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Tax Decentralization and Public Deficits in OECD Countries

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This article explores the effect of sub-national tax autonomy and sub-national control over shared taxes on primary deficits with panel data for 23 OECD countries over the 1975–2000 period. The results suggest that sub-national tax autonomy has a U-shaped effect on primary deficits. We find that the "average" country in the sample could increase the fiscal stability of its public sector by reducing sub-national tax autonomy. There is also some indication that sub-national control over shared taxes increases fiscal stability, but we obtain this result only if Belgium and Spain are included in the sample.

Introduction

Anecdotal evidence suggests that sub-national fiscal autonomy may cause budget imbalances and macroeconomic instability. In Brazil, for example, sub-national governments borrowed heavily from state-owned banks and then defaulted on repayment, thereby forcing the federal government to bail out the banks to forestall financial chaos (Samuels 2003). In 1992, the German constitutional court compelled the federal government to grant bailout transfers to two states after they had accumulated such high levels of public debt that they found it difficult to provide a basic level of public services to their citizens (Seitz 1999). In Argentina, the structure of the intergovernmental transfer scheme aggravated macroeconomic difficulties by providing sub-national governments with incentives to over-spend and over-borrow (Tomassi, Saiegh, and Sanguinetti 2001).

These developments have drawn scholarly attention to the relationship between fiscal decentralization (i.e., subnational tax and/or expenditure autonomy) and public finances. One strand of the literature, exemplified by contributions such as Wildasin (1997), Wibbels (2000), or Goodspeed (2002), suggests that subnational fiscal autonomy may indeed cause fiscal policy distortions and inefficiently high levels of public debt because of soft budget constraints or coordination failures. However, there is a different and well-established strand of the literature which

claims that fiscal decentralization ensures allocative efficiency (Oates 1972) and prevents inefficient government intervention (Brennan and Buchanan 1980). Consequently, this strand of the literature indicates that fiscal decentralization will increase the fiscal stability of the public sector.

Since the relationship between fiscal decentralization and fiscal outcomes is theoretically ambiguous, we examine in this article empirically whether fiscal decentralization improves or endangers public finances with data on twenty-three OECD countries over the 1975–2000 period. In doing so, we extend the existing literature on this question in two ways.

The first contribution of this article is that two new measures for the extent of *tax decentralization* are used to empirically operationalize the concept of fiscal decentralization. These new measures are provided by Stegarescu (2005) and are constructed according to a classification proposed by the OECD (OECD 1999). The Stegarescu (2005) measures constitute an improvement over the "revenue decentralization" measures that are traditionally used in the fiscal federalism literature because they attempt to capture the "true" fiscal autonomy of sub-national governments. That is, the traditional measures of tax decentralization, which are usually based on IMF GFS data, do not distinguish between revenues obtained by subnational governments through taxes over which they may decide autonomously, and revenues obtained through taxes over which they have no control (Ebel and Yilmaz 2002). The Stegarescu (2005) measures, on the other hand, take the autonomous taxing power of subnational governments into account. In particular, they capture over-time changes in the tax autonomy of subnational governments.[1]

The second contribution of this article is that nonlinearities in the relationship between subnational tax autonomy and public deficits are explicitly modeled. Most studies on the relationship between fiscal decentralization and public finances use a linear specification (De Mello 2000; Freitag and Vatter 2008; Baskaran 2010).[2] By doing so, they implicitly assume that the effect of an additional increase in fiscal decentralization on public deficits is the same irrespective of its currently prevailing level. This is a strong assumption. It is more likely that the effect of an increase in fiscal decentralization on public deficits depends on its currently prevailing level. For example, an additional increase in fiscal decentralization might improve the fiscal stability of the public sector if a country is highly centralized by allowing citizens to vote with their feet (Tiebout 1956). However, if a country is already heavily decentralized, then an additional increase might exacerbate coordination problems and lead to worse fiscal outcomes. Yet, it is also possible that either a completely centralized or decentralized public sector is preferable to an intermediate system, as intermediate systems might suffer from a blurring of responsibilities and an inefficient overlap of government activities. Consequently, we estimate in this article empirical models that allow for the possibility of a

nonlinear relationship between our measures for tax decentralization and public deficits.

The remainder of this article is organized as follows. The next section provides some theoretical considerations on the relationship between fiscal decentralization and public finances and a short literature review. The data used in the empirical analysis and the econometric model are described in the following section. We then present the results and end with some concluding remarks.

The Link Between Tax Decentralization and Public Deficits

There are a number of reasons why fiscal decentralization might endanger the fiscal stability of the public sector: First, if the fiscal constitution and/or the political reality in a country is such that the federal government is held responsible for the fiscal well-being of sub-national governments, then the latter might expect to receive a bailout in times of fiscal crisis. This expectation will render the budget of sub-national governments "soft" and induce them to increase expenditures and/or decrease taxes, which in turn will lead to higher public deficits (Wildasin 1997; Goodspeed 2002).

A second argument is that fiscal decentralization might lead to larger deficits if it is used by the central government to impose new or additional spending responsibilities on subnational governments without giving them sufficient revenue raising capabilities. Decentralization processes might be characterized by this phenomenon when subnational governments have little political power or low legitimacy in the eyes of the population (Rodirguez-Pose and Gill 2003). Consequently, a correlation between some measures of fiscal decentralization, in particular tax decentralization, and public deficits might emerge. Yet, it is also possible that fiscal decentralization increases deficits if subnational governments are too powerful. In this case, they can force the federal government to assume any debt that they have acquired in exchange for political support. Granting additional fiscal autonomy to subnational governments in such circumstances might then lead to more fiscal instability. Rodriguez-Pose and Gill (2004) illustrate this problem with the example of Brazil. Since Brazilian states have traditionally been politically powerful, they over-borrowed assuming that they could eventually force the federal government to take over their debt.

Third, if the fiscal constitution is characterized by extensive tax sharing arrangements and horizontal equalization, incentives for efficient and growth-enhancing activities are likely to be diminished since these institutional features are in effect a tax on sound fiscal policies. Even though these inefficiencies must not necessarily lead to higher deficits, a positive correlation between the receipts from tax sharing arrangements or horizontal transfer schemes and the accumulation of debt is often observed empirically. Rodden (2005), for example,

finds that the speed of fiscal consolidation of German States after negative fiscal shocks is inversely related to the amount of transfers received during horizontal equalization.

Furthermore, decentralization and the related concept of federalism increases the number of veto-players by providing additional institutional channels, such as a second chamber of parliament, through which opponents of reforms can voice their opposition (Tsebelis 1995). Since a larger number of political actors have to agree to fiscal decisions in decentralized systems, budget consolidations by large spending cuts or tax increases will be more difficult. In addition to such institutionalized channels of obstruction, the cohesion of national fiscal policies becomes more difficult to maintain when every individual jurisdiction may act independently of the federal and other sub-national governments (Wibbels 2000).[3]

However, there are also a number of theoretical arguments why fiscal decentralization should decrease public deficits. Decentralization of fiscal authority will in all likelihood induce competition for mobile tax payers by sub-national governments (Tiebout 1956; Brennan and Buchanan 1980). By analogy to private markets, competition might force local governments to implement optimal policies both in terms of technical and allocative efficiency. Increases in the efficiency of the public sector might then lead to lower deficits if they imply, for example, that a given amount of public goods can be provided with fewer resources. Furthermore, under fiscal competition, jurisdictions which maximize the inter-temporal revenue flow should choose low levels of debt in order to motivate citizens to move into their jurisdictions, as low levels of indebtedness signal, ceteris paribus, low future taxes.

Fiscal decentralization may also be interpreted as a means to use dispersed information efficiently (Hayek 1945). Lower level governments are likely to be better informed about local circumstances, and are capable to take these into account when implementing policies. For example, the better knowledge of local geographical conditions that subnational officials possess might be helpful in avoiding situations where *ex post* costs of infrastructure projects turn out to be higher than initially projected.

Under a decentralized public sector, jurisdictions can also experiment with new policies as suggested by the literature on laboratory federalism (Oates 1999). Institutional arrangements which ensure sound fiscal policies can be developed gradually in individual jurisdictions and, if they turn out to be successful, passed on to other jurisdictions. This has been, for example, the case in Switzerland where mechanisms which were intended to arrest the growth of public debt, in particular the so called "debt brake," have been initially introduced in a small number of sub-national jurisdictions, but gradually extended to a larger number of cantons and eventually even adopted at the federal level (Feld and Kirchgaessner 2007).

Overall, the theoretical literature on whether decentralization improves or endangers the fiscal stability of the public sector is somewhat ambiguous.

Therefore, this question is essentially an empirical one. The empirical literature on this topic uses different approaches. First, case studies have been conducted that focus on the systems of fiscal federalism prevailing in individual countries. For example, Rodden, Eskeland, and Litvack (2003) discuss the presence of soft budget constraints in various countries, and find that if intergovernmental transfer schemes are ill-designed, fiscal decentralization might endanger public finances. Von Hagen et al. (2000) discuss bailout episodes in four OECD countries: Australia, Germany, Italy, and Sweden. They show that the likelihood of fiscal profligacy is related to both idiosyncratic characteristics of sub-national jurisdictions and the political goals of the federal government. They argue furthermore that unsustainable policies by sub-national jurisdictions must not necessarily lead to a worsening of sub-national finances if the federal government, in anticipation of the fiscal woes of lower-level jurisdictions, quietly increases vertical transfers. Finally, Kirchgaessner (2005) argues, on the basis of the Swiss experience, that federal countries are more capable to limit fiscal profligacy than unitary states.

Compared to the extensive number of case studies, empirical contributions that explicitly address the relationship between fiscal decentralization and public deficits with econometric methods are relatively rare. They have been conducted at the subnational level within individual countries and at the international level with cross-country data.

There are several notable examples for single country studies. Freitag and Vatter (2008) find that in Switzerland, decentralized cantons are more likely to run balanced budgets in times of economic crisis. Schaltegger and Feld (2009) discuss the propensity of Swiss cantons toward budget consolidations and reach the conclusion that decentralization improves a canton's ability to consolidate its budget. Rattso (2004) finds for Norway that the specific system of decentralization in this country leads to a smoothing of local budgets by the central government.

Even though studies based on data at the subnational level within a country have important advantages such as dealing with a relatively stable and comparable cultural and historical environment—a fact which makes ceteris paribus conclusions more convincing—they also have some disadvantages. In particular, the fiscal policies of the central government are usually neglected. This, however, is problematic because the central government is, in many countries, responsible for the social security system and provides large amounts of intergovernmental grants.

Despite the ability of cross-country studies to paint a more comprehensive picture, their number is relatively small. De Mello (2000) explores the impact of decentralization on the deficit of both the federal and sub-national governments separately with a sample consisting of thirty countries. He uses sub-national tax autonomy as measured by the IMF's GFS data as a proxy for decentralization and concludes that it generally leads to an increase of sub-national deficits, suggesting that fiscal decentralization might aggravate soft budget constraints and

coordination failures. Fornsari, Webb, and Zou (2000) find in a study with thirty-two developing and industrial countries that expenditure decentralization contributes to a larger government sector, but that sub-national deficits have no impact on the fiscal balance of the central government. However, once a measure based on subnational revenues is used, decentralization seems to decrease central government deficits. Thornton and Mati (2008) examine whether fiscal decentralization impedes a coordinated national fiscal policy in OECD countries. They find that changes in the fiscal balances of federal and sub-national governments tend to be strongly correlated, and conclude on the basis of this evidence that decentralization does not complicate fiscal stabilization policies. Baskaran (2010) finds that expenditure decentralization is negatively related to public debt for a panel of seventeen OECD countries. Tax decentralization and vertical fiscal imbalances, on the other hand, seem to have no (linear) effect on public debt. Finally, Neyapti (2010) finds that both expenditure and revenue decentralization reduce, in general, budget deficits, but that that the strength of this effect varies according to a number of country-specific factors such as the size of the population or whether local elections are held.

Furthermore, some studies on public deficits which are not primarily concerned with fiscal decentralization nonetheless include a variable in order to control for its degree. Singh and Plekhanov (2005), for example, include a measure of expenditure decentralization in their regressions, even though they are actually interested in the impact of borrowing restrictions on subnational deficits. They find that decentralization increases deficits once they control for the presence of country fixed effects. Rodden (2002) studies the effect of intergovernmental transfer schemes, and in particular the effect of vertical grants, on the fiscal stance of subnational and central governments. The implicit assumption is that grants reduce subnational revenue autonomy and thereby increase the vertical fiscal imbalance. He finds that vertical fiscal imbalances do not generally increase deficits, thereby indirectly suggesting that revenue and/or expenditure autonomy have no significant effect on fiscal outcomes.

Data and Empirical Model

We use panel data on twenty-three high-income OECD countries[4] for the 1975–2000 period to estimate the following empirical model:

$$Y_{it} = a_i + c_t + \beta_1 DEC_{it} + \beta_2 DEC_{it} \times DEC_{it} + \delta X_{it} + \varepsilon_{it} \qquad (1)$$

The dependent variable, Y_{it}, is the general government primary deficit to GDP ratio. On the right hand side, we include country-fixed effects, a_i, year-fixed effects, c_t, measures for the extent of fiscal decentralization, DEC_{it}, their quadratic transformations, $DEC_{it} \times DEC_{it}$, and a vector of additional control variables, X_{it}.

All variables used in the analysis are explained and their sources are listed in table 1. Summary statistics can be found in table 1 in the Data Appendix (Supplementary Data).

We use as dependent variable the general government primary deficit to GDP ratio because fiscal profligacy at the subnational level must not necessarily lead to increases in *subnational deficits*. For if the federal government borrows in place of sub-national governments and passes these additional revenues quietly to the latter by means of intergovernmental transfers, the federal budget might display a deficit while subnational budgets remain balanced (Rodriguez-Pose and Gill 2003). Thus, it is necessary to consider the fiscal stance of all tiers of government simultaneously when discussing the effects of fiscal decentralization on public deficits.

The choice of the right-hand side variables is derived from theoretical reasoning and econometric tests. Country-fixed effects are included to control for both unobserved heterogeneity and for rarely time-varying institutional features such as the political (presidential versus parliamentary) or electoral (proportional versus majoritarian) system[5]; year-fixed effects are included to control for common shocks. Since tests indicate the presence of both heteroscedasticity and autocorrelation, we use robust standard errors and cluster at the country level.

All regressions control for the population size, GDP growth, the unemployment rate, the inflation rate, an urbanity index, the share of the working population, a measure of openness, and the interest rate on government bonds. These measures are likely to be important economic or sociodemographic determinants of public deficits. They are mostly obtained from OECD databases. The only exception is the urbanity index, which is obtained from the UN's World Urbanization Prospects database.

Since there might be ideological differences in the attitude towards fiscal stability, we also control for the ideology of the federal government by using an index provided by Armingeon et al. (2008). In addition, we control in all regressions for the political authority of subnational governments by including the regional authority index by Hooghe, Marks, and Schakel (2010) because politically powerful subnational governments may have a better resource base than powerless ones and therefore may be able to run sounder fiscal policies. On the other hand, central governments might find it difficult to impose hard budget constraints if subnational governments are too powerful.

Finally, we also include in some regressions the total government revenue to GDP ratio and the subnational tax revenue to GDP ratio to control for the expenditure capacity of subnational governments. We desist from including these variables in all models because they might suffer from endogeneity problems when central or subnational governments deliberately raise revenues because they plan to spend more or expect higher deficits.[6] These variables are obtained from OECD databases. (See table 1 for the specific sources.)

Table 1 Definition and source of variables

Label	Description	Source
Dependent variable		
Primary deficit	Primary deficit of general government in percent of GDP	OECD Economic Outlook No. 83
Decentralization measures		
OTD	Sub-national revenue from taxes for which sub-national governments determine rates and/or define bases as share of general government tax revenue (own taxes decentralization)	Stegarescu (2005)
STD	Sub-national revenue from taxes for which sub-national governments determine the revenue split as share of general government revenue (shared taxes decentralization)	Stegarescu (2005)
Control variables		
Population	Population	OECD Population and Labor Force Dataset
GDP growth	GDP per capita growth	OECD Economic Outlook No. 83
Unemployment	Unemployment rate	OECD Economic Outlook No. 83
Inflation	Growth of CPI Index	OECD Key Economic Indicators
Urbanity	Share of population living in urban areas	World Urbanization Prospects: The 2007 Revision (UN)
Working age	Share of population between fifteen and sixty-five years	OECD Population and Labor Force Dataset
Ideology	Index of the ideology of government, higher values indicate more leftist ideology	CPDS I Dataset 1960-2006 (Armingeon et al. 2008)
Openness	Trade-to-GDP ratio	OECD Macro Trade Indicators
Interest rate	Long-term interest rate on government bonds	OECD Economic Outlook No. 83
Regional Authority Index	Index measuring the political authority of regional governments	Hooghe et al. (2010)
Government revenue	Government revenue in percent of GDP	OECD Economic Outlook No. 83
Subnational tax revenue	Subnational tax revenue in percent of GDP	OECD Revenue Statistics

We apply two different measures of fiscal decentralization, one pertaining to the ability of sub-national governments to autonomously determine tax rates and/or bases for "own" taxes (taxes for which the revenues accrue exclusively to subnational governments, OTD), and one pertaining to sub-national control over the revenue split for taxes that are shared with the federal government (STD).

The OTD and STD measures are obtained from Stegarescu (2005). He constructs these measures according to a classification proposed by OECD (1999). OECD (1999) classifies individual taxes within a country into three main categories: (i) Taxes whose revenue accrue to subnational governments and for which subnational government can either determine rates and/or bases independently, (ii) taxes that are shared between the central and subnational governments and for which, at the very least, the revenue split cannot be changed without the consent of subnational governments, and (iii) all other taxes. The OTD measure is defined as the sum of the revenues from the taxes belonging to the first category divided by total general government tax revenues. The STD[7] measure is defined as the sum of the revenues from taxes belonging to the second category divided by total general government tax revenues.[8]

Many countries have experienced significant variability with respect to the level of tax decentralization. See figure 1 in the Data Appendix (Supplementary Data) for plots of the evolution of the OTD measure in all countries included in the sample. Countries such as Belgium, Portugal, and Spain have considerably expanded the extent of subnational tax autonomy. On the other hand, the United Kingdom has become more centralized during the sample period. Other countries, e.g., Sweden and Norway, exhibit both phases of distinct centralization and decentralization, but no overall trend. Finally, there are also some countries that have exhibited relatively constant levels of fiscal decentralization, in particular such archetypical federations as Canada, Switzerland, and the United States.

Figure 2 in the Data Appendix (Supplementary Data) shows the evolution of the shared taxes decentralization measure (STD) during the sample period. Only five countries—Austria, Belgium, Germany, Spain, and Switzerland—exhibit positive values for this variable, and therefore only these five countries are included in the figure. The other countries in the sample consistently exhibit a value of 0. In fact, only Belgium and Spain display significant over-time variation in this variable.

Except perhaps for the inclusion of the quadratic transformation, the specification in Equation (1) follows most of the existing literature. The quadratic transformations, i.e., $OTD \times OTX$ and $STD \times STD$, respectively, are included to take possible nonlinearities in the relationship between tax decentralization and public deficits into account. In other words, by including these transformations, we allow for the possibility that the effect of an increase in fiscal decentralization depends on its currently prevailing level. If the estimated coefficients for these quadratic transformations are significant, we can conclude that the OTD and

STD variables have a nonlinear (or more precisely a quadratic) effect on public deficits.

Baseline Results

We first estimate five models without the quadratic terms in order to "replicate" the studies that assume a linear relationship between fiscal decentralization and fiscal outcomes; thereafter, we re-estimate the same models with the quadratic terms included in order to explore nonlinear effects.

The results are collected in table 2. The first two models in both sets of regressions include each of the decentralization measures separately; in the third model, we include both decentralization measures jointly; in the fourth model, we additionally include the government revenue to GDP variable. In the fifth model, we expand the fourth model by including the subnational tax revenue to GDP ratio.

In the linear models, the estimated coefficient for the *OTD* variable is insignificant, whereas that for the *STD* variable is significantly negative. These results suggest that sub-national control over the revenue split for shared taxes leads to lower primary deficits. *Prima facie*, they also indicate that sub-national tax autonomy is irrelevant for fiscal outcomes.

The nonlinear models, however, compel us to re-evaluate this particular conclusion. The highly significant coefficient for the quadratic transformation of the *OTD* variable indicates that subnational tax autonomy has a nonlinear effect on primary deficits. Since the "base" effect is negative and the quadratic transformation is positive, we conclude that the aggregate marginal effect of subnational tax autonomy on primary deficits is U-shaped: marginal increase leads to smaller primary deficits at low levels of subnational tax autonomy, and to larger primary deficits at higher levels. Depending on the particular model, the optimal (i.e., "deficit-minimizing") level for our measure for sub-national tax autonomy is between 5.3 percent and 16.7 percent. We plot the marginal effect of this variable at different values of *OTD* in figure 1. The plot is based on the estimates in Model Q5 which we consider as our preferred model because it has the most complete specification. This plot illustrates once more that at low levels of OTD, a further increase leads to lower deficits. However, the effect turns positive from some point onwards.

The *STD* variable, on the other hand, does not display a nonlinear effect; instead, the estimates confirm the findings from the linear models and suggest that subnational control over shared taxes leads "linearly" to lower primary deficits. Yet, this conclusion should be viewed with caution given that it is based on variation in at most only five countries.

Table 2 Regressions of primary deficit to GDP ratio on decentralization measures, 1975–2000; fixed effects

	Linear models						Quadratic models				
	LI 1 b/t	LI 2 b/t	LI 3 b/t	LI 3 b/t	LI 4 b/t	LI 5 b/t	Q 1 b/t	Q 2 b/t	Q 3 b/t	Q 4 b/t	Q 5 b/t
Population	0.009	-0.006	-0.006	-0.006	-0.005	-0.013	0.015	-0.007	0.001	0.001	-0.008
	(0.290)	(-0.225)	(-0.220)	(-0.220)	(-0.165)	(-0.419)	(0.522)	(-0.252)	(0.029)	(0.039)	(-0.276)
GDP growth	-0.079	-0.100	-0.079	-0.079	-0.141*	-0.125*	-0.092	-0.093	-0.084	-0.123*	-0.100*
	(-0.862)	(-1.027)	(-0.823)	(-0.823)	(-1.912)	(-1.899)	(-1.154)	(-0.928)	(-0.974)	(-1.856)	(-1.800)
Unemployment	0.531**	0.469**	0.451**	0.451**	0.497**	0.459**	0.463**	0.469**	0.401**	0.432**	0.377**
	(2.630)	(2.515)	(2.365)	(2.365)	(2.570)	(2.372)	(2.642)	(2.538)	(2.399)	(2.406)	(2.121)
Inflation	-0.032	-0.010	-0.028	-0.028	-0.034	-0.005	-0.048	-0.017	-0.050	-0.050	-0.014
	(-0.410)	(-0.129)	(-0.344)	(-0.344)	(-0.408)	(-0.064)	(-0.629)	(-0.215)	(-0.650)	(-0.632)	(-0.202)
Urbanity	0.227	0.211	0.250	0.250	0.225	0.200	0.195	0.222	0.227	0.211	0.178
	(1.113)	(1.024)	(1.135)	(1.135)	(0.872)	(0.895)	(1.095)	(1.070)	(1.182)	(0.961)	(1.064)
Working age	-0.102	-0.240	-0.225	-0.225	-0.236	-0.350	0.033	-0.233	-0.072	-0.094	-0.228
	(-0.312)	(-0.864)	(-0.756)	(-0.756)	(-0.793)	(-1.179)	(0.117)	(-0.846)	(-0.270)	(-0.350)	(-0.877)
Ideology	0.064	0.104	0.106	0.106	0.163	0.137	0.103	0.110	0.143	0.172	0.140
	(0.344)	(0.553)	(0.604)	(0.604)	(0.858)	(0.702)	(0.728)	(0.583)	(1.054)	(1.148)	(0.914)
Openness	-0.056*	-0.052	-0.051	-0.051	-0.060*	-0.052*	-0.084**	-0.053	-0.079**	-0.082**	-0.074**
	(-1.749)	(-1.656)	(-1.585)	(-1.585)	(-1.850)	(-1.857)	(-2.428)	(-1.671)	(-2.264)	(-2.267)	(-2.413)
Interest rate	0.224	0.198	0.245	0.245	0.211	0.144	0.246	0.210	0.272	0.246	0.163
	(1.292)	(1.224)	(1.341)	(1.341)	(1.203)	(0.860)	(1.368)	(1.292)	(1.468)	(1.370)	(1.016)
Regional authority index	-0.228	-0.021	-0.102	-0.102	-0.072	-0.067	0.020	-0.016	0.119	0.115	0.141
	(-1.003)	(-0.091)	(-0.440)	(-0.440)	(-0.351)	(-0.329)	(0.116)	(-0.073)	(0.678)	(0.658)	(0.854)

(continued)

Table 2 Continued

	Linear models						Quadratic models				
	LI 1 b/t	LI 2 b/t	LI 3 b/t	LI 3 b/t	LI 4 b/t	LI 5 b/t	Q 1 b/t	Q 2 b/t	Q 3 b/t	Q 4 b/t	Q 5 b/t
Total government rev.					−0.219* (−1.882)	−0.101 (−0.737)				−0.132 (−1.215)	0.029 (0.242)
Subnational tax rev.						−0.873 (−1.696)					−1.132** (−2.759)
OTD	0.042 (0.330)		0.118 (1.104)	0.118 (1.104)	0.138 (1.439)	0.289** (2.500)	−0.435** (−2.716)		−0.345** (−2.621)	−0.292** (−2.327)	−0.137 (−1.046)
OTD × OTD							0.013*** (3.683)		0.013*** (3.518)	0.011*** (3.179)	0.013*** (3.844)
STD		−0.228*** (−3.431)	−0.277*** (−3.244)	−0.277*** (−3.244)	−0.302*** (−3.495)	−0.194* (−1.781)		−0.369*** (−2.820)	−0.378*** (−3.201)	−0.341** (−2.386)	−0.211 (−1.213)
STD × STD								0.007 (1.170)	0.007 (1.377)	0.004 (0.700)	0.005 (0.621)
Mean OTD							0.089		0.148**	0.158**	0.356***
Mean STD								−0.310***	−0.317***	−0.304***	−0.168
N	494	494	494	494	494	494	494	494	494	494	494
Countries	23	23	23	23	23	23	23	23	23	23	23
R^2	0.421	0.447	0.456	0.456	0.480	0.494	0.501	0.448	0.527	0.534	0.558
RMS error	2.268	2.216	2.198	2.198	2.149	2.119	2.105	2.215	2.051	2.035	1.981

Notes. (i) Mean OTD denotes the marginal effect of own taxes decentralization and STD the marginal effect of shared taxes decentralization at the sample average, (ii) country and time-fixed effects are included in all models, estimated coefficients are not reported, (iii) significance levels at *10 percent, **5 percent, and ***1 percent, (iv) significance tests are conducted with standard errors that are robust to heteroscedasticity and autocorrelation (clustered at the country-level), (v) model significance tests (*F*-tests) are omitted because of the use of clustered standard errors, (vi) *t*-statistics in parentheses
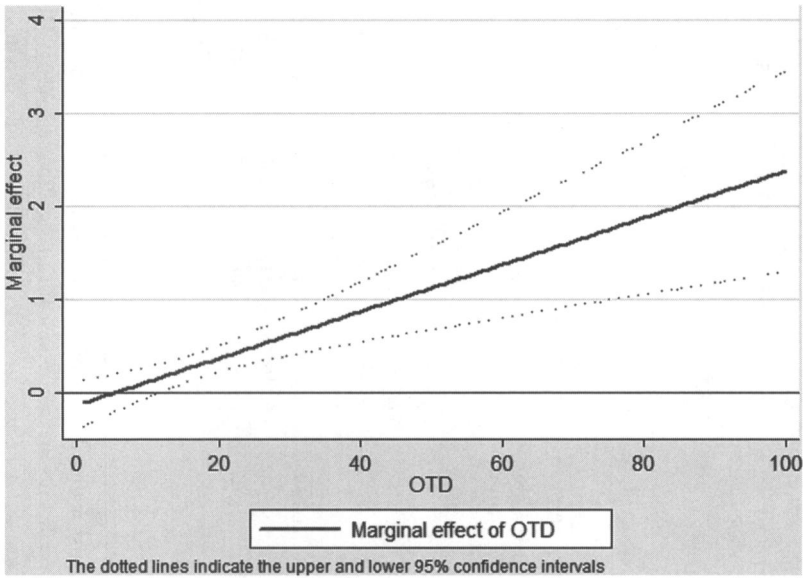
The dotted lines indicate the upper and lower 95% confidence intervals

Figure 1 Marginal effect of own taxes decentralization on primary deficits

Finally, we also calculate the marginal effect of the decentralization variables at the sample averages. These marginal effects are collected in the lower part of table 2. They suggest that the "average" OECD country in our sample could reduce primary deficits by lowering sub-national tax autonomy and increasing subnational control of shared taxes.

The remaining control variables perform reasonably. The unemployment rate, for example, has a consistently significant and positive effect on deficits, which suggests that high unemployment rates tend to destabilize public budgets by requiring the government to increase spending. Openness, on the other hand, displays negative coefficient estimates. This suggests that increasing openness leads to more balanced budgets. Finally, both subnational tax revenues and total government revenues tend to reduce public deficits.

Robustness Checks

In this section, we investigate the robustness of the baseline results. We conduct four robustness checks on the basis of Model Q5 in table 2 (our preferred model). The results are collected in table 3.

We study first whether our results from the previous section are sensitive to outliers by means of two different tests. In the column entitled *Outlier*, we drop all observations for which the absolute value of the standardized residual in our

Table 3 Regressions of primary deficit to GDP ratio on decentralization measures; 1975–2000, robustness checks

	Outlier b/t	Without BEL & ESP b/t	PCSE b/z	Five years b/t
Population	0.002	−0.035	0.013	−0.040
	(0.097)	(−1.225)	(1.283)	(−1.198)
GDP growth	−0.139**	−0.173***	−0.115***	−0.186
	(−2.627)	(−3.274)	(−4.026)	(−0.909)
Unemployment	0.343***	0.362	0.433***	0.239
	(3.576)	(1.721)	(8.723)	(1.010)
Inflation	0.032	0.059	−0.096**	0.227*
	(0.499)	(0.895)	(−2.388)	(1.839)
Urbanity	0.103	0.091	0.112	0.209
	(0.754)	(0.552)	(1.452)	(0.997)
Working age	−0.164	−0.493**	−0.302	−0.358
	(−0.826)	(−2.241)	(−1.622)	(−1.464)
Ideology	0.134	0.058	0.051	0.177
	(1.124)	(0.310)	(0.702)	(0.741)
Openness	−0.078**	−0.058*	−0.044***	−0.101***
	(−2.750)	(−2.070)	(−4.094)	(−3.544)
Interest rate	0.023	0.089	0.134*	0.058
	(0.179)	(0.697)	(1.921)	(0.519)
Regional authority index	0.236**	0.025	0.008	0.410*
	(2.148)	(0.114)	(0.132)	(1.790)
Total government rev.	0.049	−0.024	−0.305***	0.137
	(0.569)	(−0.186)	(−6.709)	(0.835)
Subnational tax rev.	−1.311***	−1.405***	−0.273*	−1.564**
	(−4.160)	(−2.992)	(−1.695)	(−2.302)
OTD	−0.218**	0.024	−0.065	−0.200
	(−2.308)	(0.154)	(−1.154)	(−1.496)
OTD ×OTD	0.015***	0.012***	0.007***	0.016***
	(8.063)	(3.592)	(4.822)	(4.671)
STD	−0.137	3.864***	−0.154**	−0.228
	(−1.070)	(4.301)	(−2.176)	(−0.872)
STD × STD	0.004	−0.058***	0.001	0.005
	(0.602)	(−3.898)	(0.546)	(0.471)
Mean OTD	0.358***	0.495***	0.200***	0.416***
Mean STD	−0.102	3.393***	−0.142**	−0.189
N	463	446	494	98
Countries	23	21	23	23
R^2	0.651	0.523		0.587
RMS error	1.598	2.031	1.343	1.581

Notes. (i) Mean OTD denotes the marginal effect of own taxes decentralization and Mean STD the marginal effect of shared taxes decentralization at the sample average, (ii) country and time-fixed effects are included in all models, estimated coefficients are not reported, (iii) significance levels at *10 percent, **5 percent, and ***1 percent, (iv) *t*-statistics in parentheses in models entitled Outlier, Without BEL & ESP, and Five years; *z*-statistic in parentheses in model entitled PCSE, (v) all models are replications of Model Q5 in table 2.

preferred model is larger than 2 and re-estimate the preferred model. Dropping these outliers, however, does not change the main conclusions from the baseline models. The *OTD* variable continues to display a U-shaped relationship with primary deficits; and the marginal effect at the sample average remains positive. At the same time, the *STD* variable turns insignificant, but continues to display a negative (albeit insignificant) coefficient at the sample average.

In the column entitled *Without BEL & ESP*, we drop Belgium and Spain from the sample. These two countries might influence the estimates for the decentralization variables disproportionately because they have experienced in the last two decades a rapid move toward decentralization. Since the relevant reforms were deliberately implemented for political reasons, it is conceivable that the decision makers have taken special care to ensure the fiscal stability of sub-national governments.

Dropping Belgium and Spain indeed suggests different conclusions– but only with respect to the *STD* variable. When these two countries are not included, the *STD* variable displays an inversely U-shaped relationship, and its marginal effect at the sample average is positive. This indicates that sub-national control over shared taxes leads in general to higher fiscal imbalances; only in Belgium and Spain, it seems to have had a positive effect on the fiscal stability of the public sector. That is, once only countries with a long tradition of shared taxes are included, in particular Austria and Germany, tax sharing appears to increase deficits.

The conclusions with respect to the *OTD* variable, however, are not affected by the exclusion of Belgium and Spain. This decentralization variable displays a U-shaped relationship; and its effect at the sample average is positive.

In the column entitled *PCSE*, we collect the results from a model where hypothesis tests are conducted on the basis of Panel Corrected Standard Errors. The standard errors are also robust to AR 1 autocorrelation. The results with respect to the decentralization variables, however, are essentially the same as in the baseline models.

In the column entitled *Five Years*, we collect the results from estimating our preferred model in five year averages in order to control for short-term variability in the dependent and control variables. This model includes five-year period instead of year fixed effects; standard errors continue to be clustered at the country level. The results are once again in line with the baseline results.

Overall, these robustness checks confirm the baseline results for the *OTD* variable. With regard to the *STD* variable, however, they indicate that the results are sensitive to the in- or exclusion of Belgium and Spain.

Conclusion

In this article, we have explored whether fiscal decentralization, when measured by the extent of subnational control over tax revenues, has an effect on primary

deficits. Our results indicate that subnational control over shared taxes is negatively and linearly related to primary deficits. This conclusion, however, is mainly driven by developments in Belgium and Spain. While suggestive, this particular finding should therefore be viewed with caution. Subnational tax autonomy (i.e., control over own taxes), on the other hand, has a nonlinear effect. The estimates indicate that an increase in subnational tax autonomy results in more fiscal stability in countries where the prevailing level of tax autonomy is low. Yet, they also suggest that tax autonomy has a detrimental effect for fiscal stability from some point onwards.

Given the widespread trend towards more decentralized government, the question of how to organize and manage decentralization processes has acquired added importance (Rodden 2006). The findings in this study should therefore be of interest to policy makers in both developed and developing nations as they provide answers to one important challenge for fiscal decentralization initiatives: how to ensure the stability of the fiscal sector when responsibility for fiscal policy is shared among various units of government.

In summary, these regressions appear to indicate that granting too much tax autonomy to subnational jurisdictions can be problematic. That fiscal decentralization can begin to be detrimental at relatively low levels is an unexpected finding, especially because the theoretical literature reviewed above points to a number of reasons why decentralization should lead to more sustainable fiscal policies.

One explanation for this unexpected finding might lie in how the countries that were studied in this article have managed their decentralization processes. Bahl (1999) lists a set of criteria, or implementation rules, which should be fulfilled for decentralization to unfold its beneficial implications. Most notably, he argues that the political authority of subnational governments should match their fiscal authority and that they should have sufficient revenue sources. It is possible that at least some of the countries in our sample have breached these rules. In particular, decentralization could have been initiated by the central government as a stratagem to divest itself from its responsibilities. Central governments may have imposed new tasks on subnational governments while not increasing their funding sources *sufficiently*. In other words, subnational governments may have had too little political power to effectively defend themselves against unfunded mandates. While such insufficiently funded mandates would result in a correlation between subnational tax autonomy and public deficits, tax autonomy as such would not be the cause for the increases in public deficits, but rather *insufficient* tax autonomy and too little political power.[9]

One possible implication of the results in this article, therefore, is that subnational fiscal autonomy can unfold its beneficial consequences only if central governments are truly committed to decentralization. If, on the other hand, fiscal

decentralization is only a convenient means for central governments do deal with their own fiscal problems, it might have undesirable consequences.

A second explanation for the unfavorable findings regarding subnational tax autonomy is that our regressions rely on the within-variation only, and such highly decentralized countries as Switzerland and the United States exhibit only little over-time variation in the tax decentralization variable. That is, little information on the effects of decentralization on public deficits is used from countries that are widely considered to be successful federations. This means in turn that the estimates rely to a large extent on information from countries that have little experience with decentralization. It is therefore likely that the results are overly pessimistic. In fact, we cannot dismiss the possibility that (even more) tax autonomy will improve fiscal stability in countries that have sufficient experience with decentralized policy making, i.e. in countries such as Switzerland and the United States. On the other hand, subnational tax autonomy seems to be problematic for fiscal stability in countries that have little experience with decentralization, at least in the short run.

It follows from our results that one challenge for future research on the implications of fiscal decentralization for fiscal stability is to pay more attention to the details of why processes of decentralization are initialized and how they are managed. In particular, detailed studies on the interactions of the political and fiscal dimensions of decentralization are necessary to gain further insights on how to successfully manage decentralization processes, and to understand what conditions have to prevail for decentralization to lead to favorable outcomes. Insights gained from such studies will ensure that countries which decide to increase the extent of subnational autonomy will fully reap the benefits of decentralization.

Supplementary Data

Supplementary data can be found at www.publius.oxfordjournals.org.

Notes

1. Sorens (2011) notes in a recent contribution that the Stegarescu measures, too, have some shortcomings. He argues that they do not control for unfunded mandates and may consequently give a misleading picture of the true level of fiscal decentralization within a country.
2. However, sometimes interaction effects are included to condition the effect of fiscal decentralization on other variables.

3. As pointed out by Freitag and Vatter (2008), the veto-player argument can also be used in an opposite fashion. That is, it is possible to argue that fiscal decentralization will lead to lower deficits because agreement on additional expenditures funded through debt becomes harder.

4. Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and United States.

5. Hausman test and F-tests on the significance of the country dummies also suggest that the fixed effects model is appropriate.

6. Note, however, that our results change neither qualitatively nor quantitatively between the models that include and those that omit these variables, thereby suggesting that such problems are not affecting our results.

7. Note that the original variable in Stegarescu's data set is constructed as the sum of own and shared taxes. In this article, we redefine this variable (by appropriate subtraction) such that it only covers shared taxes.

8. While the Stegarescu (2005) dataset covers the period 1975–2001, observations in 2001 are missing for several countries. Therefore, we restrict the sample in the regressions to the 1975–2000 period. Due to the suggestion by a referee, we attempted to update the database such that it additionally covers the period 2001–2006 by following the methodology in Stegarescu (2005) and OECD (1999) and using the OECD's Revenue Statistics database. However, a number of decisions have to be made with regard to the classification of the individual taxes included in the OECD Revenue Statistics database when the OTD and STD variables are constructed. Since we lacked detailed information on the decisions made in Stegarescu (2005) regarding the classification of the taxes, it was difficult to ensure complete consistency with Stegarescu's data. For the time-frame where both our and Stegarescu's data were available, the correlation was around 0.9 for the respective OTD and STD measures. (In order to conduct this comparison, we calculated our data from 1995 onwards.) This indicates that both data sets are roughly similar, but it also shows that they are not fully consistent. In addition, there were some notable differences in the levels of the OTD and STD measures for some countries. Nevertheless, the results (available upon request) when using the updated database are in line with those reported in the article.

9. For example, Vinueala (2000, 23) notes that unfunded mandates to subnational governments were partly to blame for borrowing in some Spanish Regions.

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