

FISCAL DECENTRALIZATION AND ECONOMIC GROWTH: SPENDING VERSUS REVENUE DECENTRALIZATION

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This article examines whether the efficiency gains accompanying fiscal decentralization generate higher growth in more decentralized economies, applying pooled-mean group techniques to a panel dataset of 23 Organization for Economic Co-operation and Development (OECD) countries, 1972–2005. We find that spending decentralization has tended to be associated with lower economic growth while revenue decentralization has been associated with higher growth. Since OECD countries are substantially more spending than revenue decentralized, this is consistent with Oates' (1972) hypothesis that maximum efficiency gains require a close match between spending and revenue decentralization. It suggests reducing expenditure decentralization, and simultaneously increasing the fraction financed locally, would be growth-enhancing. (JEL E62, H71, H72)

I. INTRODUCTION

Fiscal decentralization (hereafter: FD) is a political economy trend in both developing and developed countries. According to the World Bank (1999), some 95% of democracies now have elected subnational governments, and countries everywhere are devolving political, fiscal, and administrative powers to subnational tiers of government below the national level. In developed countries the United States, the United Kingdom, and Canada have revived debates on FD or devolution (Xie, Zou, and Davoodi 1999). In recent years, the U.S. Congress has been contemplating how to devolve more expenditure responsibility to State and local governments. FD has also become a key issue in Japan because the law for the promotion of fiscal decentralization was enacted in 1995. These efforts at devolution in a number of Organization for Economic Co-operation and Development (OECD) countries are accompanied by

the emergence of a new top layer of government in the European Union (EU). Stegarescu (2009) finds that European integration has favored the fiscal decentralization process by increasing market size and the benefits of decentralized provision of public goods in accordance with comparative advantage and the inter-regional division of labor. The rise of the regional level of government in Spain, Belgium, Italy, France, and the United Kingdom are examples of this decentralization process in the EU.

The movement toward FD is often justified by the widespread belief that it is an effective tool for increasing the efficiency of public expenditures and competition among subnational governments in delivering public services. This may also be a reaction to the failure of large centralized bureaucracies in developing and transitional countries (Martínez-Vázquez and McNab 2003). The World Bank (1999), for example, has argued

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ABBREVIATIONS

FD: Fiscal Decentralization
 GDP: Gross Domestic Product
 GFS: Government Finance Statistics
 OECD: Organization for Economic Co-operation and Development
 PMG: Pooled Mean Group
 RHS: Right-Hand Side
 VAT: Value-Added Tax
 VIF: Variation Inflation Factor

that alongside globalization, localization—the increasing demand for local autonomy—is the main force shaping the world in the first decade of the twenty-first century.

In this article, we focus on a specific debate in the FD literature—namely that it improves economic growth performance. We summarize a number of the relevant arguments in Section II, and then review the existing empirical evidence on the FD-growth relationship in Section III. We argue that the existing literature is deficient in a number of respects, for example by rarely testing simultaneously for revenue and expenditure decentralization. Section IV presents our data and empirical methodology, and Section V tests for an effect of FD on economic growth rates in OECD countries over the period 1972–2005. Section VI checks the robustness of our findings to alternative econometric techniques to deal with endogeneity, and alternative measures of fiscal decentralization. Section VII summarizes the main conclusions.

II. ARGUMENTS FOR AND AGAINST FISCAL DECENTRALIZATION

The basic argument in favor of fiscal decentralization is that it improves the efficiency of the public sector and promotes long-term economic development (Oates 1972). The mainstream theory of fiscal federalism, referred to by Oates (2005) as “first-generation” theory argues that decentralization enhances economic efficiency because local governments have better knowledge of local conditions and preferences in the provision of public goods than national governments due to their physical and institutional proximity. These informational advantages allow local governments to deliver public goods and services that better match local preferences and/or deliver the same public goods and services at lower cost. These arguments are reinforced where public good characteristics are local in nature (e.g., sharing economies or nonexcludability aspects are geographically restricted). The first-generation theory contends that if some local outputs can produce inter-jurisdictional spillover effects, then central governments should provide matching grants to decentralized government that would internalize the benefits.

Secondly, Oates (1999) argues that by diversifying government output according to local preferences, decentralization may attain higher levels of social welfare. If preferences for public

goods differ across regions, uniform levels of public goods and services across jurisdictions will generally be inefficient. The larger the variance in regional demands for public goods, the larger the benefits of FD. This diversification also allows residents to move to the community that best matches their demand for public goods and services, and local tax rate. Thus, a “Tiebout sorting” of individuals into demand-homogeneous jurisdictions further increases efficiency in resource allocation.

In addition, subnational governments may be subject to closer scrutiny by their constituencies. Recent theoretical models stress that one of the major advantages of decentralization is that it leads to greater local accountability, such that decentralization may be preferable even in cases of perfect homogeneity of preferences across local jurisdictions. This greater accountability may also lead to greater producer efficiency by providing incentives to local governments to innovate in the production and supply of public goods and services (Martínez-Vázquez and McNab 2003). Over 30 years ago Oates (1972) argued that this allocative efficiency benefit becomes greater when there is a close match between revenue discretion and spending assignments at subnational levels. Such matching, it is argued, gives local government a stronger fiscal incentive to support local market development (Jin, Qian, and Weingast 2005), improves accountability of subnational governments and reduces the distorting effects of intergovernmental transfers (Shah 1994). Local jurisdictions, therefore, need to weigh these benefits of proposed public programs against their costs (Oates 2005).

Building on the Tiebout (1956) mechanism, Brueckner (2006) proposes a model in which FD leads young and old consumers to live in separate jurisdictions according to their different demands for public services: low and high. This sorting increases after-tax income when young while reducing it when old, increasing the incentive to save, which, in turn, leads to an increase in investment in human capital and long-term economic growth.¹ Kappeler and Väilä (2008) also find that FD increases productive public investment and reduces the relative share of economically less productive public investment,

1. It is not necessary, however, for individuals to have different preferences for local public goods or to be relatively mobile to obtain efficiency gains from FD. Thiessen (2003) argues that as long as subnational governments better reflect the priorities of taxpayers, this is sufficient for fiscal decentralization to offer efficiency advantages.

because fiscal competition increases the quality of public expenditure and affects firms' location decisions. By changing the composition of public investment toward the most productive, FD may therefore enhance economic growth. Finally, Schaltegger and Feld (2008) show that, contrary to the popular claim that decentralized governments undermine policy makers' ability to fight fiscal imbalance, FD increases the probability of a successful "fiscal consolidation" (lower public debt). In particular, FD increases the credibility and accountability of mutually agreed reductions in fiscal imbalances, whereas federal transfer payments may reduce the costs of making these fiscal adjustments. Thus, FD could increase economic growth if the reduced fiscal imbalances that it encourages have expansionary economic effects (Giavazzi and Pagano 1996).

However, the theoretical effects of FD on economic growth are not unambiguously positive. Firstly, FD may impact negatively on the distribution of public resources across jurisdictions, because mobility of households and businesses can seriously constrain attempts to redistribute income. Redistributive policies are likely to induce poor individuals to move into the jurisdiction while higher income individuals (who bear a greater tax burden) move out. Along these lines, Fiva and Rattsø (2006) find that decisions of Norwegian local governments about welfare benefit levels depend on the benefit level in neighboring municipalities and own socioeconomic characteristics.² To the extent that income inequality retards economic growth (Persson and Tabellini 1994), FD might negatively affect growth by making redistribution more difficult. Furthermore, concentration of public goods, with supra-local spillovers, in a few geographical locations can also inhibit per capita growth because regional inequalities in infrastructure, education, healthcare, and other public services may prevent full use of factors of production (Thiessen 2003). In this case, more centralized public sectors might redistribute resources across jurisdictions leading to a more efficient distribution.

Other economic arguments against FD include possible damage to macroeconomic stability via fiscal policy coordination problems (Tanzi 1996); inter-jurisdictional "leakages"

2. Nevertheless, these authors do not find that this strategic interaction among local governments results in under-provision or even a race to the bottom in welfare spending, because of the centralized grants financing of the local governments in the Norwegian system.

associated with local expenditures (Oates 1972); and failure to exploit economies of scale and scope (Prud'homme 1995).³ More recently, Inman (2003) contends that local government may expect to be bailed out from their fiscal deficits by central governments, given the likelihood that failure to rescue local governments would lower local welfare with some of the political costs placed shifted to central government by voters (Goodspeed 2002). In addition, FD may lead local governments to engage in a "race to the bottom" on the taxation of mobile factors, hence under-providing productive public expenditure (Brueckner 2004), or increase corruption because officials at the local level are more susceptible to the demands of local interest groups (Prud'homme 1995; Tanzi 1996).⁴ Finally, to the extent that individuals do not move freely between municipalities, at least in the short term, this allows local governments to be relatively unresponsive to local citizens' preferences.

In summary, there are clearly arguments for both positive and negative effects of FD on fiscal efficiency and economic growth rates. It is perhaps not surprising then that the empirical literature discussed below has tended to find a variety of effects in different contexts.

III. EMPIRICAL EVIDENCE ON FD AND ECONOMIC GROWTH

As a number of authors have noted, there is surprisingly little research devoted to measuring the impact of FD on economic growth rates, given that economic efficiency is the central argument used to support FD (Bardhan 2002; Martínez-Vázquez and McNab 2003). Among

3. On the other hand, Gramlich (1993) claims that if economic shocks are asymmetric, then decentralized systems make it easier to achieve macroeconomic stability. Shah (2006) also suggests that central bank independence is more probably attained under decentralized systems, because the pressure of a unique central government diminishes, leading to the presence of multiple governments with diverse and conflicting interests. In this line, Treisman (2000) shows that, by creating additional veto players, federal structure may lock in existing patterns of monetary policy, leading to slower growth of inflation among (mostly developed) countries that started with low inflation. Finally, Martínez-Vázquez and McNab (2003) maintain that a well-designed fiscal decentralization system (preventing local governments to borrow without controls) avoids fiscal systems damaging macroeconomic stability.

4. Martínez-Vázquez and McNab (2003) dispute this argument claiming that local officials are more visible to their constituents and thus corrupt behavior is more visible than at the central level of government.

existing studies a mixed picture emerges of the effect of decentralization on growth rates. Initial contributions tended to find that FD has a negative or negligible effect on economic growth (Davoodi and Zou 1998; Jin and Zou 2005; Woller and Philips 1998; Xie, Zou, and Davoodi 1999; Zhang and Zou 1998). These authors interpret their results as an indication that FD is already high, such that further decentralization may be harmful for economic growth. However, many of these studies focus on developing or transition economies, with China a specific focus of attention.⁵

A number of factors may explain this negative effect. Firstly, as Davoodi and Zou (1998) and Zhang and Zou (1998) argue, FD may be particularly harmful for economic growth in the early stages of development, where the administrative capability of local governments is insufficient, local officials may not be responsive to preferences of local residents, and local governments in those countries may be constrained by central government. Secondly, fiscal policy-growth effects may be more related to the functional composition of government spending or type of tax rather than to fiscal decentralization per se. If subnational governments spend more on items with low growth effects such as social welfare, whereas national governments spend more on growth enhancing items such as infrastructure, then we could expect to observe a negative, endogenous relationship between FD and economic growth.

More recent studies, especially those examining the U.S. or OECD countries, find some evidence of a positive relationship between FD and growth; see Akai and Sakata (2002), Thiessen (2003), Ebel and Yilmaz (2004), Meloche, Vaillacourt, and Yilmaz (2004), Iimi (2005), Jin, Qian, and Weingast (2005) and Thornton (2007). One source of difference in results between the early, and recent, studies may be the FD measure used. Recognizing that high subnational spending and revenue shares do not necessarily reflect high local autonomy, and if *autonomy* is the key growth-enhancing characteristic of FD, then early studies probably overstated the degree of effective decentralization because some local

revenues/expenditures are typically controlled or mandated by central governments.⁶

By contrast, recent studies have focused on a more restricted measure of FD: local government spending net of conditional or discretionary transfers (Ebel and Yilmaz 2004; Meloche, Vaillacourt, and Yilmaz 2004) and local revenues over which subnational governments have some degree of control over the tax rate, the tax base, or both (Akai and Sakata 2002; Ebel and Yilmaz 2004; Meloche, Vaillacourt, and Yilmaz 2004; Thornton, 2007). Lin and Liu (2000) and Jin, Qian, and Weingast (2005) use the marginal retention rate of locally collected revenue to reflect the degree of FD arguing that this captures the fiscal incentives for local government to promote local business development. Using these narrower FD measures, a positive impact of FD on economic growth has found more support.⁷

Recent literature has started to examine samples of OECD alone, and thus is more related to our work. Thiessen (2003) finds evidence of a growth-maximizing degree of FD. That is, growth is enhanced by converging toward intermediate levels of decentralization—from either high or low initial levels. Thornton (2007) argues that much of the literature has not distinguished appropriately between administrative and substantive FD. Adam, Delis, and Kammas (2008) find that public sector efficiency is increasing with FD, whereas fiscal dependency of local government on intergovernmental transfers affects efficiency negatively. Baskaran and Feld (2009) find that fiscal decentralization is generally unrelated to economic growth, and

6. Furthermore, Lin and Liu (2000) criticize the measure employed in Zhang and Zou (1998)—the ratio of provincial spending to total central spending—because a large province would appear to have a high degree of fiscal decentralization merely by being more populous. More generally, the legal distinction between locally and centrally controlled public expenditures or taxes may not be a reliable guide to the extent of decentralization of decision-making in practice. Thus, central governments may formally devolve spending responsibility to local levels but circumscribe the use of those expenditures with a variety of legal or administrative conditions. In the United States, for example, Federal “maintenance of effort” requirements now preclude U.S. states from making major adjustments to Medicaid programs, including those parts that are state funded.

7. An exception to these fiscal decentralization measures is Stansel (2005) who focuses on the horizontal dispersion of power among lower tiers of government using the number of county, municipal, and township administrations per 100,000 residents in 314 U.S. metropolitan areas. Using this measure, Stansel (2005) finds a positive and significant effect of FD on the growth of both population and real per capita income.

5. On China, see also Lin and Liu (2000) and Jin, Qian, and Weingast (2005) who find some evidence of positive growth effects of FD, and the critique of early studies by Akai and Sakata (2002). A detailed summary of the empirical evidence can be found in the working paper version of this article at http://www.ief.es/documentos/recursos/publicaciones/papeles_trabajo/2009_06.pdf.

that, if anything, subfederal control over shared taxes leads to more economic growth.

Using more flexible dynamic econometric methods we show below that, for a variety of measures of local fiscal autonomy, an important characteristic appears to be convergence toward similar levels of *revenue and spending* decentralization. That is, our evidence suggests raising revenue decentralization and/or lowering spending decentralization would be growth-enhancing on average for OECD countries. As far as we are aware, our empirical evidence is the first to support Oates' (1972) hypothesis that FD efficiency benefits become greater when there is a close match between revenue discretion and spending assignments at subnational levels. Jin and Zou (2005) also tested simultaneously for growth effects of expenditure and revenue decentralization across Chinese provinces, but they reject Oates' hypothesis. We obtain our results after controlling for endogeneity; we find some effects running from growth to fiscal decentralization in line with the arguments of Bahl and Linn (1992) and Martínez-Vázquez and McNab (2003) that efficiency gains from, and demand for, FD emerge as economies grow. Most previous empirical FD studies have not controlled for endogeneity, at least in a systematic way, an exception being Iimi (2005).⁸ Using flexible dynamic panel methods, and the pooled mean group (PMG) in particular, recognizes that efficiency gains may take some time to materialize and occur at different rates in different countries.

IV. DECENTRALIZATION MEASURES, DATA AND ECONOMETRIC METHODS

A. Decentralization Measures

The data used in our econometric analysis is based on OECD *General Government Accounts* (various editions). We have extended this time-series using annual IMF (2001), *Government Finance Statistics* (GFS) data.⁹ We follow

8. Zhang and Zou (1998), Xie et al. (1999), Lin and Liu (2000), Thiessen (2003), and Jin et al. (2005) acknowledge potential endogeneity bias but do not control for it—due to small sample sizes and the difficulty of finding good instruments. Lin and Liu (2000) show that, for their case, the Hausman test of the potential endogeneity of the FD variable fails to reject the hypothesis that the marginal retention rate is exogenous. Jin, Qian, and Weingast (2005) regress marginal retention rates on lagged growth rates and find a negative rather than positive coefficient, rejecting a positive upward bias in their estimated FD growth effect for China.

9. The OECD *General Government Accounts* uses accrual accounting, providing a better picture of commitments undertaken by governments than traditional cash

Stegarescu (2005) and construct two measures of expenditure decentralization and three measures of revenue decentralization.¹⁰ In all cases, these annualized decentralization measures are calculated as shares of consolidated general government spending or revenue. For expenditures we calculate:

- (1) Direct spending_{*t*}

$$\frac{\text{Subnational spending}_t - \text{Transfers from subnational to central government}_t}{\text{Consolidated general government spending}_t}$$

- (2) Self-financed spending_{*t*}

$$\frac{\text{Subnational spending}_t - \text{Grants from other governments}_t}{\text{Consolidated general government spending}_t}$$

Equation (1), "Direct spending" in year *t*, subtracts transfers paid to central government in that year, thus reporting amounts spent directly at each local administrative level.¹¹ Equation (2) treats subnational expenditure net of grants received from central government as "self-financed spending," reflecting spending from

accounting. However, the information available from this source starts in 1990 or 1995 for most of the countries. We have extended this time-series using annual IMF, *Government Finance Statistics* (GFS), data. This source covers a longer period, from 1972 to 1998 or 1999, but is based on the cash criterion. Using the rate of variation of the GFS to extend back the OECD data is a sensible procedure because the coefficient of correlation between the overlapped period of the 1990s is always 0.94 or higher, except for Australia (0.87) and New Zealand (0.81). Indeed, cash and accrual accounting coincide over the medium term because commitments undertaken end up materializing in payments. For Mexico, we use IMF cash data for the whole period, because there is no information about this country in the OECD and Greece has no overlapping years for cash and accrual data. These two countries, plus New Zealand, are excluded from the robustness checks. The dataset is available at: <http://www.victoria.ac.nz/sacl/staff/norman-gemmell.aspx> and <http://www.fcjs.urjc.es/departamentos/areas/profesores/ficha.asp?id=trqssvwuur>.

10. Sorens (2011) provides an interesting discussion of the Stegarescu (2005) measures of decentralization and constructs alternative measures.

11. These transfers refer to the category, "Grants to other general government units" (Government Finance Statistics Manual 2001). They can be current or capital grants, depending on purpose, and they include the tax levied by one level of government but transferred to other levels of government. Transfers from subnational governments to central governments are only significant for Spain and, especially, for Greece. For the rest of the sample it accounts for a small share of subnational government spending (average: 1.9%).

“own resources” (Stegarescu 2005). As a measure of locally financed spending it may be regarded as a more appropriate indicator of local autonomy.

On the revenue side, a measure of “own revenue” decentralization is:

$$(3) \text{ Own revenue}_t = \frac{\text{Subnational revenue}_t - \text{Grants from other governments}_t}{\text{Consolidated general government revenue}_t}$$

Equation (3) subtracts grants received from other levels of government from total subnational revenues, to capture “own resources.”¹²

However, there are also locally collected taxes over which local governments have little or no control (Sorens 2011). Arguably, these taxes should also be subtracted to measure autonomous local resources appropriately. Unfortunately, there is no official OECD data distinguishing between locally collected taxes controlled by local versus central governments for a broad sample of countries.¹³ However, following the methodology of OECD (1999, 2001) for Central and Eastern European Countries, Stegarescu (2005) provides data for 21 OECD countries from 1975 to 2000 on the locally collected taxes, decomposed into the following categories:

A	Tax bases or/and rates determined by <i>subnational</i> governments
B	Tax revenues <i>shared</i> between subnational and central governments
<i>of which:</i>	
B1	shared taxes: subnational level determines revenue split
B2	shared taxes: subnational level has to consent to revenue split
B3	shared taxes: central government unilaterally determines revenue split
C	Tax bases or/and rates determined by central governments

Extending the analysis to consider decentralization for all sources of public revenue requires

12. Ebel and Yilmaz (2004) contend that unconditional transfers, and transfers given under objective criteria, could be included under revenue decentralization. However, we subtract all transfers to leave only those revenues generated by subnational governments and which are not discretionarily fixed by central government (Stegarescu 2005). The other indicator used in the literature, the marginal retention rate, is not directly observable; calculation would require simulations for each type of revenue; see Thiessen (2003).

13. It is available for some Central and Eastern European Countries for 1997–2000; see OECD (1999, 2001).

the addition of nontax revenues. According to Stegarescu (2005) these nontax revenues may include user charges, operational surplus of public enterprises, and capital revenue. This allows two additional revenue decentralization measures to be calculated: autonomous own revenue (Equation (4) below) and the autonomous plus shared own revenue (Equation (5) below).

$$(4) \text{ Autonomous own revenue}_t = \frac{\text{Owntax revenue}(A)_t + \text{Nontax and capital revenue}_t}{\text{Consolidated general government revenue}_t}$$

$$(5) \text{ Autonomous and Shared own revenue}_t = \frac{\text{Own tax revenue}(A)_t + \text{Shared tax revenue}(B1 \text{ and } B2)_t + \text{Nontax and capital revenue}_t}{\text{Consolidated general government revenue}_t}$$

Equation (4) is the share of taxes for which subnational governments determine the tax base/rates (category A), plus local nontax and capital revenue. The autonomous-plus-shared own revenue (Equation (5)) is the share of taxes in Equation (4), plus shared taxes where the revenue split is determined, or consented, by subnational governments (categories B1 and B2). These two revenue decentralization measures provide a narrower definition of local autonomy in public revenues but are only available for a more limited sample of countries and years. Thus, for Equations (1)–(3) above our sample is composed of annual data for 23 OECD countries from the early 1970s to 2005. For Equations (4) and (5) data are restricted to 18 countries from 1975 to the late 1990s. We therefore use Equations (4) and (5) as robustness checks on the other indicators.

B. Data

Table 1 shows the period averages for each FD Indicator by OECD country. These cover state and local governments combined since only nine countries have a federal system showing state spending and revenue separately. Each indicator shows substantial variation across countries, with Canada, Switzerland, and the United States revealing the greatest degrees of FD. In those countries, subnational governments account for approximately half of the consolidated public spending and revenue. By

TABLE 1

State and Local Shares in Aggregate Government Spending and Revenue Across OECD Countries: 1970–2005

Country	Own Calculations Based on OECD National Accounts and IMF GFS (1972–2005)			Stegarescu (2005): Calculations Based on IMF, GFS (1975–2000)	
	State and Local Direct Spending	State and Local Self-financed Spending	State and Local Own Revenue	State and Local Autonomous Revenue	State and Local Autonomous and Shared Revenue
Australia	44.6	22.2	27.4	27.4	27.4
Austria	30.9	23.8	27.4	14.3	35.7
Belgium	22.5	10.2	10.4	14.4	23.6
Canada	60.5	51.0	52.2	55.3	55.3
Denmark	56.3	31.7	32.5	31.1	31.1
Finland	37.8	27.2	26.6	32.0	32.0
France	16.0	11.6	12.1	18.3	18.3
Germany ^a	41.6	35.6	35.1	24.5	53.3
Greece	4.8	4.8	3.6	—	—
Iceland	22.3	19.7	21.5	22.2	22.2
Ireland	32.5	15.9	14.4	10.5	10.5
Italy	24.9	13.5	11.3	7.7	7.7
Luxembourg	14.4	9.5	8.6	11.3	11.3
Mexico	18.5	18.2	20.6	—	—
Netherlands	34.8	11.7	11.6	10.7	10.7
New Zealand	11.6	11.4	10.8	9.3	9.3
Norway	35.0	29.0	24.9	26.4	26.4
Portugal	10.7	7.5	8.1	5.4	5.4
Spain	25.7	13.0	15.6	14.0	17.2
Sweden	44.2	35.3	33.6	41.4	41.4
Switzerland	57.6	50.7	48.0	62.8	65.6
United Kingdom	28.4	12.9	12.9	15.7	15.7
United States	46.8	46.8	41.6	45.0	45.0
Unweighted mean	31.4	22.3	22.2	23.8	26.9

^aData for Germany before 1991 refer to West Germany.

Source: OECD: National Accounts of OECD Countries—Vol. IV: General Government Accounts. IMF: Government Finance Statistics Yearbook, and Stegarescu (2005).

contrast, Greece, Portugal, New Zealand, and Luxembourg have highly centralized governments which control more than 85% of the public sector size.

Differences across countries tend to be higher toward the beginning of the period. For example, the standard deviation of logs of state and local direct spending—the usual σ -convergence indicator—decreased from 0.77 in 1974 to 0.68 in 2003 (from 0.74 to 0.63 for self-financed spending). The dispersion in own revenue also diminished from 0.31 to 0.27. Countries with high (low) initial levels of decentralization generally reduced (increased) these, confirming the convergence trend in the FD process identified by Thiessen (2003).

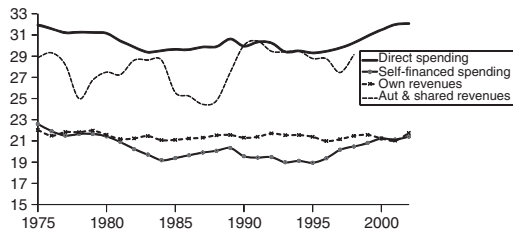
An important feature of these data is that, with the exception of Mexico, state and local direct spending shares are higher than state and local revenue shares. That is, subnational governments

depend on central government transfers to finance their spending. Self-financed subnational spending is generally close to the subnational own revenues; that is, subnational governments do not run large deficits after taking into account transfers from central governments.¹⁴

Over 1974–2003 the data reveal quite different patterns for revenue and spending decentralization: Figure 1 shows annual mean values across the OECD countries. Direct and self-financed spending decentralization in the OECD decreased on average during the 1970s and early

14. Surprisingly, the Stegarescu (2005) database shows higher subnational revenue shares than our OECD-based database despite the fact that the Stegarescu measure defines local revenues more narrowly. This could be due to different countries/time periods and/or differences in the main data source (IMF Government Finance Statistics vs. OECD National Accounts). There are also numerous missing values for some of the 21 countries in the Stegarescu database.

FIGURE 1
State and Local Shares in Consolidated
Aggregate Government Spending and Revenue
(OECD Simple Mean, 1975–2002)



1980s, trending upward only from the early-to-mid 1990s. By contrast, own revenue decentralization has remained fairly constant throughout the period. “Autonomous and shared” revenues (Equation (5)) reveal more variation without any clear trend over time, but this pattern may partly reflect missing values for some of the countries in the series.

C. Econometric Methods

Our econometric analysis follows the approach of Davoodi and Zou (1998) and Xie, Zou, and Davoodi (1999) who consider a production function with two inputs: private capital and public spending. Public spending is carried out by three levels of government: federal, state, and local. Assuming a Cobb–Douglas production function with constant returns to scale, these authors show that the long-run growth rate of per capita output is a function of the tax rate and the federal, state, and local shares in aggregate government spending. Optimal government spending shares of each administrative level match the growth elasticity of this administration relative to the sum of the elasticities for all administrations. If the local spending share is below (above) this optimum, further decentralization enhances (retards) economic growth.

The models of Davoodi and Zou (1998) and Xie, Zou, and Davoodi (1999) recognize that consolidated government spending must be financed by tax revenue, such that tests of the growth effects of FD need to recognize the government budget constraint.¹⁵ In addition to production function-related variables, we therefore also include the general government

15. See Bleaney et al. (2001) and Kneller et al. (1999) for similar arguments relating to tests of fiscal policy on growth more generally.

revenue/gross domestic product (GDP) ratio as a measure of the overall fiscal burden. Surprisingly, most recent empirical studies have failed to control for this fiscal burden, giving rise to potential bias in their estimates of the FD effects on growth.¹⁶

Our estimating equation uses the PMG model of Pesaran, Shin, and Smith (1999), which allows for heterogeneous short-run effects across countries but homogeneous long-run effects. The PMG regression takes the following “error correcting” form:

$$(6) \quad \Delta g_{it} = \phi(g_{it-1} - \beta F_{it-1}) + \sum_{j=1}^J \gamma_{0j} \Delta g_{it-j} + \sum_{l=0}^L \gamma_{1il} \Delta F_{it-l} + \varepsilon_{it}$$

where i indicates the country, t is time, g is the rate of growth of GDP, F is a matrix of fiscal and control variables, ϕ , β , and γ are parameters to be estimated and ε_{it} is a classical error term. In particular, the β parameter vector measures the homogeneous long-run (level) effect of the fiscal and control variables, γ_0 and γ_1 measure the (heterogeneous) short-run growth responses (to lagged growth and fiscal/control variables, respectively), and ϕ captures the adjustment toward long-run equilibrium.¹⁷ Our interest here is primarily with the long-run parameters, in particular the long-run effect of FD on economic growth.

Previous studies have typically sought to capture the long-run effect of FD on growth by using multi-year averages (Davoodi and Zou 1998; Woller and Philips 1998) or lagged (including initial year) values of FD in their estimations (Akai and Sakata 2002; Imi 2005; Lin and Liu 2000; Stansel 2005; Thiessen 2003; Thornton 2007). Using dynamic panel methods, and the PMG in particular, recognizes that efficiency gains need some time to materialize in a highly flexible way. The heterogeneous short-run transitory effects in the PMG also allow for

16. For example, if FD leads to a lower public sector size, because of the increased competition among levels of administration, and there is a negative relationship between the public sector size and growth, then there will be a positive bias in the estimation of the growth effects of FD.

17. Using a Mean Group (MG), rather than PMG, model allows long-run, as well as short-run, heterogeneity with the PMG restricted tested using a Hausman test. However, running an MG model requires many more degrees of freedom and is therefore not feasible here. However, Hausman tests on our PMG regressions in Table 2 support assumption of long-run parameter homogeneity.

differences across countries in their short-run responses of growth to changes in each independent variable. By focusing on a relatively homogeneous set of high-income OECD countries we hope to overcome Akai and Sakata's (2002) concern over international differences in history, institutions, culture, etc., but allowing for short-run heterogeneity facilitates a more accurate estimate of long-run effects.

A disadvantage of the PMG estimator over simpler methods, such as fixed effects models which impose homogeneity of all marginal responses, is that unless the available time series is long a degrees of freedom problem is soon reached. For the dataset available here this requires choices over restrictions to lag lengths and the set of included right-hand-side (RHS) variables. For this reason, we generally restrict the RHS variables to include three control variables (the investment rate, employment growth, and the ratio of general government revenue to GDP). Data on GDP growth, the private investment/GDP ratio, employment growth, and GDP per capita were obtained from OECD sources. This allows us to use up to two lags and up to four FD variables (subnational spending and revenue decentralization; disaggregated by local and state government where possible). Restricting our regressions to include a maximum of two lags, nevertheless, allows the effect of shocks to persist over many periods via the inclusion of the lagged dependent variable.

As a robustness check we include openness and inflation as controls (at the cost of reduced lag length) because these variables have often been employed previously.¹⁸ Openness is expected to affect growth positively, via the resource allocation benefits of external competition (Feder 1983). Inflation can have either positive or negative effects on growth though the latter is more usually observed (Zhang and Zou 1998). If, as argued by Treisman (2000), decentralization slows inflation in developed countries and inflation reduces growth, estimated effects of FD on economic growth that do not account for inflation are biased upward. Along these lines, Martínez-Vázquez and McNab (2006) find that decentralization indirectly enhances economic growth through its positive impact on price stability in developed countries, offsetting the negative direct effect of FD on growth.

18. The school enrolment ratio has been also included as a control variable in some studies on the effects of FD and economic growth. However, this variable is not reliable on an annual basis for OECD countries.

V. ECONOMETRIC RESULTS

A. PMG Results

Table 2 shows regression results using both the direct spending decentralization measure (Equation (1): in columns 1–3) and self-financed spending decentralization (Equation (2): in columns 4–5). We report only the long-run (β) parameters in order to save space (full results are available from the authors on request). All regressions include the overall revenue/GDP ratio and two production function “controls”: the investment ratio and employment growth.¹⁹ Investment and employment confirm the expected positive and significant relationships with GDP growth. Regressions including openness and inflation are discussed below; they have little impact on the other parameters shown in Table 2. The table also shows the importance of including the overall revenue burden which can be seen in all regressions to impact negatively and significantly on growth. That is, increases in overall fiscal size retard growth for a given level/type of decentralization.

Regression results in columns 3 and 5 (using direct and self-financed spending, respectively) represent our preferred specifications—including both spending and revenue decentralization. This allows us to test Oates' (1972) FD hypothesis that efficiency is enhanced by closer “matching” of revenue and spending decentralization. These reveal a negative and significant effect of state and local direct spending shares, or self-financed spending shares, on economic growth. Conversely, there is a positive, significant effect of larger state and local revenue shares on economic growth.

Together with the evidence in Table 1 that state and local direct spending shares are higher than revenue shares in our sample countries, this implies that a reduction of this gap, achieved either by reducing subnational spending shares or by increasing revenue shares, would increase economic growth.²⁰ As these results represent marginal effects associated with changes from

19. Like most growth regression studies, data for investment ratios is more readily available and generally more reliable than capital growth data. We also prefer employment to labor force growth because the former can account for the cyclical dimension to output growth better.

20. This result contrasts with the empirical evidence for China by Jin and Zou (2005), who also introduce simultaneous spending and revenue decentralization. For China, they find a positive effect for revenue decentralization when this measure was higher than spending decentralization and a negative effect when it was lower.

TABLE 2
Decentralization and Economic Growth: Pooled Mean Group Regressions (1972–2005)

Regression Decentralized Spending Measure	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Method	Direct PMG (2 Lags)	PMG (2 Lags)	Direct PMG (2 Lags)	Self- financed PMG (2 Lags)	Self- financed PMG (2 Lags)	Direct Orthog PMG (2 Lags)	Self-financed Orthog PMG (2 Lags)	Direct PMG (2 Lags)	Self- financed PMG (2 Lags)
General revenue ratio	-0.052 (-4.41)	-0.036 (-3.15)	-0.053 (-4.50)	-0.042 (-3.43)	-0.042 (-3.56)	-0.053 (4.50)	-0.050 (4.24)	-0.067 (-1.51)	-0.083 (-2.04)
State and local spending	-0.050 (-3.80)		-0.074 (-4.92)	-0.019 (-1.30)	-0.052 (-2.24)	-0.497 (2.19)	-0.550 (2.40)	-0.141 (-3.92)	-0.104 (-1.52)
State and local own revenue		-0.014 (-0.76)	0.056 (2.83)		0.060 (1.98)	0.353 (2.84)	0.341 (2.79)	0.067 (1.02)	-0.016 (-0.22)
Investment ratio	0.053 (2.28)	0.051 (2.25)	0.051 (2.28)	0.066 (2.66)	0.080 (3.47)	0.051 (2.28)	0.528 (11.61)	0.411 (5.04)	0.183 (2.60)
Employment growth	0.637 (13.44)	0.637 (15.03)	0.585 (13.28)	0.577 (11.83)	0.535 (11.32)	0.585 (13.28)	0.061 (2.65)	0.941 (11.68)	0.781 (9.60)
Countries/observations	23/726	23/726	23/726	23/726	23/726	23/726	23/726	9/283	9/283

Note: *t*-statistics in parentheses below parameters. The dependent variable in all regressions is the annual rate of GDP growth.

current settings they cannot confirm whether raising revenue shares to current spending share levels, or vice versa, would necessarily increase growth. However, they do confirm that reductions in state/local spending shares and financing a greater fraction of this spending by state/local taxes would be growth-enhancing, consistent with Oates' "matching" hypothesis.

Including *either* revenue shares *or* spending shares (columns 1, 2, and 4) reveals that false conclusions may be drawn when one FD variable is omitted. Including only state and local spending continues to generate a negative parameter but which is not always significantly different from zero. Including only state and local revenues appears essentially to generate a zero (but negatively signed) growth effect. It could be argued that our "matching" evidence is due to collinearity between revenue and spending decentralization—tending toward equal and opposite signed parameters. Indeed, subnational direct spending and own revenue reveal a 0.89 between-country correlation and a 0.63 within-country correlation. In order to analyze whether these high correlations are driving our results we implement the regression collinearity diagnostic procedures proposed by Belsley (1991), based on the interrelationships among the independent variables. As a rule of thumb, Belsley (1991) suggests that if the condition number is 30 or higher, then there may be collinearity problems.²¹ At 19.5 the higher condition number for our set of variables is well below this value. Using the variation inflation factor (VIF)²² leads to the same conclusion: the highest VIF is 4.69 (subnational government spending), well below the suggested rule of thumb of 10, from which collinearity problems should be further investigated (Hair et al. 1995). Nevertheless, as a further check, we orthogonalized subnational spending and revenue by creating a set of orthogonal variables, using a modified Gram-Schmidt procedure (Golub and Van Loan 1996), such that the effects of the preceding variable have been removed from each

variable. Thus, in column 6 we transform subnational government direct spending into a new variable in which the effect of the constant is removed and transform subnational government revenue into a new variable in which both the effects of the constant and subnational government spending are removed.²³ The interpretation of the orthogonalized variable is the independent variable in question minus the linear influences of the variables upon which it is orthogonalized. Results show that we find again a negative growth impact of spending decentralization and a positive impact for revenue decentralization. We reach the same conclusion when orthogonalizing self-financed subnational spending and subnational revenue in column 7.

Columns 8 and 9 disaggregate state and local direct spending and revenues into their two components. This reduces the sample to the nine federal countries having separate state and local spending.²⁴ With one exception (state own revenues becomes zero) we continue to find negative spending and positive revenue share effects associated with the state and local components. The largest parameters are associated with the local administration level, because the difference between spending and revenue is higher for local government than for the state level. This is consistent with there being greater efficiency gains from convergence toward equality between subnational spending and revenue when the initial mismatch is higher.

These results again indicate that a convergence toward more equal expenditure and revenue decentralization, at both the local and state level, would enhance economic growth, reinforcing the importance of testing for the growth effects of spending and revenue decentralization simultaneously. Surprisingly, few previous empirical studies have tested directly for both shares simultaneously; Jin and Zou (2005) is an exception. Note that our evidence does not necessarily imply that it is optimal for the degree of decentralization to be equal for revenues and expenditures—a "zero gap." It does imply, given observed values in OECD countries on average, that a marginal shift in the direction of closer alignment of these subnational expenditures and revenues would enhance growth.

21. The condition number is the condition index with the largest value; it equals the square root of the largest eigenvalue divided by the smallest eigenvalue. A condition number of 1 means that independent variables are orthogonal. Large values of condition number indicate rank deficiency of the independent variables matrix and that estimates are sensitive to small changes in the data. This number has been obtained applying the `Coldiag2` command in Stata.

22. VIF is an index which measures how much the variance of a coefficient is inflated by the existence of multicollinearity. Large VIF values indicate that severe effects are present.

23. We orthogonalize these variables using the Stata command `Orthog`.

24. As the PMG calculates means of individual country estimations, it is not possible to introduce variables taking zero values for a country in every year.

B. Instrumental Variables

Our estimates in Table 2 of the impact of FD on economic growth may be biased if, as Bahl and Linn (1992) and Martínez-Vázquez and McNab (2003) argue, the efficiency gains from FD emerge as economies grow and mature or decentralization is generally demanded at relatively high levels of per capita income. In this subsection, we account for potential endogeneity bias affecting the FD variables and investment, using their third and fourth lagged values as instruments.

Instruments must satisfy two requirements: they must be (a) correlated with the included endogenous variables; and (b) orthogonal to the error process. The first condition can be tested using the F -statistic and the partial R^2 between the excluded instruments and the endogenous regressors of the first stage. However, these measures will not reveal the weakness of a particular instrument if remaining instruments are highly correlated with the endogenous variables (Staiger and Stock 1997). The Shea partial R^2 (Shea 1997) overcomes this by taking into account the cross-correlations among the instruments. Baum, Schaffer, and Stillman (2003) suggest, as a rule of thumb, that if the partial R^2 is large, whereas the Shea partial R^2 measure is small, we may conclude that the instruments lack sufficient relevance to explain all the endogenous regressors.²⁵

Table 3 (lower section) shows both the Shea partial R^2 and the partial R^2 (in brackets) for the first stage regression. These confirm that the Shea partial R^2 s are relatively high and differences between the two measures are small—with the possible exception of the disaggregation between state and local decentralization. Table 3 also reports the Anderson under-identification test of the hypothesis that excluded instruments are uncorrelated with the endogenous regressors. This test is rejected in all estimations, indicating that the excluded instruments are relevant in explaining our endogenous variables.

Since high Shea partial R^2 and rejection under the Anderson test does not guarantee that weak instrument problems are absent, we also report the Stock and Yogo (2005) test for the presence of weak instruments. Results reported in Table 3 reject the null hypothesis

25. The distribution of Shea's partial R^2 statistic has not been derived.

of weak instruments.²⁶ In sum, our set of excluded instruments is highly correlated with the included endogenous variables. Furthermore, Sargan tests reported in Table 3 do not reject the hypothesis that the third and fourth lagged values are valid instruments, that is, orthogonal to the error process.²⁷

Comparing results in Tables 2 and 3 (columns 1 and 2) confirms our earlier FD findings. Subnational direct spending decreases growth, whereas subnational own revenue enhances GDP growth, with parameter estimates in Table 3 larger than their Table 2 equivalents, confirming our expectations that taking endogeneity into account leads to higher estimated growth impacts. Thus, FD continues to be associated with faster economic growth when subnational government spending more closely matches what it collects. Using direct spending, the same conclusion is reached when disaggregating spending and revenues into local and state government components for the subsample of the nine "federalist" countries. Higher state direct spending significantly decreases growth, whereas higher state revenues significantly increase growth. Results are less clear for local spending and revenues in Table 3, though when openness and inflation are included (see below) a similar pattern to state spending/revenues is obtained.

Column 4 in Table 3—for disaggregated state and local government and *self-financed* spending—appears to suffer from weak instrument problems: both the identification test and the Shea partial R^2 s for state self-financed spending and own revenues are low. When openness and inflation is included, this weak instrument problem wanes, but the Sargan test indicates that the instruments are not exogenous. Unfortunately, we cannot investigate this further using the fifth lag, because the time-series is insufficient and we have only nine countries in the subsample.

26. Stock and Yogo (2005) propose a test based on the F -form of the Cragg-Donald statistic. This test has good power, especially when the number of instruments is large as in our case. For the case of three endogenous variables, a desired maximal bias of 10%, and up to 14 excluded instruments (as in Table 4) the critical value is 10.25 (Stock and Yogo 2005, Table 1). Similarly, the critical value for two endogenous variables, desired maximal bias of 10%, and 14 excluded instruments, is 36.36 (Table 2).

27. The Sargan test rejects the use of second and third lags.

TABLE 3
Decentralization and Economic Growth: Instrumental Variable Regressions (1972–2005)
Instruments: 3rd and 4th lagged values

Regression Decentralized Spending Measure	[1]	[2]		[3]	[4]
Method	Direct PMG/IV (2 Lags)	Self- financed PMG/IV (2 Lags)		Direct PMG/IV (2 Lags)	Self- financed PMG/IV (2 Lags)
General revenue ratio	−0.004 (−0.28)	−0.017 (−1.17)		0.084 (2.56)	−0.091 (−3.51)
State and local spending	−0.083 (−7.04)	−0.082 (−3.10)	State spending	−0.112 (−7.87)	0.068 (1.09)
State and local own revenue	0.119 (5.81)	0.115 (3.53)	State own revenue	0.137 (5.25)	−0.142 (−2.21)
			Local spending	0.114 (1.72)	−0.415 (−5.54)
			Local own revenue	0.021 (0.24)	0.566 (6.29)
Investment ratio	−0.091 (−3.38)	−0.064 (−2.27)		−0.215 (−4.16)	−0.012 (−0.19)
Employment growth	0.525 (14.44)	0.654 (15.57)		0.528 (10.73)	0.594 (10.99)
Countries/Observations	23/645	23/645		9/254	9/254
Correlated with the included endogenous variables: Shea partial R^2 (overall R^2 in brackets)					
Shea partial R^2 : revenue ratio	0.60 [0.73]	0.55 [0.72]		0.56 [0.73]	0.43 [0.74]
Shea partial R^2 : state and local expenditure	0.46 [0.70]	0.27 [0.59]	State Spending	0.32 [0.82]	0.02 [0.55]
Shea partial R^2 : state and local revenue	0.31 [0.61]	0.24 [0.59]	State Own revenue	0.24 [0.66]	0.03 [0.62]
Shea partial R^2 : local expenditure			Local Spending	0.39 [0.50]	0.28 [0.56]
Shea partial R^2 : local revenue			Local Own revenue	0.37 [0.57]	0.26 [0.57]
Shea partial R^2 : investment	0.40 [0.50]	0.37 [0.50]		0.40 [0.50]	0.32 [0.51]
Anderson test	216.01 p value .00	174.29 p value .00		169.84 p value .00	16.47 p value .02
Weak identification test	30.23	23.62		15.20	1.31
Orthogonal to the error process					
Sargan test	1.251 p value .87	5.864 p value .21		7.829 p value .25	7.216 p value .30

Notes: t -statistics in parentheses below parameters. The dependent variable in all regressions is the annual rate of GDP growth.

VI. ROBUSTNESS CHECKS

A. Adding Control Variables

We noted earlier that several previous studies included inflation and openness variables among their control variables (though most recent papers fail to control for total government revenues). In regressions equivalent to those in Tables 2 and 3 but including these additional growth determinants (not reported) we find that the openness variable regularly takes the “wrong” (negative) sign which is frequently

significant.²⁸ In addition, this variable appears to interact counter-intuitively with the investment ratio in several regressions. We do not regard these regressions as satisfactory. Nevertheless, of particular interest here is that inclusion of these additional regressors does not alter the parameter estimates or conclusions regarding the growth effects of spending or revenue decentralization. In all cases, these remain negative and

28. These estimations can be found in the working paper version of this paper mentioned in footnote 5.

positive, respectively, typically significantly different from zero.

B. Using “Autonomous Revenue” Definitions

The availability of the Stegarescu (2005) database allows us to examine Equations (4) and (5) discussed above—based on definitions of “autonomous” and central/local “shared” revenues. Five countries are dropped from our previous sample: Greece and Mexico (no data), and Italy, New Zealand, and Portugal (time-series insufficient to include in PMG estimations).²⁹ This reduces the sample to 18 countries and 384 observations. Disaggregation into state and local governments is also not available. Nevertheless, the Stegarescu (2005) database is potentially helpful to check the robustness of our earlier results to narrower definitions of subnational revenues, capturing aspects of subnational “control” (Equation (4)) and “shared revenues” (Equation (5)).

Table 4 reports results equivalent to those reported in Table 3 for our larger sample. Using either Equations (4) or (5) again suggests that both greater direct and self-financed spending retards growth, whereas greater autonomous revenues (either alone or with shared revenues) enhance growth. General government revenue is again robustly negatively associated with GDP growth. It would appear then that changing the FD measures (direct vs. self-financed spending, own revenues vs. autonomous own revenues), changing the data source (OECD vs. IMF), and changing the sample (23 OECD vs. 18 OECD vs. 9 “federalist” countries) does not alter the conclusion: fiscal decentralization enhances economic growth where this involves moving toward a closer match between subnational spending and subnational revenues.

C. Government Spending/Revenue Composition by Levels of Administration

Our evidence of negative expenditure decentralization effects on growth could be due to the fact that local governments spend less on growth-enhancing functions than central governments, rather than being more inefficient. Analogously, evidence of positive revenue decentralization effects on growth could

also simply reflect the fact that local governments collect less from growth-distorting taxes than central governments. Hence our data may simply reflect the evidence of Kneller, Bleaney, and Gemmell (1999) and Bleaney, Gemmell, and Kneller (2001) that “distortionary” taxes retard growth while “productive” expenditures enhance it, rather than the administration level at which these fiscal aggregates are spent or collected.

To investigate this, we follow the methodology of Kneller, Bleaney, and Gemmell (1999) and Bleaney, Gemmell, and Kneller (2001) to produce an aggregate “productive spending” category—the sum of general public services, defense, public order and safety, environment protection, housing and community amenities, health and education. We also aggregate government revenue sources into “distortionary” and “nondistortionary” taxes and “other revenues” (see Kneller, Bleaney, and Gemmell 1999 for discussion), where the former is composed of current taxes on income, wealth and capital and social contributions and so-called “nondistortionary” taxes are mainly indirect taxes such as value-added tax (VAT). These aggregations are only possible for European countries (from 1995), based on Eurostat data for the functional composition of government spending and the composition of government revenues by levels of administration.

Our calculations show the share of state and local government in total productive spending in the EU-15 countries over 1995–2004 to be 35%. There is some variation across types of spending; the local share is particularly high for education, public order, and safety. The share of productive expenditure is significantly above the equivalent share of total nonproductive spending (28%). Using an “economic” classification leads to a similar conclusion: local and state governments in the EU-15 accounted for a significantly higher share of government capital formation (68%) than for intermediate consumption (3%), compensation of employees (6%), or transfers (4%). This would seem to suggest that the negative effect of expenditure decentralization on economic growth we find is unlikely to occur because of a higher proportion of nonproductive spending within local and state budgets.

A similar pattern emerges for revenue decentralization. For distortionary taxes, we find that local and state governments in the EU-15 collected 14% of all distortionary taxes during 1995–2004, and 28% of “other revenues”

29. In addition Greece, Mexico, and New Zealand are the three countries for which extending the data back has been more difficult (see footnote 9). Table 4 shows that excluding these three countries does not change the econometric results.

TABLE 4
Decentralization and Economic Growth: IV Regressions Using Stegarescu Variables and Sample (1975–2000)

Regression	[1]	[2]	[3]	[4]
Method	PMG/IV (1 lag)	PMG/IV (1 lag)	PMG/IV (1 lag)	PMG/IV (1 lag)
General revenue ratio	–0.099 (–3.88)	–0.099 (–2.94)	–0.064 (–2.32)	–0.054 (–1.84)
State and local direct spending	–0.077 (–5.07)	–0.075 (–3.73)		
State and local self-financed spending			–0.078 (–3.34)	–0.039 (–1.54)
Autonomous own revenues	0.101 (5.87)		0.085 (6.14)	
Autonomous and shared own revenues		0.037 (2.92)		0.036 (3.76)
Investment	–0.014 (–0.58)	–0.058 (–2.04)	0.019 (0.86)	–0.000 (–0.02)
Employment growth	0.689 (28.26)	0.717 (25.74)	0.695 (28.47)	0.740 (28.48)
Openness	–0.021 (–4.58)	–0.017 (–3.01)	–0.034 (–7.30)	–0.040 (–7.34)
Inflation	–0.114 (–5.35)	–0.108 (–4.61)	–0.154 (–7.05)	–0.177 (–7.48)
Sample	$N = 18$ Observation = 359	$N = 18$ Observation = 359	$N = 18$ Observation = 359	$N = 18$ Observation = 359
Correlated with the included endogenous variables: Shea partial R^2 (overall R^2 in brackets)				
Shea partial R^2 : revenue ratio	0.94 [0.95]	0.94 [0.95]	0.94 [0.95]	0.94 [0.95]
Shea partial R^2 : direct exp	0.92 [0.97]	0.86 [0.98]		
Shea partial R^2 : self-financed exp			0.93 [0.97]	0.72 [0.98]
Shea partial R^2 : own tax	0.93 [0.98]		0.88 [0.95]	
Shea partial R^2 : own and shared tax		0.86 [0.98]		0.68 [0.95]
Shea partial R^2 : investment	0.71 [0.72]	0.71 [0.72]	0.69 [0.72]	0.66 [0.73]
Shea partial R^2 : openness	0.96 [0.99]	0.97 [0.99]	0.96 [0.99]	0.97 [0.99]
Anderson test	397.80 p value .00	397.49 p value .00	370.28 p value .00	304.92 p value .00
Weak identification test	75.15	75.04	66.46	48.60
Orthogonal error process				
Sargan test	7.715 p value .17	6.803 p value .24	6.704 p value .24	5.748 p value .33

Instruments: 3rd and 4th lagged values.

Spending FD measures: Direct spending and Self-financed spending.

Revenue FD measures: Autonomous own revenues and Autonomous and shared own revenues.

Notes: t -statistics in parentheses below parameters. The dependent variable in all regressions is the annual rate of GDP growth.

(Kneller, Bleaney, and Gemmell show the latter also tend to be growth-retarding). By contrast, state and local governments only collected 11% of all nondistortionary taxes (growth-neutral according to Kneller, Bleaney, and Gemmell

1999). The positive revenue decentralization growth effect found in Tables 2 and 4 is unlikely therefore to be explained by a higher proportion of nondistortionary taxes among state and local revenues.

VII. CONCLUSIONS

The empirical literature on the efficiency gains associated with fiscal decentralization has generally focused on the growth impact of spending or revenue decentralization separately. However, following Jin and Zou's (2005) evidence for China, we test simultaneously for the growth effects of both spending and revenue decentralization across OECD countries. From a theoretical perspective, Oates (1972) has argued that FD efficiency benefits become greater when there is a close match between revenue discretion and spending assignments at subnational levels.

We find that economic growth in OECD countries has been adversely affected by decentralization of expenditures but encouraged by revenue decentralization. As OECD countries are, in general, substantially more spending than revenue decentralized, this implies empirical support for the prediction that there would be FD efficiency gains on average by moving toward a closer match between spending and revenue decentralization in OECD countries. Our econometric results relate to *marginal* changes and, hence, do not indicate whether a shift to "perfect matching" would maximize growth. Nor can we be sure that raising the share of decentralized revenues to the level of current expenditure shares (or reducing decentralized expenditure shares to current revenue shares) would necessarily be growth-enhancing. However, they do support the conclusion that reducing expenditure decentralization, and simultaneously reducing the fraction which is financed centrally would be growth-enhancing.

This evidence is robust to various definitions of decentralized spending and "own revenues," and the use of PMG methods has allowed for the possibility that dynamic responses of growth to changes in spending and revenue shares may take several years. We have also allowed these short-run responses to vary across countries rather than impose short-run homogeneity as in the fixed effects models used by previous investigators. Our results emphasize the importance of testing simultaneously for expenditure and revenue decentralization to avoid conflating the distinct, and oppositely signed, impacts of the two aspects to FD.

Finally, testing for possible endogeneity bias of our fiscal decentralization (and some control) variables, suggests that lagged values can provide valid instruments and these confirm that our

FD-growth estimates do not appear to be due to endogenous responses. For OECD countries, therefore, it would appear that, *ceteris paribus*, their growth rates have been hindered by a common tendency to finance a large fraction of their subnational expenditures using centrally raised tax revenues together with inter-government transfers, in preference to financing a higher fraction of subnational expenditures with revenues at the subnational level. There may be a number of good or bad reasons why this is the case, which we have not addressed in this article. However, the growth consequences of those choices seem clear.

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