fiscal decentralization induce agents to demand increased production of publicly provided private goods. We test this hypothesis using an unbalanced panel data set of 59 developed and developing countries covering a 30-year period. We find that expenditure decentralization positively and significantly influences the share of health and education expenditures in the consolidated government budgets; this finding is robust across multiple estimators. Decentralized governance thus appears to alter the composition of public expenditures towards publicly provided private goods.

Keywords: Fiscal Decentralization, Functional Composition, Pure Public Goods, Publicly Provided Private Goods, Education, Health

JEL classification: H30, H50

Decentralized Governance and Preferences for Public Goods

Abstract

The theoretical and policy literature on decentralization has long asserted since Oates (1972) that decentralized governance increases allocative efficiency in the public sector. But, despite the colossal growth in the literature on decentralization and fiscally decentralized systems in the real world over the past four decades, this hypothesis has gone untested, largely because of the difficulties of deriving measures of allocative efficiency. In this paper we offer an indirect test of the allocative efficiency hypothesis by examining how decentralized governance affects the expression of preferences for public goods. Specifically, we examine the relationship between fiscal decentralization and the functional composition of public expenditures. Using a distance-sensitive representative agent model, we hypothesize that higher levels of fiscal decentralization induce agents to demand increased production of publicly provided private goods. We test this hypothesis using an unbalanced panel data set of 59 developed and developing countries covering a 30-year period. We find that expenditure decentralization positively and significantly influences the share of health and education expenditures in the consolidated government budgets; this finding is robust across multiple estimators. Decentralized governance thus appears to alter the composition of public expenditures towards publicly provided private goods.

1. Introduction

The application of fiscal decentralization reforms and demand for fiscal decentralization policy design has grown significantly in developed and developing countries in the past three decades (Bird, Ebel, & Wallich, 1995; Campbell, 2003; Dillinger, 1994; Martinez-Vazquez & McNab, 2003; Martinez-Vazquez & Vaillancourt, 2010; Oates, 2005). Diverse economic and political factors, from the pursuit of increased economic efficiency to the expansion of democratic governance, have driven this wave of decentralization reforms (Arzaghi & Henderson, 2005; Shah & Chaudhry, 2004). Researchers and policymakers alike have promoted decentralization reform agendas on the premise that decentralization results in a more efficient allocation of public goods by enabling local governments, which have better information, to tailor more closely their public spending decisions to the needs and preferences of their constituencies (Oates, 1972, 1999). Theoretically, a significant body of work suggests that fiscal decentralization, under certain conditions, promotes allocative efficiency (Diamantaras & Gilles, 1996; Mas-Colell, 1980; Oates, 1972; Rubinfeld, 1987). However, despite the growth in decentralization literature over the past four decades, this basic hypothesis has gone untested, largely because of the difficulties of deriving measures of allocative efficiency.[1]

While efficiency increases in public service delivery have been attributed to fiscal decentralization programs (Alderman, 1998; de Sousa Santos, 1998; Galasso & Ravallion, 2005; King & Ozler, 1998), the complexity of generating standardized measurements of allocative

---

[1] In contrast, there is a very large literature measuring the impact of decentralization on an array of economic variables, such as economic growth or poverty, and institutional variables, such as corruption or voters' participation. Part of this literature also looks at the impact of fiscal decentralization on public service delivery outcomes in education, public health and so on. For a recent survey, see Martinez-Vazquez (2011). A considerable share of this literature can be interpreted as examining the productive efficiency (as opposed to allocative efficiency) of fiscally decentralized governance. The emphasis in Oates (1972) and the subsequent theoretical literature was not to claim that decentralized systems can deliver cheaper services (production efficiency) but that they can deliver the right services better matching the preferences of voters (allocative efficiency) vis-à-vis the case of centralized delivery.

efficiency across countries has handicapped empirical research on the hypothesized impact of decentralization on allocative efficiency. Implicit in the argument that decentralization can increase allocative efficiency, however, is the implication that a change in the level of decentralization is likely to alter the composition of public expenditures. In comparison to using direct measures of allocative efficiency, examining the relationship between fiscal decentralization and composition of public expenditures is relatively straightforward.

Recent papers have considered the determinants of the composition of public expenditures (Barro, 1990; Devarajan, Swaroop, & Zou, 1996; Fan & Rao, 2003; Sanz & Velázquez, 2004; Shelton, 2007; Shonchoy, 2010). While this literature offers insight on the determinants of the composition of public expenditures, none of these studies explicitly examines the potential influence of fiscal decentralization on expenditure composition and its link to allocative efficiency. An emerging literature, however, studies the influence of decentralization on expenditure composition (Alegre, 2010; Ashworth, Galli, & Padovano, 2009; Busemeyer, 2008; Faguet, 2004; Fiva, 2006; Kwon, 2003). This paper surveys and extends this literature.

The main goal of this paper is to offer an indirect test of decentralization's allocative efficiency effects by examining its role in the composition of public expenditures. First, we explore the theoretical linkages between decentralized governance and expenditure composition by means of a distance-sensitive representative agent model. Then we estimate the impact of fiscal decentralization on the level and functional composition of public expenditures using an unbalanced panel data set spanning 59 developed and developing economies over a period of 30 years.

The remainder of the paper is organized as follows. In the following section, we briefly review the two strands of literature on the determinants of the composition of public expenditure and, more specifically, the impact of fiscal decentralization on expenditure composition. In the third section, we develop a distance-sensitive representative agent model to explore the potential influence of decentralization on expenditure composition. The fourth section discusses the data and presents the estimation results. In the last section of the paper, we conclude and offer suggestions for future research.

2. Review of the Literature

Over the last two decades, a large literature has developed on the relationship between the composition of public expenditures and a variety of macroeconomic variables, including welfare and human capital, income inequality, macroeconomic stability, fiscal competition, globalization and economic growth (Aschauer, 1989; Brueckner, 2006; Devarajan et al., 1996; Dreher, Sturm, & Ursprung, 2006; Gupta, Clements, Baldacci, & Mulas-Granados, 2002; Matovu, 2000; Sanz & Velázquez, 2004; Turnovsky & Fisher, 1995). In addition, several authors have examined whether there is empirical evidence to support Wagner's Law on rising public expenditures (Akitoby, Clements, Gupta, & Inchauste, 2006; Durevall & Henrekson, 2011; Shelton, 2007; Shonchoy, 2010; Zaghini & Lamartina, 2008) while others have examined the influence of corruption on the composition of expenditures (Gupta, de Mello, & Sharan, 2001; Mauro, 1998).

The contributions are fewer with respect to our narrower interest in the question of whether fiscal decentralization influences the composition of public expenditures. A strand of the literature has researched whether fiscal decentralization would result in the concentration of

public expenditures on the provision of services related to poverty alleviation (Bird & Vaillancourt, 1998; Fox, 1995; Fox & Aranda, 1996). Decentralization in Bolivia from 1991 to 1996, for example, resulted in increased investment in socially oriented sectors, such as education, urban development, water and sanitation, and health care (Faguet, 2001). In addition, the empirical evidence suggests that decentralization unambiguously increased education expenditures in OECD countries (Busemeyer, 2007). However, the impact of decentralization on healthcare or social security expenditures in OECD countries remains an unsettled question (Ashworth et al., 2009; Busemeyer, 2008; Ezcurra & Rodríguez-Pose, 2011). Health and education expenditures may also be pro-cyclical during periods of economic expansion and relatively acyclical during recessionary periods (Arze del Granado, Gupta, & Hajdenberg, 2012) There is much less evidence on the influence of decentralization on expenditure composition in developing countries.

Thus the evidence to date is suggestive of a relationship between fiscal decentralization and the functional composition of public expenditures. In this paper we first provide a theoretical basis for the argument that shifts in the composition of public expenditures under decentralization is reflective of improved allocative efficiency through improved matching of subnational preferences. Second, in our empirical analysis, we expand and improve the empirical literature on the impact of decentralization on public expenditure composition providing an indirect test of the impact of decentralization on allocative efficiency.

3. Modeling the Relationship between Decentralization and Expenditure Composition

The theoretical framework in this section stresses the potential heterogeneous nature of tastes among individuals residing in different jurisdictions as a fundamental factor of the relationship between fiscal decentralization and the composition of public expenditures.

We rely on a theoretical model that focuses only on a "representative" median-voter. We note, however, that the literature has criticized the application of this type of model to decentralization issues because representative-agent models have largely ignored the heterogeneity of individual preferences.[2] We, however, employ a distance-sensitive utility function that allows us to assume that all individuals have the same general utility, but "each one of them" has a different preferred type of public good with independent quantity preferences. Intuitively, we interpret the distance between individuals as a measure of their variation in preferences. The further an individual is from the median voter, the greater their dissatisfaction with the median voter's decision, and the less utility they derive from the provision of the public good in question.

Previous work has employed distance-sensitive utility functions with one public and one private good (Alesina, Baqir, & Easterly, 1999; Alesina, Baqir, & Hoxby, 2004; Alesina & Spolaore, 1997; Panizza, 1999). In our theoretical framework, we extend the distance-sensitive representative agent model to an economy with two levels of government and two types of publicly provided goods. This allows us to explicitly provide a link between the representative agent's utility and the composition of national and subnational public expenditures.

More specifically, we extend from a uni-dimensional to a multi-dimensional voting framework Alesina, Baquir, and Easterly's (1999) result that the optimal amount of publicly provided goods is a function of the "median distance from the median." We further base our

---

[2] Fundamentally, decentralization would not make much sense if we assume that all individuals have identical preferences as representative-agent models often assume (Kirman, 1992; Martinez-Vazquez & McNab, 2003).

model of heterogeneous preferences on two additional assumptions: a) individuals are uniformly distributed along a country area, and b) individual utility accrued from any given public good is decreasing on distance to the middle of the country or jurisdiction that provides it.

Thus, let us assume that individuals are uniformly distributed along a country with area A, population N, and J local governments (where $J > 1$). Each agent consumes three types of goods: one private good (C) and two publicly provided goods: S, a Samuelsonian pure public good (PPG) provided solely by the central government and G, a publicly-provided private good ($PPPG$) whose provision is divided between the central government and local governments. The letters c, s, and g, respectively, represent the per capita consumption of these goods. For simplicity, we assume an exogenous level of centralization (θ) that is equal to the fraction of the PPPG provided by the central government.[3] Education and national defense are examples of a PPPG and a PPG, respectively.[4]

We assume that each individual has a set of characteristics that determine their preferred type and quantity of the PPG and PPPG.[5] The median voter at the national and local level (med^s, med^g) democratically decides the type and quantity of each public good. For this reason, it is possible that there may be a separate "type median voter" and "quantity median voter" for each public good. In order to ensure the median voter result in the presence of multidimensional issues, we must assume that: a) individuals vote on one issue at a time and b) individuals have separable preferences.[6]

---

[3] Deriving an optimal level of centralization would require the specification of a government objective function and the determinants of fiscal decentralization. See, for example, Panizza (1999).

[4] There may be disagreement with the choice of these two examples, but in essence we assume there are PPPG subject to "crowding," as opposed to PPG, which are not.

[5] For example, education is a publicly provided good that can be clearly categorized into different types based on the characteristics of the educational curriculum of schools. Some educational programs may impart certain religious beliefs and practices while others may be mainly focused on the development of the musical abilities of the students.

[6] Enelow & Hinich (1984) show that under these assumptions cycling-- related to simultaneous multidimensional voting-- is avoided and that the outcome of majority voting is the optimum alternative of the median voter on each

We further assume that individuals are uniformly distributed, Tiebout-sorted, and pay a lump sum tax t on the same income y.[7] Each type of PPG is located on an ideological Euclidean space that captures individual preferences and represents the area of the country.[8] We assume that voters' optima are evenly distributed over the space, that the number of voters is large enough so that the space can serve as a proxy for the voters, and that the country size area is normalized at one with no loss of generality.[9] The distribution of individuals is such that each alternative can be uniquely mapped in the Euclidean space.

Based upon these assumptions, individual i's utility function is given by:

$$U_i = s_i^{1-\alpha\, y_{ic}}\, g_i^{(1-\alpha(\theta\, x_{ic}+(1-\theta)x_{ij}))}\, c_i^{\beta} \qquad (1)$$

where $s,\ g,\ c$, and θ are as defined previously; y_{ic} is individual i's distance to the middle of the country measured on the PPG axis; x_{ic} is individual i's distance to the middle of the country measured on the PPPG axis; and x_{ij} is individual i's distance to the middle of the jurisdiction where he resides measured over the PPPG axis. The parameter α, where $0 \le \alpha \le 1$, measures preference heterogeneity, that is as α approaches 0, preferences become relatively more homogenous.

The public budget constraint is $T = G + S$, where T represents general (central plus subnational) tax revenue and p_g and p_s are normalized to one.[10] The representative agent's budget

---

issue. Note that we do not consider any distortions to the democratic process in the model as the capture of the democratic process at the local and national level in Bardhan & Mookherjee (2000) or how the democratic process may be offset by Leviathan local and central governments as in Panizza (1999).

[7] Income distribution issues are assumed away, not because they are considered unimportant, but in order to isolate the locational efficiency effects of decentralized decision-making (Wildasin, 1991, 1994).

[8] This is an extension of the multidimensional problem (Alesina & Spolaore, 1997).

[9] These assumptions have been used in several other studies that use a Euclidean space as an analytical tool for spatial analysis (Davis, DeGroot, & Hinich, 1972; Plott, 1967; Tullock, 1967).

[10] The maximization of individual utility subject to the individual after tax income constraint allows us to find the optimal demand for public goods. Note that the individual after tax income is independent of the level of government providing the good and of the location of the individual. The assumptions that an income lump sum finances all public goods and that all individuals have equal income guarantee independence. Also note that we do

constraint is $y = s + g + c$ or $y = c + t$. Let $\delta_i = 1 - \alpha (\theta x_{ic} + (1-\theta) x_{ij})$ and $\gamma_i = 1 - \alpha y_{ic}$, then the

maximization of the individual's utility function with respect to the budget constraint generates

the following demand functions:

$$g_i = \frac{\delta_i y}{\delta_i + \gamma_i + \beta} \; ; \; s_i = \frac{\gamma_i \, y}{\delta_i + \gamma_i + \beta} \; ; \; c_i = \frac{\beta \, y}{\delta_i + \gamma_i + \beta} \tag{2}$$

We can employ the Euclidean distance between two points to measure each individual's

distance between their preferred types of PPPGs and those actually provided. Let $\| z - z^m \| = c$ be

part of a circle on which each point $z = (y_1, x_1)$ has a constant Euclidean distance to the point of

the type-median's location $z^m = (y_m, x_m)$. As illustrated in Figure 1, for each individual located on

the circle, there exists another individual with exactly the same horizontal and vertical distance

to the center of the circle. Individuals with the same horizontal and vertical distances to the type-

median will demand the same quantity of each good.[11]

Given symmetric preferences, the location of the median voter's preferred quantity is at a

distance equal to the 'median distance to the median' along the horizontal axis. For a country

with area A, the median distance to the median is $Ax/4$. Let $\delta_k = 1 - \alpha (\theta x^m_{kc} + (1-\theta) x^m_{kj}) > 0$

and $\gamma_k = 1 - \alpha y_{kc} > 0$, y^m_{kc} be the median distance to PPG type-median, x^m_{kc} be the median

distance to the PPPG country type-median, and x^m_{kj} be the median distance to the PPPG

jurisdiction type-median. Using (2) we can express the quantities of g and s provided at

equilibrium as:

---

not include any assumptions related to the production of public goods, such as costs differentials, or shared tax
sources between levels of government (Caplan, 2001; Faguet, 2004; Nechyba, 1997; Wrede, 2000).
[11] This is as opposed to individuals with same Euclidean distance to type median, who will not all demand the same
quantity of public goods. In Figure 1 all points in the circle have the same Euclidean distance to the middle.
However, just the pairs of points situated exactly in opposite sides of the circle have same horizontal and vertical
distances to the middle.

$$g*_k = \frac{\delta_k y}{\delta_k + \gamma_k + \beta}; \quad s*_k = \frac{\gamma_k y}{\delta_k + \gamma_k + \beta} \qquad (3)$$

From (2) and (3), we develop four propositions which we test empirically in the following section. We summarize the decision-making mechanism for both type and quantity of both types of public goods in Table A.1 in Appendix 1 and present, where applicable, the proofs of the propositions in Appendix 2.

Propositions on Centralization and the Composition of Public Expenditure

Given the heterogeneous preferences, as the centralization level increases the number of dissatisfied individuals with respect to the PPPG's type increases accordingly. All else being equal, demand for PPPG expenditure is inversely related to the level of centralization. Conversely, demand for PPG expenditure is positively related to the level of centralization as individuals substitute away from PPPGs towards the centrally provided PPG. The following propositions summarize these results.

Proposition 1: PPPG equilibrium quantity is decreasing in the centralization level, that is,
$$\delta g^*_k / \delta\theta < 0.$$

Proposition 2: PPG equilibrium quantity is increasing in the centralization level, that is,
$$\delta s^*_k / \delta\theta > 0.$$

The intuition of Proposition 1 is simple. In a more centralized country there will be more unhappy individuals with the chosen PPPG's type. As a result, overall demand and support for this kind of expenditure will be smaller, other things equal, than in a more decentralized country. Given that PPGs are provided centrally, the country's median voter will decide the quantity of each PPG. The median voter's decision on the provision of the PPG is inversely related to the median distance to the country median. Likewise, local governments provide a share of PPPG expenditure and the median vote of each jurisdiction decides the quantity of each PPPG. This

decision is inversely related to the median distance to the jurisdiction median. If more than one jurisdiction exists, the median distance to the country median is greater than the median distance to the jurisdiction median. Thus, the more decentralized the provision of public goods, the higher the demand for PPPGs relative to PPGs. As the level of decentralization increases, the provision of PPGs declines at a faster rate than the PPPGs increase, thus, the total level of public expenditure also declines. Intuitively, decentralized provision of public goods allows local governments to provide combinations of goods to each jurisdiction, as opposed to providing a whole package to all jurisdictions in the country like the central government may be forced to do (due to lack of knowledge on local preferences or other constraints).[12] The following propositions summarize these results.

Proposition 3: PPPG share of total expenditure is decreasing in the centralization level, that is,
$$\delta(g/(g+s))/\ \delta\theta < 0.$$

Proposition 4: Total public expenditure is increasing in the centralization level, that is,
$$\delta(g+s)/\ \delta\theta > 0.$$

The interpretation of these results is again quite straightforward. First, the central government chooses the level of centralization for public good provision (exogenous in this model). Second, if the government centralizes the public good's provision, the preferences of the overall median voter will decide the "type." If, in contrast, each jurisdiction provides the public good, the type-median voter of each locality will decide the "type" of public good. Once jurisdiction decides the type of each kind of public good, individuals decide the quantity to be provided. Individuals demand more publicly provided goods the closer the type is to their individual preferences.

---

[12] Note that it may be possible to get the central government to provide different packages of PPPGs to different jurisdictions. The central government may be able to discriminate among jurisdictions with different packages of services (Besley & Coate, 2003; Lockwood, 2002). In this paper we keep the conventional assumption that central provision is homogenous for all jurisdictions.

Given the fact that the government centrally provides the pure public goods in our model, the overall median voted will decide the quantity of such goods. This decision is inversely related to the 'median distance to the country median.' Conversely, in our model, the local government provides a share of PPPG expenditures. The jurisdiction median voter decides the quantity of the PPPG. This decision is inversely related to the median distance to the jurisdiction median. In countries with more than just one jurisdiction, the median distance to the country median is higher than 'the median distance to the jurisdiction median.' This determines that the more decentralized the provision of public goods, the higher the demand for publicly provided private goods (as opposed to pure public goods). In other words, given the distribution of preferences, the more centralized the provision of goods, the lower the ratio of publicly provided private goods to the total amount of public goods provided.[13]

Intuitively, Proposition 4 suggests that decentralized provision of public goods allows local government to provide specific goods or combinations of goods to each jurisdiction, rather than needing to provide a whole package to all jurisdictions in the country, which the central government may be forced to do given an absence of knowledge on local preferences or otherwise (political) inability to discriminate among jurisdictions.[14] This specialization of public good provision implies a potentially lower level of total expenditures. Proposition 4 is also in line with several hypotheses in the decentralization literature. Alternative explanations include: a) decentralization can lead to lower expenditures arising from a reduction in redistribution expenditures as a result of Tiebout sorting, which would imply income-homogeneous

---

[13] That is, given our assumption of the spatial distribution of individuals across the country and the correspondence of location and preferences.
[14] But see footnote 21 above.

jurisdictions; this is an argument originally made by Musgrave (Oates, 1985)[15]; or b) decentralization constitutes a disciplining force that provides a closer link between revenues and spending (Brennan & Buchanan, 1980). What is novel in our result in Proposition 4 is that the shrinking effect of decentralization on overall public expenditures does not depend on fiscal competition, as in Brennan and Buchanan, or on the reduction of redistributional expenditures as noted by Musgrave. However, our results presuppose some sort of Tiebout sorting and the inability of the central government to offer different packages, or discriminate, across local jurisdictions (in contrast to the assumptions in Besley & Coate (2003) and Lockwood (2002)).

4. Empirical Analysis

We now turn to examining whether empirical support exists for the implications of our theoretical model. In this section we focus on testing the empirical validity of Proposition 3 on the relationship between decentralization and expenditure composition.[16]

Model Specification

To test Proposition 3, we define the dependent variable, *Comp*, as the ratio of education and health expenditures to total public expenditures. Thus, based upon our discussion in the previous section, we expect *a priori* that, all other things equal, more decentralized countries spend a higher share of their expenditures on education and health. In terms of the explanatory variables in the model, our main interest is on expenditure decentralization, *Dec*, which we measure as the share of subnational expenditures in total public expenditures.

---

[15] Income-homogenous jurisdictions may not be necessary for equilibrium to exist. Given heterogeneity of preferences and income, an allocation of households across communities may exist where stratification by income no longer holds (Epple & Platt, 1998).
[16] Testing the effects of decentralization on the equilibrium quantities of PPPG and PPG in Propositions 1 and 2 will involve very different data sets and we will perform this in future research. On the other hand, the public finance literature has tested the equivalent of Proposition 4 on many different occasions, especially in the case of the Leviathan model, with mixed results (Oates, 1985, 1989; Rodden, 2003).

A matrix **X** of control variables, includes population, population density, GDP per capita, and budget balance. We allow for potential differences in the impact of decentralization on expenditure composition in developing and developed countries by introducing an interaction term, *Dev*, between our decentalization measure and a dummy variable to capture OECD membership status. We employ panel data and thus specify the general estimation form as:

$$Comp_{i,t} = G\left(\alpha + \beta_1 DEC_{i,t} + \beta_2 Dev + \beta_3 X_{i,t} + \mu_i + \lambda_t + \upsilon_{i,t}\right) \qquad (4)$$

where *G(·)* is a transformation function we apply due to the fractional nature of the dependent variable (discussed below), and where μ_i and λ_t denote the unobservable individual country and time effects, respectively. The subscripts *i* and *t* denote country and time period, respectively.

Estimation Strategy

The estimation of equation (4) raises several economeric issues: the potential endogeneity of the fiscal decentralization variable, serial correlation, heteroscedasticity, the possibility of country and time-specific effects, and the fractional variable nature of the dependent variable. We employ three estimators to address these econometric issues and to examine whether our results are fragile with respect to alterations in our empirical approach. This approach replicates and extends the existing literature, especially with respect to the question of endogeneity.

We first examine the influence of fiscal decentralization on the composition of public expenditures using an error components estimator; this will also provide comparability with the earlier literature.[17] We examine the appropriateness of a random effects GLS estimator versus a fixed effects Within estimator. While we would prefer to employ a random effects estimator, as this would allow the inclusion of several time-inarviant variables (such as, ethnic

---

[17] Unlike previous analyses which rely primarily on OECD data (Sanz & Velázquez, 2004), our sample includes non-OECD members and we were unable to collect panel data for many of these countries with regards to population age structure. We are not certain of what effects that may have in our estimates, but previous studies have found none or little effect of population age structure on education spending (Fernandez & Rogerson, 1997; Poterba, 1997).

fractionalization, colonial tradition, religious preference), a modified Hausman test rejects the null hypothesis that the effects are orthognal to the independent variables suggesting the need to use fixed effects. We use Likelihood Ratio and F-tests to examine if the country and time-specific effects are jointly equal to zero and in all cases we reject the null hypothesis that the effects are jointly equal to zero. We thus include country and time-specific effects. We unambigously reject the null hypotheses of homoscedasticity and no-serial correlation and adrress these concerns using a two-step process and Windmeijer corrected standard errors[18].

In order to control for endogeneity of the fiscal decentralization variable, we employ system-GMM estimation (Arellano & Bover, 1995; Blundell & Bond, 1998).[19] Following Roodman (2008), we explicitly control for fixed time effects but do not include fixed individual country effects.[20] The short time series and the persistence effect of the dependent variable clearly support the extra moment conditions of the system-GMM versus the difference-GMM (Baltagi, 2008; Blundell & Bond, 1998). We test the validity of the moment conditions by using the Hansen J-test. We also test the hypothesis that the error term in the second order is not serially correlated using the Arellano-Bond test. The set of instruments in the System-GMM estimation was collapsed following the procedure proposed by Roodman (2008) to avoid the possibility of over fitting the endogenous variables.

---

[18] Following Wooldridge (2001), we strongly reject the null of no serial correlation (F(1,58)=107). Using a Breusch-Pagan test for heteroscedasticity, we also strongly reject the null of homogeneity (Chi Squared(1) =33.4).
[19] Estimates from the more commonly used differences Arellano-Bond (1991), behave poorly in datasets with a large number of cross sections and a small number of time periods, in particular in models with persistent series (Arellano and Bover, 1995; Blundell and Bond, 1998, Bond 2002). That is when the autoregressive parameter alpha on an AR(1) model increases towards unity. These authors suggest the use of System-GMM, a system that includes equations in levels as well as in differences simultaneously. GMM estimation instruments potentially endogenous or predetermined variable with their lags t-1 or earlier in the transformed equations; and with contemporaneous first differences in the levels equation.
[20] Roodman (2008) notes that including fixed individual (country) specific effects would be a mistake as this would induce a Within groups transformation which would result in dynamic panel data bias. Unlike the Within and GLS estimators, the system GMM estimator thus only includes fixed time effects.

Finally, we address the fractional variable nature of the dependent variable. The fiscal decentralization measure is constrained in the unit interval [0,1] and may not offer sufficient variation for estimation by OLS.[21] We follow Papke and Wooldridge by using a quasi-maximum likelihood estimator (QMLE), with fixed country and time specific effects, to guarantee that the predicted values of the dependent variable lie on the unit interval. With respect to the QMLE model, we control for serial correlation by correcting the estimated variance-covariance matrix. Utilizing the variance-covariance matrix is desirable as we are interested in examining a proposition in levels while the first differencing transformation would have changed the question under consideration to one of change-on-change. With respect to the fixed effects, the literature supports the argument that fully robust estimators work reasonably well even when the cross-sectional sample size is not especially large relative to the time series dimension (Wooldridge, 2001, 2003). Given the relatively small number of groups in our sample (N=59), the inconvenience of using a set of country dummies in order to control for unobserved country effects is not as great compared to the existing alternatives.[22]

The Data

One common difficulty faced in the cross-country study of fiscal decentralization is how to properly measure the extent of decentralization. Ideally, we would construct a panel data set from measures of fiscal decentralization that effectively quantify the activities of subnational governments resulting from their autonomous or independent decisions. This would require classifying those expenditures and revenues that are under the effective control of the central

---

[21] See Papke and Wooldridge (1996) for a discussion of this issue.
[22] In contrast to the within and random estimation methods for linear models, the literature on fixed and random effects for nonlinear models is limited. One theoretical approach to control for unobserved effects in nonlinear models is to maximize a conditional likelihood, for which the unobserved effects are integrated out. This is done through a conditional joint distribution (W. Greene, 2004; W. H. Greene, 2001; Hausman, Hall, & Griliches, 1984; Wooldridge, 2001). Despite these computational advances, in most models it is not always possible to remove the unobserved effects from the density, especially in estimations with continuous dependent variables.

government as central government activities, regardless of the level of government at which these expenditures occurred or similarly those revenues that are the control of the central government as transfers, and so on. Constructing such a panel data set from measures of the decentralization of expenditures would require information on the overall level of political, administrative and fiscal autonomy of subnational governments (Martinez-Vazquez & McNab, 2003). While more detailed data are available for a number of OECD countries (Stegarescu, 2005a, 2009), unfortunately, similar quality (and quantity) data are not readily available for a large number of developing countries. To examine the question of whether fiscal decentralization influences the composition of public across a sample of developed and developing countries, we are left with the standard, albeit imperfect, measure of fiscal decentralization based on expenditure (or revenue) ratio data. We define fiscal decentralization as the share of subnational government expenditures to general government expenditures.[23] We employ the International Monetary Fund's Government Finance Statistics Annual Yearbook (GFS) as the primary data source for expenditures of national and subnational governments.[24]

We would be remiss not to note that, due to a shift in recording methods, GFS data are not comparable across two distinct periods of time. From 1972 to approximately 2003 (depending upon when the country switched to accrual reporting), the GFS contained information on a cash basis. After 2003, the GFS records data on an accrual basis and there is no

---

[23] Several authors have noted the pitfalls associated with the conventional measurement of fiscal decentralization (Dreher, Sturm, & Ursprung, 2006; Ebel & Yilmaz, 2002; Fisman & Gatti, 2002; Fiva, 2006; Prud'homme, 1995; Stegarescu, 2005b). While some studies of fiscal decentralization have attempted to construct measures of decentralization net of grants and transfers and net of certain types of expenditures, we do not construct such measures, as we are not able to ascertain, with any degree of certainty, whether these techniques reduce or enhance the bias already present in our measures of fiscal decentralization.

[24] We use GFS data at the consolidated central government, regional and state government, and local government levels. For those countries that do not report consolidated central government data, we substitute data on the budgetary central government. Of the 180-plus potential countries in the GFS data set, we select countries that reported expenditures for at least the central government and at least one level of subnational government. We did not include those countries that stopped reporting expenditure information prior to 1990 and those countries whose reported data were mathematically inconsistent. We did include countries that reported zero or minimal expenditures for at least one subnational level of government.

existent method for reconciling the two subsets of data. For the purposes of this study, we employ the GFS data prior to the shift to accrual reporting.

Combining the GFS data with the data extracted from the other data sources reduced the size of the data set from approximately 1,500 to approximately 1,149 observations due to missing observations for some control variables in the World Development Indicators dataset. The final panel dataset covers 59 countries from 1972-2003, albeit with gaps. Table 1 presents the variables used in the empirical model and their sources. Tables 2 and 3 present descriptive statistics of these variables and the sample countries and time periods, respectively.

To test Proposition 3 regarding expenditure composition developed in the preceeding section, we need to classify observed public expenditures as either coming from pure public goods or from publicly provided private goods. We simplify this task by focusing on the identification of two public services as publicly provided private goods: education and health. Together these two services tend to represent a large share of decentralized expenditures in most countries. A standard technique to identify the degree of publicness of government services, used in studies related to the determinants of public expenditures and the demand for public goods, is the calculation of a crowding parameter (Blecha, 1987; Borcherding & Deacon, 1972; Gonzalez & Means, 1991; Gramlich & Rubinfeld, 1982; Martinez-Vazquez, 1982). Health and education expenditures should be classified as publicly provided private goods, subject to specific caveats on the measurement of the crowding parameter (Borcherding & Deacon, 1972; Oxley & Martin, 1991; Saunders, 1993).

While we cannot provide empirical evidence at this juncture on the degree of crowding for education and health services in the sample countries, we believe that it is relatively safe to assume that these two types of services generally do not exhibit the characteristics of non-

excludability and non-rivalry of pure public goods. With respect to the private nature of health services, over 60 percent of total health spending is out of pocket in low-income countries, relative to 20 percent in high-income countries. In Africa, out-of-pocket spending accounts for almost 50 percent of total health spending, on average, and in 31 African countries, it accounts for 30 percent or more of total health spending (Schieber, Fleisher, & Gottret, 2006). Immunization, sanitation, other public health services also appear to be non-exclusive but rival; while services of acute health care are clearly rival and exclusive (Burki, Perry, & Dillinger, 1999). Similarly, classroom size limitations and number of teachers per student in most of the developing countries clearly add some degree of rivalry to education services.

The raw data show that over the period 1972-2003 expenditure decentralization remained quite flat in OECD countries but increased quite significantly in Emerging and Developing countries (Figure 2). On the other hand, the examination of the expenditure decentralization and the ratio of total education and health expenditures for the whole sample of countries over the same period suggests a positive relationship between these two variables (Figure 3).

Estimation Results

Table 4 presents the estimation results. From the perspective of this paper, the most important result is the positive, statistically significant, and robust influence of fiscal decentralization on the composition of public expenditures, as measured by the ratio of total health and education expenditures to total expenditures. The estimated coefficient for fiscal decentralization is positive and statistically significant across all models. This result is robust to modifications in the estimation models used. This suggests that higher levels of expenditure decentralization are associated with a higher share of public expenditures on health and

education in total expenditures, illustrating the potential impact of expenditure decentralization in developed and developing countries. Our results also provide an indirect test to the classical proposition that decentralization leads to increases in allocative efficiency via the better matching of taxpayers' preferences.

Briefly, the estimated coefficient for expenditure decentralization in levels is statistically significant using the fixed effects estimator. A one standard deviation increase in the level of expenditure decentralization appears to induce an approximate 2.8 percent increase in the share of education and health expenditures in the consolidated budget. This suggests, as posited by the theoretical model, that the share of PPPGs increases as the level of decentralization increases. The estimated coefficient for fiscal decentralization is also statistically significant at the 1% level using System-GMM.[25] The Hansen J-test fails to reject the validity of instruments using the second lag of GDP growth. In both cases, fixed effects and system GMM, decentralization appears to positively and significantly influence expenditure composition, although the size of the estimated coefficient for decentralization is larger in system-GMM.

As previously noted, due to the fractional nature of the expenditure decentralization variable, only the QMLE's predicted values are bound to the unit interval. While it would be possible to estimate the marginal effect of decentralization on expenditure composition for the fixed effects or GMM predicted values, these marginal effects may result from predictions of expenditure composition that are not bounded by [0,1]. We thus argue that the QMLE's estimated coefficients are most appropriate to estimate the marginal effect of fiscal decentralization on expenditure composition. The QMLE marginal effects are non-linear

---

[25] We determine the number of lags used in each particular specification based on the degree of exogeneity of the explanatory variables used with respect to the dependent variable (i.e., whether they are a priori assumed to be predetermined or endogenous), and on whether this lag level passes the tests for validity of the instruments (Hansen-statistic) as well as of serial correlation of the disturbance term (evidence of an AR2 process in first differences indicates that the tested lag structure is invalid).

functions of the estimated coefficients and the specific values of the explanatory variables. Given the logistic density function $g(z) = \delta G(z) / \delta z = exp(z)/(1+exp(z)]^2$, the QMLE marginal effects are equal to $\delta E(y|x)/\delta x_j = m_j = g(x\beta)\beta_j$. In order to find the marginal effects, we must choose values for the explanatory variables to estimate a scalar value for $g(x\beta)$, which then is multiplied to each variable's coefficient. For this purpose, we choose the mean values of the explanatory variables, as reported in the descriptive statistics (Table 2).

The estimated marginal effect of expenditure decentralization on expenditure composition is 0.22, that is, for a one standard deviation increase in the level of expenditure decentralization, the share of health and education expenditures increases by approximately 3.3 percent. While the marginal effect of decentralization is lower with the QMLE relative to the other estimators, we note that the finding that decentralization positively influences the share of health and education expenditures appears to be robust to a variety of estimation approaches.

Let us now turn briefly to the other explanatory variables. The parameter for the interaction term for fiscal decentralization and industrial country status is negative and significant in the two-way error component fixed effect model. This result suggests that decentralization's influence on expenditure composition may be attenuated in industrialized countries.[26] We must caution, however, that the estimated coefficient for the OECD interaction variable was neither significant in the System GMM model nor the QMLE estimator and that this result bears further investigation.

The coefficient for GDP per capita is positive and statistically significant in the QMLE estimator. However, this coefficient is not statistically significant in the fixed effect and system

---

[26] Private service alternatives for education and health, for example, are likely to be more available in developed countries.

GMM models. This result suggests that the estimated coefficient may be sensitive to the type of instruments included in the model.

The positive and statistically significant coefficient for the budget balance in the two way error components fixed effects suggests that education and health expenditures may be more vulnerable to cuts (reducing their budget shares) in times of expenditure rationalization (International Monetary Fund, 2003; Lora & Olivera, 2007; Snyder & Yackovlev, 2000). Yet the coefficient for budget balance is not significant when estimated using system-GMM and QMLE. These results are consistent with other studies that assessed the impact of different measures of the business cycle and expenditure consolidation on social expenditures and found no evidence that social expenditures are more vulnerable to cuts during these types of episodes (Clements, Gupta, & Nozaki, 2011; Granado, Gupta, & Hajdenberg, 2010).

Finally, regarding our composite measure of freedom, its coefficient is positive and statistically significant in all estimation models, suggesting that increased political rights and civil liberties, usually accompanied by greater accountability, increase the expenditure share of health and education.

In summary, we find robust statistical evidence from cross country panel data that decentralization affects the composition of public expenditures by increasing the share of publicly provided private goods, as captured by public education and health. These results suggest that expenditure decentralization significantly influences the composition of public expenditures and we note that this finding is robust to alternative specification measures. Even at the lower bound of the results, expenditure decentralization shifts the composition of public expenditures towards PPPGs. Therefore these results offer strong support to Proposition 3 in our theoretical model.

5. Conclusion

This paper set out to suggest an indirect test of the allocative efficiency effects of decentralization by examining the role of decentralization on the composition of public expenditures. We investigate this issue from a theoretical viewpoint by means of a distance-sensitive representative agent model. By employing a two-dimensional space country framework we are able to integrate two features of fiscal decentralization: the distribution of expenditure assignments between two levels of government and the composition of public expenditures into two kinds of public goods. This approach allows us to represent the heterogeneous nature of tastes within a representative agent model. Among other implications of the model, we find that decentralization leads to a higher share of publicly provided private goods in total government expenditures. Our empirical analysis strongly supports this prediction of the model based on an unbalanced panel data set spanning 59 developed and developing economies over a period of 30 years.

The policy implications of our findings are intriguing. Decentralization trends all over the world are likely to result in a reallocation of resources in the public sectors from centrally provided PPGs to subnationally provided PPPGs. This higher emphasis of expenditures on education and health may not only yield increases in allocative efficiency and overall welfare, but also may support, given the key importance of expenditures on those services, national efforts for poverty alleviation and improving economic growth.

Table 1
Variables

Variable	Definition	Units	Source
Expenditure Composition	Ratio of education expenditures plus heath expenditures to total expenditures	Fraction (0-1)	Calculated from GFS
Fiscal Decentralization	Ratio of total subnational expenditures to total national expenditures	Fraction (0-1)	Calculated from GFS
Interaction Term	Fiscal decentralization multiplied by the industrialization dummy	Fraction (0-1)	Authors' Calculation
Budget Balance	Current and capital revenue and official grants received less total expenditure and lending minus repayments as a percentage from GDP all at national (central government or consolidated government) level.	Fraction (0-1)	Calculated from World Development Indicators (WDI)
Freedom	A composite index equal to ((14-political rights score – civil rights score)/12). The resulting index ranges from 0 (least free) to 1 (most free).	Fraction (0-1)	Freedom House and Authors' Calculations
Gross Domestic Product Per Capita	Gross Domestic Product divided by total population	One hundred thousand constant US Dollars	WDI
Population	Total population	10 millions	WDI
Population density	Total population divided by land area in square kilometers	Thousands	WDI
Industrial Dummy	1 for members of the OECD, 0 otherwise	0 and 1	Calculated

Table 2
Descriptive Statistics

Series	N	Mean	Standard Deviation	Minimum	Maximum
Expenditure Composition	1149	.334	.147	.052	.654
Fiscal Decentralization	1149	.235	.150	.016	.601
OECD Interaction Term	1149	.152	.185	0	.605
Budget Balance	1149	-.017	.035	-.179	.142
Freedom	1149	.766	.273	0	1
Population	1149	.358	.830	.006	7.651
Population Density	1149	.101	.128	.001	.843
Per Capita GDP	1149	.105	.097	.002	.460

Table 3
Sample Countries

Country	Years	Country	Years
Argentina	1978-79; 1981-2002	Australia	1972-2003
Austria	1972-1997	Azerbaijan	1994-1999
Bahrain	1975-1996	Belarus	1992-2002
Belgium	1978-1988	Bolivia	1986-2003
Brazil	1980-1994	Bulgaria	1988-2003
Canada	1974-2003	Chile	1974-88; 1992-2003
Costa Rica	1972-1985; 1987-1996	Croatia	1994-2001
Czech Republic	1993-2003	Denmark	1972-2003
Dominican Republic	1973-1996	Estonia	1991-2001
Fiji	1974-1993	Finland	1972-1997
France	1975-1993	Georgia	1997-2001
Germany	1972-96; 1999-2003	Hungary	1981-2002
Iceland	1972-77; 1979-2002	India	1974-1985
Indonesia	1975-1998	Ireland	1972-1997
Israel	1974-2002	Kazakhstan	1997-2003
Kenya	1972-84; 1986-1994	Kyrgyz Republic	1995-2001
Latvia	1994-2003	Lithuania	1993-2003
Luxembourg	1972-88; 1990-95;1998-99; 2000-2003	Malaysia	1972-81; 1985-1997
Mauritius	1980-85; 1987-99; 2002-03	Mexico	1972-2000
Moldova	1996-2003	Mongolia	1992-98; 2000-2002
Netherlands	1975-1997	New Zealand	1992-2001; 2003
Norway	1972-77; 1980-2003	Panama	1973-1994
Paraguay	1973-80; 1984-87; 1989-1993	Philippines	1978-1992
Poland	1994-2001	Romania	1981-2001
Russia	1994-95; 1998-2003	Slovak Republic	1996-2003
Slovenia	1993-2003	Spain	1972-85; 1987-2001
Sweden	1972-2002	Switzerland	1972-84; 1991-2001
Thailand	1972-2003	United Kingdom	1974-2000
United States	1972-2001	Uruguay	1973-84; 1989-1997
Zimbabwe	1976-1989		

Table 4
Composition of Public Expenditures
Fixed Effects, GMM and QMLE Estimates

	Two-Way Fixed Effects	System-GMM	QMLE	
			Coefficient	Marginal Effect (at Sample Mean)
Fiscal Decentralization	0.38**	0.80**	1.04+	0.22+
	(0.12)	(0.29)	(0.62)	(0.13)
OECD Interaction Term	-0.79**	-0.10	-0.67	-0.14
	(0.23)	(0.33)	(0.60)	(0.13)
Budget Balance in % of GDP	0.20*	0.15	0.90	0.19
	(0.10)	(0.14)	(0.91)	(0.19)
Population Density	-0.05	0.07	-0.47	-0.10
	(0.09)	(0.12)	(0.48)	(0.10)
Population	0.01	-0.06**	-0.15**	-0.03**
	(0.06)	(0.02)	(0.06)	(0.01)
GDP Per Capita	0.17	0.01	1.79*	0.38*
	(0.22)	(0.32)	(0.84)	(0.17)
Freedom	0.05+	0.10+	0.88**	0.22**
	(0.03)	(0.06)	(0.28)	(0.06)
Constant	0.3**	0.11		
	(0.05)	(0.07)		
AR(1) p-value		0.05		
AR(2) p-value		0.40		
Hansen J-test		0.41		
Number of Instruments		41		
Countries	59	59	59	59
Observations	1149	1149	1149	1149

Notes: **,*,+ denote significance at the 1%,5%, and 10% level respectively. For two way error components the quantities in (.) are the White corrected standard errors. Quantities in (.) for the System GMM estimators are the White corrected standard errors. The quantities in (.) for the QMLE marginal effects are the delta-method standard errors.

Figure 1
Median to the Median in a Two Dimensional Space

Pure Public Good

b_2

$\left\| z_1 - z^m \right\| = c$

b_1

a_2

$z^m = \left(y^m, x^m \right)$

a_1

$a_1 = a_2 \; ; \; b_1 = b_2$
$a_1 = a_2 \; ; \; b_1 = b_2$

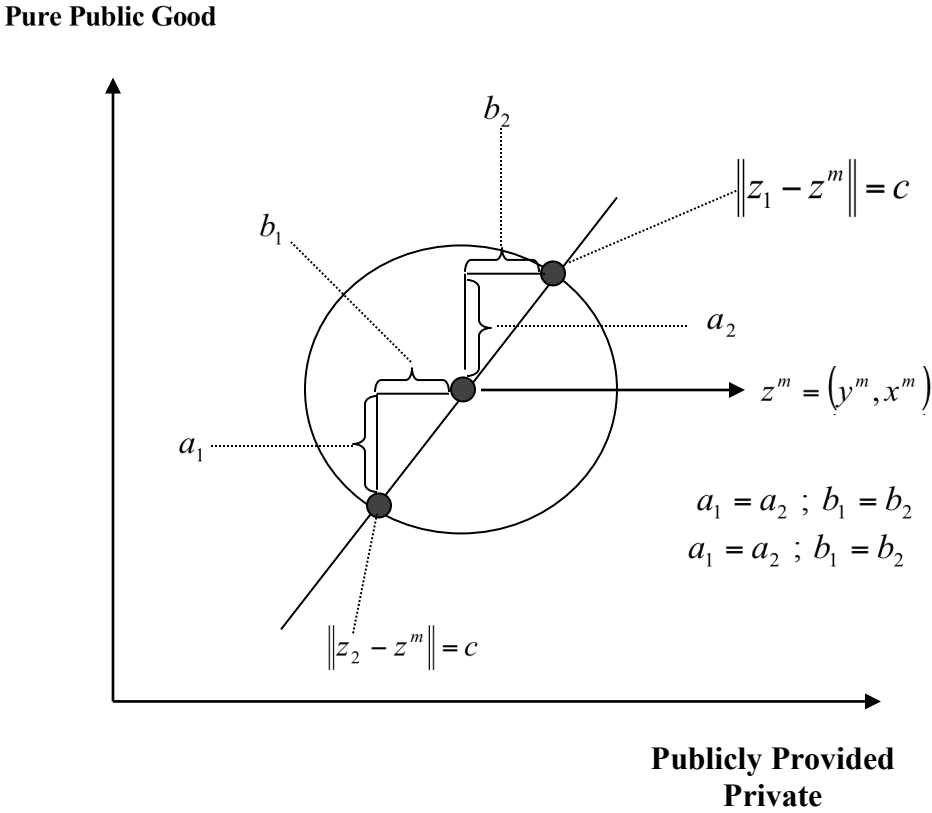$\left\| z_2 - z^m \right\| = c$

Publicly Provided
Private

Figure 2
Expenditure Decentralization
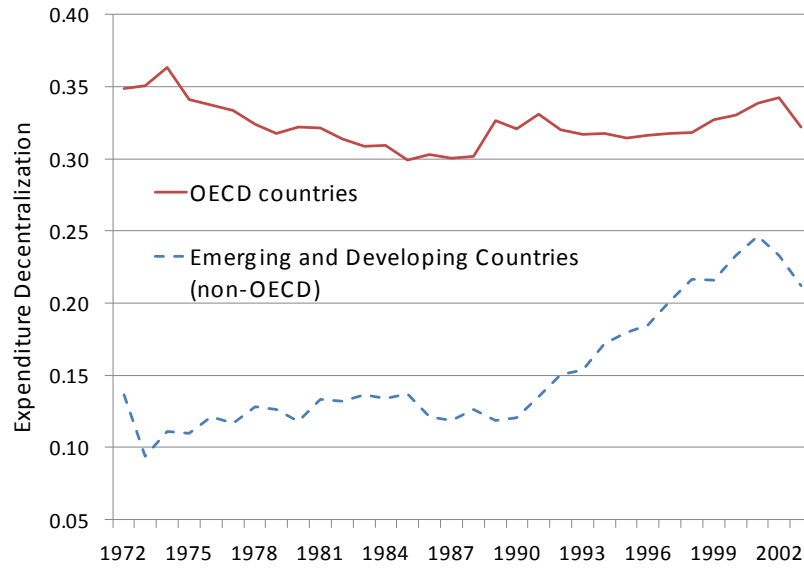1971-2003
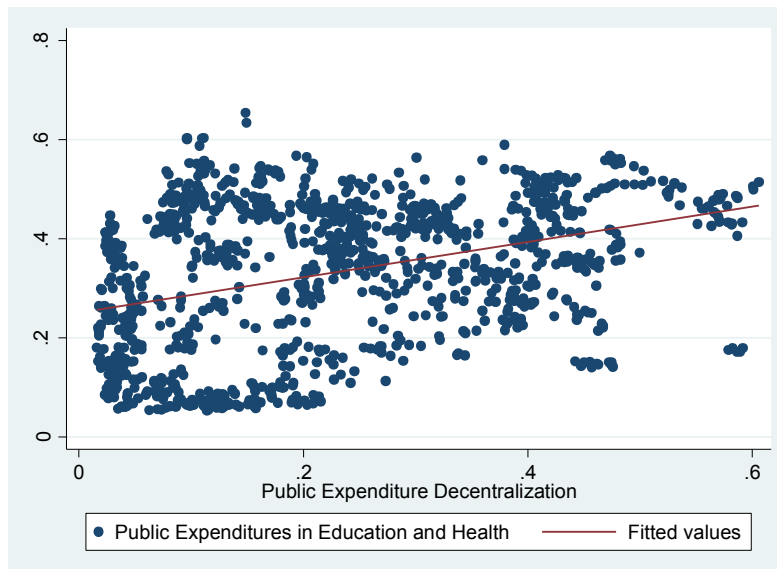(Authors' Calculations)

Figure 3
Social spending versus expenditure decentralization
Pooled data
Authors' Calculations

Appendix 1

Table A.1
Deciding the Type and the Quantity of Public Goods

Decision		Type		Quantity	
		Who is the key decision maker?	**Where is the location of the key decision maker?**	**Who is the key decision maker?**	**Where is the location of the key decision maker?**
Pure Public Goods		Type national median voter	Middle of the country (vertical axis)	Quantity national median voter. Determined by the distance to the national median (vertical axis)	Median distance to the country median (vertical axis)
PPPG's	**Share θ**	Type national median voter	Middle of the country (horizontal axis)	Quantity national median voter. Determined by the distance to the country median (horizontal axis)	Median distance to the country median (horizontal axis)
	Share (1-θ)	Type jurisdiction median voter	Middle jurisdiction (horizontal axis)	Quantity jurisdiction median voter. Determined by the distance to the middle of the jurisdiction (horizontal axis).	Median distance to the jurisdiction median. (horizontal axis)

Appendix 2

Proof of Proposition 1

$$\frac{\partial g_i^*}{\partial \theta} = \frac{\delta_\theta y(\delta + \beta + \gamma) - \delta y \delta_\theta}{(\delta + \beta + \gamma)^2} = \frac{\delta_\theta y \delta + \delta_\theta y \beta + \delta_\theta y \gamma - \delta y \delta_\theta}{(\delta + \beta + \gamma)^2}$$

$$= \frac{\delta_\theta y(\delta + \beta + \gamma - \delta)}{(\delta + \beta + \gamma)^2} = \frac{y \delta_\theta (\beta + \gamma)}{(\delta + \beta + \gamma)^2} \tag{5}$$

$$\text{If } J > 1, \text{ then } \delta_\theta = -\alpha(x_{ic} - x_{ij}) < 0 \tag{6}$$

$$\text{and } \frac{\partial g_i^*}{\partial \theta} < 0$$

Proof of Proposition 2

$$\frac{\partial s}{\partial \theta} = -\frac{\gamma y \delta_\theta}{(\delta + \beta + \gamma)^2} \tag{7}$$

$$\text{given that } \delta_\theta < 0 \Rightarrow \frac{\partial s}{\partial \theta} > 0.$$

Proof of Proposition 3

Given normalized prices total expenditures must decrease, and the ratio PPPG to total expenditures must necessarily increase with decentralization. Taking the first derivative of the PPPG to total expenditures ratio with respect to decentralization, we note:

$$\frac{\partial(g^* /(g^* + s^*))}{\partial \theta} = \frac{g_\theta (g + s) - g(g_\theta + s_\theta)}{(g + s)^2} = \frac{g_\theta g + g_\theta s - g g_\theta - g s_\theta}{(g + s)^2}$$

$$= \frac{g_\theta (g + s - g) - g s_\theta}{(g + s)^2} = \frac{g_\theta s - g s_\theta}{(g + s)^2}$$

Since $g_\theta < 0$, $s_\theta > 0$, $(g_\theta s - g s_\theta) < 0$ $(g + s)^2 > 0$ which implies $\dfrac{\partial (g^* / (g^* + s^*))}{\partial \theta} < 0$.

Proof of Proposition 4

Note that

$$\frac{\partial (g + s)}{\partial \theta} > 0. \quad (8)$$

Given propositions 1 and 2, $\dfrac{\partial g_i}{\partial \theta} < 0$, $\dfrac{\partial s}{\partial \theta} > 0$, the sign of equation 8 is positive if $\left| \dfrac{\partial g_i}{\partial \theta} \right| < \left| \dfrac{\partial s}{\partial \theta} \right|$.

Rewriting equation (7) in terms of $\dfrac{\partial g_i}{\partial \theta}$ (equation 5) as:

$$\frac{\partial s}{\partial \theta} = -\frac{\gamma \, y \, \delta_\theta}{(\delta + \beta + \gamma)^2} = -\left[\frac{\partial g}{\partial \theta} - \frac{y \delta_\theta \beta}{(\delta + \beta + \gamma)^2} \right]$$

$$\frac{\partial s}{\partial \theta} = -\frac{\partial g}{\partial \theta} + \frac{y \delta_\theta \beta}{(\delta + \beta + \gamma)^2} \quad (9)$$

Define a constant $c = \dfrac{y \delta_\theta \beta}{(\delta + \beta + \gamma)^2}$; rearranging equation (9): $\dfrac{\partial s}{\partial \theta} + c = -\dfrac{\partial g}{\partial \theta}$ or

$\left| \dfrac{\partial g_i}{\partial \theta} - c \right| = \left| \dfrac{\partial s}{\partial \theta} \right|$, given equation (6), $\delta_\theta < 0 \Rightarrow c < 0$ hence $\left| \dfrac{\partial g_i}{\partial \theta} \right| < \left| \dfrac{\partial s}{\partial \theta} \right|$.

REFERENCES

Akitoby, B., Clements, B., Gupta, S., & Inchauste, G. (2006). Public spending, voracity, and Wagner's law in developing countries. *European Journal of Political Economy*, *22*(4), 908–924. doi:10.1016/j.ejpoleco.2005.12.001

Alderman, H. (1998). *Social assistance in Albania: decentralization and targeted transfers*. World Bank Publications.

Alegre, J. G. (2010). Decentralization and the Composition of Public Expenditure in Spain. *Regional Studies*, *44*(8), 1067–1083. doi:10.1080/00343400903365151

Alesina, A. F., Baqir, R., & Easterly, W. (1999). Public Goods and Ethnic Divisions. *The Quarterly Journal of Economics*, *114*(4), 1243 –1284. doi:10.1162/003355399556269

Alesina, A. F., Baqir, R., & Hoxby, C. (2004). Political Jurisdictions in Heterogeneous Communities. *Journal of Political Economy*, *112*(2), 348–396.

Alesina, A. F., & Spolaore, E. (1997). On the Number and Size of Nations. *The Quarterly Journal of Economics*, *112*(4), 1027 –1056. doi:10.1162/003355300555411

Arellano, M., & Bover, O. (1995). Another look at the instrumental variables estimation of error-components models. *Journal of Econometrics*, *68*, 29–51.

Arzaghi, M., & Henderson, J. V. (2005). Why Countries Are Fiscally Decentralizing. *Journal of Public Economics*, *89*(7), 1157–1189. doi:10.1016/j.jpubeco.2003.10.009

Arze del Granado, J., Gupta, S., & Hajdenberg, A. (2012). Is Social Spending Procyclical? Evidence for Developing Countries. *World Development*, (0). doi:10.1016/j.worlddev.2012.07.003

Ashworth, J., Galli, E., & Padovano, F. (2009). Government Decentralization and Public

      Spending Programs. Italian Society of Public Economics. Retrieved from

      http://www.unipv.it/websiep/2009/200904.pdf

Baltagi, B. H. (2008). *Econometric Analysis of Panel Data* (4th ed.). Wiley.

Bardhan, P. K., & Mookherjee, D. (2000). Capture and Governance at Local and National

      Levels. *American Economic Review*, *90*(2), 135–139.

Barro, R. J. (1990). Government Spending in a Simple Model of Endogeneous Growth. *Journal*

      of Political Economy, *98*(5), S103–S125.

Besley, T., & Coate, S. (2003). Elected Versus Appointed Regulators: Theory and Evidence.

      Journal of the European Economic Association, Journal of the European Economic

      Association, *1*(5), 1176–1206.

Bird, R. M., Ebel, R. D., & Wallich, C. (1995). *Decentralization of the Socialist State:*

      Intergovernmental Finance in Transition Economies. Washington DC: World Bank

      Publications.

Bird, R. M., & Vaillancourt, F. (1998). *Fiscal decentralization in developing countries*.

      Cambridge University Press.

Blecha, B. J. (1987). The Crowding Parameter and Samuelsonian Publicness. *Journal of*

      Political Economy, *95*(3), 622–631.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restriction in dynamic panel data

      models. *Jounal of Econometrics*, *87*, 11–143.

Borcherding, T. E., & Deacon, R. T. (1972). The Demand for the Services of Non-Federal

      Governments. *The American Economic Review*, *62*(5), 891–901.

Brennan, G., & Buchanan, J. M. (1980). *The power to tax: analytical foundations of a fiscal constitution*. Cambridge University Press.

Burki, S. J., Perry, G., & Dillinger, W. R. (1999). *Beyond the center: decentralizing the State*. World Bank Publications.

Busemeyer, M. R. (2007). Determinants of public education spending in 21 OECD democracies, 1980–2001. *Journal of European Public Policy*, *14*(4), 582–610. doi:10.1080/13501760701314417

Busemeyer, M. R. (2008). The Impact of Fiscal Decentralisation on Education and Other Types of Spending. *Swiss Political Science Review*, *14*(3), 451–481. doi:10.1002/j.1662-6370.2008.tb00109.x

Campbell, T. (2003). *Quiet Revolution: Decentralization and the Rise of Political Participation in Latin American Cities*. Pittsburgh: University of Pittsburgh Press.

Caplan, B. (2001). When is two better than one? How federalism mitigates and intensifies imperfect political competition. *Journal of Public Economics*, *80*(1), 99–119. doi:10.1016/S0047-2727(00)00106-7

Clements, B., Gupta, S., & Nozaki, M. (2011, August 31). What Happens to Social Spending in IMF-Supported Programs? International Monetary Fund. Retrieved from www.imf.org/external/pubs/cat/longres.aspx?sk=25190

Davis, O. A., DeGroot, M. H., & Hinich, M. J. (1972). Social Preference Orderings and Majority Rule. *Econometrica*, *40*(1), 147–157. doi:10.2307/1909727

de Sousa Santos, B. (1998). Participatory Budgeting in Porto Alegre: Toward a Redistributive Democracy. *Politics & Society*, *26*(4), 461 –510. doi:10.1177/0032329298026004003

Devarajan, S., Swaroop, V., & Zou, H. (1996). The Composition of Public Expenditure and

    Economic Growth. *Journal of Monetary Economics*, *37*(2), 313–344. doi:10.1016/S0304-

    3932(96)90039-2

Diamantaras, D., & Gilles, R. P. (1996). The Pure Theory of Public Goods: Efficiency,

    Decentralization, and the Core. *International Economic Review*, *37*(4), 851–860.

    doi:10.2307/2527314

Dillinger, W. (1994, May 31). Decentralization and its Implications for Urban Service Delivery.

    The World Bank. Retrieved from http://go.worldbank.org/8O4BSXB620

Dreher, A., Sturm, J.-E., & Ursprung, H. (2006). *The Impact of Globalization on the*

    Composition of Government Expenditures: Evidence from Panel Data. CESifo Group

    Munich. Retrieved from http://ideas.repec.org/p/ces/ceswps/_1755.html

Durevall, D., & Henrekson, M. (2011). The futile quest for a grand explanation of long-run

    government expenditure. *Journal of Public Economics*, *95*(7-8), 708–722.

    doi:10.1016/j.jpubeco.2011.02.004

Ebel, R. D., & Yilmaz, S. (2002). On the Measurement and Impact of Fiscal Decentralization.

    SSRN eLibrary. Retrieved from

    http://papers.ssrn.com/sol3/papers.cfm?abstract_id=636092

Epple, D., & Platt, G. J. (1998). Equilibrium and Local Redistribution in an Urban Economy

    when Households Differ in both Preferences and Incomes. *Journal of Urban Economics*,

    43(1), 23–51. doi:10.1006/juec.1996.2030

Ezcurra, R., & Rodríguez-Pose, A. (2011). Decentralization of Social Protection Expenditure and

    Economic Growth in the OECD. *Publius: The Journal of Federalism*, *41*(1), 146–157.

    doi:10.1093/publius/pjp042

Faguet, J.-P. (2004). Does Decentralization Increase Government Responsiveness to Local

  Needs?: Evidence from Bolivia. *Journal of Public Economics*, *88*(3-4), 867–893.

  doi:10.1016/S0047-2727(02)00185-8

Fan, S., & Rao, N. (2003). *Public Spending in Developing Countries: Trends, Determination,*

  and Impact. International Food Policy Research Institute (IFPRI). Retrieved from

  http://ideas.repec.org/p/fpr/eptddp/99.html

Fernandez, R., & Rogerson, R. (1997). *The Determinants of Public Education Expenditures:*

  Evidence from the States, 1950-1990. National Bureau of Economic Research, Inc.

  Retrieved from http://ideas.repec.org/p/nbr/nberwo/5995.html

Fisman, R., & Gatti, R. (2002). Decentralization and corruption: evidence across countries.

  Journal of Public Economics, Journal of Public Economics, *83*(3), 325–345.

Fiva, J. H. (2006). New Evidence on the Effect of Fiscal Decentralization on the Size and

  Composition of Government Spending. *FinanzArchiv: Public Finance Analysis*, *62*, 250–

  280. doi:10.1628/001522106X120659

Fox, J. (1995). Governance and rural development in Mexico: State intervention and public

  accountability. *Journal of Development Studies*, *32*, 1–30.

  doi:10.1080/00220389508422399

Fox, J., & Aranda, J. (1996). Decentralization and Rural Development in Mexico: Community

  Participation in Oaxaca's Municipal Funds Program. Center for US-Mexican Studies,

  University of California San Diego. Retrieved from

  http://escholarship.org/uc/item/5jk3b9gt

Galasso, E., & Ravallion, M. (2005). Decentralized Targeting of an Antipoverty Program.

  Journal of Public Economics, *89*(4), 705–727. doi:10.1016/j.jpubeco.2003.01.002

Gonzalez, R. A., & Means, T. S. (1991). Benefit Shares, the Crowding Parameter and

   Samuelsonian Publicness. *Southern Economic Journal*, *58*(2), 518–527.

   doi:10.2307/1060193

Gramlich, E. M., & Rubinfeld, D. L. (1982). Micro Estimates of Public Spending Demand

   Functions and Tests of the Tiebout and Median-Voter Hypotheses. *Journal of Political

   Economy*, *90*(3), 536–560.

Granado, J. A. del, Gupta, S., & Hajdenberg, A. (2010). Is Social Spending Procyclical? *SSRN

   eLibrary*. Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1750723

Greene, W. (2004). The behaviour of the maximum likelihood estimator of limited dependent

   variable models in the presence of fixed effects. *The Econometrics Journal*, *7*(1), 98–119.

   doi:10.1111/j.1368-423X.2004.00123.x

Greene, W. H. (2001). Fixed and Random Effects in Nonlinear Models. *SSRN eLibrary*.

   Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1292666

Gupta, S., de Mello, L., & Sharan, R. (2001). Corruption and military spending. *European

   Journal of Political Economy*, *17*(4), 749–777. doi:10.1016/S0176-2680(01)00054-4

Hausman, J., Hall, B. H., & Griliches, Z. (1984). Econometric Models for Count Data with an

   Application to the Patents-R&D Relationship. *Econometrica*, Econometrica, *52*(4), 909–

   38.

International Monetary Fund. (2003). Evaluation Report: Fiscal Adjustment in IMF-Supported

   Programs. International Monetary Fund. Retrieved from

   http://www.imf.org/external/np/ieo/2003/fis/index.htm

King, E. M., & Ozler, B. (1998, April 27). What's Decentralization Got To Do With Learning?

   Development Research Group, The World Bank. Retrieved from

http://siteresources.worldbank.org/EDUCATION/Resources/278200-

1099079877269/547664-1099079934475/547667-

1135281552767/What_Decentralization_Learning.pdf

Kirman, A. P. (1992). Whom or What Does the Representative Individual Represent? *The*

Journal of Economic Perspectives, *6*(2), 117–136.

Kwon, O. (2003). The Effects of Fiscal Decentralization on Public Spending: The Korean Case.

Public Budgeting & Finance, *23*(4), 1–20. doi:10.1111/j.0275-1100.2003.02304001.x

Lockwood, B. (2002). Distributive Politics and the Costs of Centralization. *Review of Economic*

Studies, Review of Economic Studies, *69*(2), 313–37.

Lora, E., & Olivera, M. (2007). Public debt and social expenditure: Friends or foes? *Emerging*

Markets Review, *8*(4), 299–310. doi:10.1016/j.ememar.2006.12.004

Martinez-Vazquez, J. (1982). Fiscal Incidence at the Local Level. *Econometrica*, *50*(5), 1207–

1218. doi:10.2307/1911870

Martinez-Vazquez, J., & McNab, R. M. (2003). Fiscal Decentralization and Economic Growth.

World Development, *31*(9), 1597–1616. doi:16/S0305-750X(03)00109-8

Martinez-Vazquez, J., & Vaillancourt, F. (2010). *Decentralization in Developing Countries:*

Global Perspectives on the Obstacles to Fiscal Devolution. London: Edward Elgar.

Mas-Colell, A. (1980). Efficiency and Decentralization in the Pure Theory of Public Goods. *The*

Quarterly Journal of Economics, *94*(4), 625 –641. doi:10.2307/1885661

Mauro, P. (1998). Corruption and the composition of government expenditure. *Journal of Public*

Economics, *69*(2), 263–279. doi:10.1016/S0047-2727(98)00025-5

Nechyba, T. J. (1997). Existence of equilibrium and stratification in local and hierarchical

    Tiebout economies with property taxes and voting. *Economic Theory*, *10*, 277–304.

    doi:10.1007/s001990050158

Oates, W. E. (1972). *Fiscal Federalism*. Harcourt, Brace, Jovanovich, Inc.

Oates, W. E. (1985). Searching for Leviathan: An Empirical Study. *American Economic Review*,

    American Economic Review, *75*(4), 748–57.

Oates, W. E. (1989). Searching for Leviathan: A Reply and Some Further Reflections. *The*

    American Economic Review, *79*(3), 578–583.

Oates, W. E. (1999). An Essay on Fiscal Federalism. *Journal of Economic Literature*, *37*(3),

    1120–1149. doi:10.1257/jel.37.3.1120

Oates, W. E. (2005). Toward A Second-Generation Theory of Fiscal Federalism. *International*

    Tax and Public Finance, *12*(4), 349–373. doi:10.1007/s10797-005-1619-9

Oxley, H., & Martin, J. P. (1991). Controlling Government Spending and Deficits: Trends in the

    1980s and Prospects for the 1990s. *OECD Economic Studies*, *17*(Autumn). Retrieved

    from http://www.oecd.org/dataoecd/33/12/34259242.pdf

Panizza, U. (1999). On the determinants of fiscal centralization: Theory and evidence. *Journal of*

    Public Economics, *74*(1), 97–139. doi:10.1016/S0047-2727(99)00020-1

Plott, C. R. (1967). A Notion of Equilibrium and its Possibility Under Majority Rule. *The*

    American Economic Review, *57*(4), 787–806.

Poterba, J. M. (1997). Demographic structure and the political economy of public education.

    Journal of Policy Analysis and Management, Journal of Policy Analysis and

    Management, *16*(1), 48–66.

Prud'homme, R. (1995). The Dangers of Decentralization. *The World Bank Research Observer*, *10*(2), 201 –220. doi:10.1093/wbro/10.2.201

Rodden, J. (2003). Reviving Leviathan: Fiscal Federalism and the Growth of Government. *International Organization*, *57*(04), 695–729. doi:10.1017/S0020818303574021

Roodman, D. (2008, May). A Note on the Theme of Too Many Instruments. Center for Global Development. Retrieved from http://www.cgdev.org/files/14256_file_Instruments.pdf

Rubinfeld, D. L. (1987). Chapter 11 The economics of the local public sector (Vol. Volume 2, pp. 571–645). Elsevier. Retrieved from http://www.sciencedirect.com/science/article/pii/S157344208780006X

Sanz, I., & Velázquez, F. J. (2004). The Evolution and Convergence of the Government Expenditure Composition in the OECD Countries. *Public Choice*, *119*, 61–72. doi:10.1023/B:PUCH.0000024162.20553.8e

Saunders, P. (1993). *Recent Trends in the Size and Growth of Governments in OECD Countries*. University of New South Wales.

Schieber, G., Fleisher, L., & Gottret, P. (2006). Getting Real on Health Financing. *Finance & Development*, *43*(4).

Shah, A., & Chaudhry, T. T. (2004). Implementing Decentralized Local Governance: A Treacherous Road with Potholes, Detours, and Road Closures. *SSRN eLibrary*. Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=610397

Shelton, C. A. (2007). The Size and Composition of Government Expenditure. *Journal of Public Economics*, *91*(11-12), 2230–2260. doi:10.1016/j.jpubeco.2007.01.003

Shonchoy, A. S. (2010, December). Determinants of Government Consumption Expenditure in Developing Countries : A Panel Data Analysis. Institute of Developing Economies, Japan

External Trade Organization (JETRO). Retrieved from

http://ideas.repec.org/p/jet/dpaper/dpaper266.html

Snyder, J. M. J., & Yackovlev, I. (2000, April). Politcal and Economic Determinants of Changes

in Government Spending on Social Protection Programs. MIT Working Paper.

Stegarescu, D. (2005a). Public Sector Decentralisation: Measurement Concepts and Recent

International Trends*. *Fiscal Studies*, *26*(3), 301–333. doi:10.1111/j.1475-

5890.2005.00014.x

Stegarescu, D. (2005b). Public Sector Decentralisation: Measurement Concepts and Recent

International Trends. *Fiscal Studies*, *26*(3), 301–333. doi:10.1111/j.1475-

5890.2005.00014.x

Stegarescu, D. (2009). The effects of economic and political integration on fiscal

decentralization: evidence from OECD countries. *Canadian Journal of Economics/Revue

canadienne d'économique*, *42*(2), 694–718. doi:10.1111/j.1540-5982.2009.01524.x

Tullock, G. (1967). The General Irrelevance of the General Impossibility Theorem. *The

Quarterly Journal of Economics*, *81*(2), 256 –270. doi:10.2307/1879585

Wildasin, D. (1991). Income Redistribution in a Common Labor Market. *American Economic

Review*, *81*(4), 757–74.

Wildasin, D. (1994). Income Redistribution and Migration. *Canadian Journal of Economics*,

27(3), 637–56.

Wooldridge, J. M. (2001). *Econometric Analysis of Cross Section and Panel Data* (1st ed.). The

MIT Press.

Wooldridge, J. M. (2003). Cluster-Sample Methods in Applied Econometrics. *American

Economic Review*, *93*, 133–138. doi:10.1257/000282803321946930

Wrede, M. (2000). Shared Tax Sources and Public Expenditures. *International Tax and Public Finance*, *7*(2), 163–175.

Zaghini, A., & Lamartina, S. (2008). Increasing Public Expenditures: Wagner's Law in OECD Countries. *SSRN eLibrary*. Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1123946