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Decentralizing Spending More than Revenue: Does It Hurt Fiscal Performance?

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Fiscal Affairs Department

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Abstract

In many countries the decentralization of spending responsibilities has outpaced the decentralization of revenue powers. Sub-national governments have then to rely on transfers from the center and borrowing to finance their spending. When this occurs, we find that the overall fiscal deficit tends to increase. This result is based on cross-country econometric evidence from OECD countries, and is particularly strong in the presence of regional disparities. Fiscal discipline can be strengthened by ensuring that sub-national taxing powers are adequate to meet spending obligations.

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I. INTRODUCTION

Many OECD countries have undertaken fiscal decentralization reforms in recent decades, assigning more expenditure functions and revenue sources to lower levels of governments. The decentralized provision of goods and services is generally intended to better take into account differing local preferences, increase efficiency of public services, and enhance the accountability of sub-national authorities (Oates, 1972).

However, the devolution of spending responsibilities has not always gone hand in hand with the devolution of tax revenues, resulting in “vertical fiscal imbalances.” Sub-national authorities have to rely on transfers, and to a lesser extent, on borrowing in order to finance expenditure. This paper uses the concept of “vertical fiscal imbalance” (VFI) to measure the gap between own revenue and spending of sub-national governments.

Large VFIs may relax fiscal discipline. Although some level of discrepancy between sub-national own revenues and spending is inevitable and may even be desirable, large gaps present risks. A common view in the normative literature is that a high reliance on intergovernmental transfers or borrowing “softens” the budget constraint of local governments, in particular because the cost of spending is not adequately internalized (Rodden and others, 2003). However, the empirical literature shows conflicting results. Some papers find that intergovernmental transfers improve fiscal performance by strengthening control over sub-national spending (De Mello, 2000).

This paper assesses whether lowering VFIs improves fiscal performance in OECD countries. It presents several novel elements. First, it adopts a cross-country approach, in contrast to the prolific case study literature on VFIs. Second, it identifies conditions under which VFIs impact fiscal performance. Third, it analyzes the combined effect of vertical and horizontal imbalances. And finally, the paper addresses the problem of endogeneity in assessing the relationship between VFI and fiscal performance, which has been a weakness in earlier studies.

Our empirical results support the view that decreasing VFIs can potentially generate large fiscal gains. A higher reliance on transfers or borrowing reduces the general government balance, other factors being equal. This negative effect seems to be more pronounced when regional disparities are large. We also find that spending decentralization is not detrimental to fiscal performance when financed through additional sub-national own revenues.

The paper is organized as follows: Section II reviews the economic literature on VFI and fiscal performance. Section III defines and discusses the indicator of VFI applied in Section IV to produce stylized facts. Section V uses econometric methods to relate the VFI to fiscal outcomes, and section VI concludes.

II. VERTICAL FISCAL IMBALANCE AND FISCAL PERFORMANCE

A vertical imbalance exists when there is a gap between own spending (total spending minus transfers paid) and own revenues (total revenues minus transfers received) at a given level of government.² There is no consensus on the specific definition of the vertical imbalance. Most studies use interchangeably the terms “vertical fiscal imbalance,” “vertical fiscal gap,” or “transfer dependency.” Researchers generally apply the VFI concept to sub-national governments but gaps can also materialize at the central level.³

The theoretical literature generally emphasizes the risks associated with large vertical imbalances. A common view is that the vertical structure of the public sector may “soften” the budget constraint of sub-national governments, lead them to overspend, and lower their tax effort—mainly because they do not fully internalize the cost of spending and/or anticipate that their financing gap will be covered by additional transfers. The local governments’ lack of discipline may spill over to the center if the latter is pressed to bail out sub-national authorities. VFIs may thus lead to excessive and unproductive spending, inefficient revenue mobilization, higher borrowing costs, and lower accountability of local authorities. Conversely, allowing sub-national governments to access own revenue through local taxation is seen as essential to promoting fiscal discipline (Oates, 2006; IMF, 2009; Blöchliger and Petzold, 2009).

However, closing the vertical gap is not always feasible or even beneficial (Box 1). As the optimal degree of decentralization is generally larger on the spending than on the revenue side, it can potentially be efficient to allow for some degree of VFI. In addition, transfers may be warranted to better control sub-national spending, provide insurance to local authorities against external shocks, internalize inter-jurisdictional spillovers, or pursue redistributive/equalization objectives.

²In the paper, the term “transfer” always refers to intergovernmental (not interpersonal) transfers. “Own revenues” are measured as the difference between total revenues and intergovernmental transfers received by a given level of government; they include both tax and non-tax revenues.

³Both gaps are often related as the sub-national “vertical deficit” is generally covered by intergovernmental transfers and is likely to be associated with a central government “vertical surplus.”

Box 1. Cost-Benefit Analysis of Vertical Imbalances in the Theoretical Literature

Reliance on transfers or borrowing may undermine the fiscal discipline of local governments for the following reasons:

- *Common pool effect.* When financed through transfers, sub-national governments do not internalize the full cost of local expenditure and tend to overspend/lower their tax effort.
- *Soft budget constraint.* Sub-national governments carry out looser policies when they anticipate transfer-based bailouts by higher-level authorities.
- *Soft financing.* Access to borrowing should not contribute to chronic deficits if the market imposes discipline. But in practice, sub-national governments often resort to “soft” financing (by borrowing from public banks or from state-owned enterprises, for instance), which results in another form of soft budget constraint/quasi-bailout (Oates, 2006).
- *Governance and accountability.* Discretionary grants are prone to undue sub-national influence or interest. In addition, local authorities are less accountable when they do not have to tax their constituency.
- *Grant design.* Many grants, for instance, have a matching dimension, with grant allocation increasing when sub-national governments spend more on the matched service.
- *Vertical spillovers.* Local borrowing and transfer dependency may affect the central government performance by: crowding out available financing and putting upward pressure on interest rates; pushing up risk premia on government bonds; or through the cost of bailouts (IMF, 2009).

However, some degree of vertical imbalance is inevitable. The degree of spending decentralization called for by efficiency considerations tends to exceed the degree of tax autonomy that would be consistent with optimal tax assignment (Ter-Minassian, 1997a):

- *Tax centralization.* Only a few tax bases are best suited for local management—those that are immobile, evenly distributed geographically and that generate stable revenues, whereas nationwide taxes have fewer distortionary effects on flows of mobile resources, and permit a higher degree of progressivity (Joumard and Kongsrud, 2003; Ter-Minassian, 1997b; Norregaard, 1997; McLure and Martinez-Vasquez, 2000).
- *Spending decentralization.* In contrast, the scope to increase sub-national spending on efficiency grounds seems larger. According to Oates’ Decentralization theorem (1972), decentralized provision is at least as efficient as central government provision, efficiency requiring that diversity of preferences be matched with diversity in public good and service provision. In addition, sub-national governments face competitive pressures to attract mobile residents, resulting in more efficient provision of public goods.
- *Capacity constraints.* Tax devolution is also limited by the lower tax administration capacity of local governments and diseconomies of scale in tax administration (Ter-Minassian, 1997b). More generally, the quality of bureaucracies is usually lower at the sub-national level.

Vertical imbalances may even be desirable in some cases:

- *Control over local spending.* Curtailing transfers may be used by central governments to constrain sub-national spending and, as such, could improve fiscal performance. More generally, stabilization and adjustment policies conducted by the center may be undermined if a large share of taxes and spending is devolved to sub-national governments.
- *Insurance against external shocks.* When sub-central governments come under fiscal pressure that has purely external origins, the center should provide assistance through transfers.
- *Redistribution.* Equalization grants are needed to transfer resources to poorer regions and correct horizontal imbalances (revenue-raising capacity disparities). In addition, sub-national governments are often given responsibility for implementing national programs meant to be provided equally across regions (although intergovernmental grants are not the most efficient instrument to achieve interpersonal redistribution objectives).
- *Internalize horizontal (inter-jurisdictional) externalities.* Matching grants may provide incentives for lower level governments to invest in public goods that have positive spillover effects into other jurisdictions.
- *Internalize vertical (intergovernmental) externalities.* Grants may be used to limit the negative effects of under-spending at the local level (for instance, on primary and secondary education) on central government spending (on tertiary education).

The empirical literature on vertical imbalances is abundant but mainly draws on case studies. Most papers are country-specific, while cross-country work is scarce and relatively recent, focusing on OECD countries. The literature is particularly rich for Australia, Canada, Germany, and Italy. However, case studies rarely relate VFIs to fiscal performance.

Most cross-country papers find that large vertical imbalances are generally associated with poor fiscal performance.⁴ A vast econometric literature on the “flypaper-effect” tests the impact of intergovernmental transfers on local spending (Gamkhar and Shah, 2007). In contrast, fewer papers relate vertical imbalances to fiscal performance. Rodden (2002) provides evidence that higher reliance on intergovernmental transfers worsens the general government’s overall balance, especially when sub-national governments have high borrowing autonomy. Similarly, Plekhanov and Singh (2007) find that the rules constraining sub-national borrowing improve fiscal performance when transfer dependency is high. In a sample of federations, Rodden and Wibbels (2009) show that transfer dependency is associated with larger fiscal deficits, the negative impact being larger at high levels of decentralization. Jin and Zou (2001) find that transfers increase the size of the government at the sub-national, national, and general government levels. Fornasari (2000) also demonstrates that sub-national spending funded by transfers is additional to central government spending, not a substitute. Finally, according to De Mello (2007), transfer growth may become endogenous, with deficits bringing about more grants, which in turn generate higher deficits.

However, a few studies find that VFIs are associated with better fiscal outcomes. According to De Mello (2000), transfer dependency only deteriorates the fiscal position of the central government in non-OECD countries, while the opposite result is found in OECD countries. His interpretation is that, in the OECD sample, transfer dependency measures the ability of central governments to control sub-national finances rather than to indicate common pool problems. This result is consistent with the findings of the comparative literature on successful (lasting) fiscal consolidations. Based on a sample of OECD countries, Darby and others (2005) show that central governments exert a strong influence on the expenditure of sub-national governments through their grant allocations; grants are generally cut substantially during successful consolidations, in order to “force the hand” of sub-central tiers to adjust expenditure.

⁴Most of the empirical literature uses “transfer dependency” as a measure of the vertical imbalance, the former being defined as the ratio of transfers received by sub-national governments to their total revenues (or spending).

III. MEASURING VERTICAL FISCAL IMBALANCES

Different measures of VFIs are used in the empirical literature. Transfer dependency is the most common indicator with transfers measured either as a share of sub-national spending (Jin and Zou, 2002), or as a share of sub-national total revenues (Rodden, 2002; Baskaran, 2010), or even as a share of central government revenues (Bahl and Wallace, 2007). Some papers measure VFI as the difference between own revenues and own spending rather than the ratio, bringing the concept closer to a fiscal balance (Bird and Tarasov, 2004). Others distinguish between the “vertical fiscal gap” (VFG) and VFI.⁵

In this paper, we define the VFI as the share of sub-national own spending not financed through own revenues, as do Ahmad and Craig (1997), and Schroeder and Smoke (2002). By definition, the counterparts of VFI are sub-national borrowing and transfers received from other units of general government—both expressed as shares of sub-national own spending (Box 2). In contrast to most of the literature focusing on transfer dependency, our measure of VFI also includes borrowing. There is a strong case for combining transfer and sub-national borrowing—two forms of “soft” financing—whereas “own revenues” are more likely to “harden” the budget constraint. Sub-national governments generally have less control over transfers and borrowing, and fewer incentives to use them efficiently (Box 1).⁶

Our VFI measure presents a number of advantages. First, it extends the concept of “transfer dependency” to sub-national borrowing, which is another kind of “soft” resource (see above). In addition, borrowing is an important contributor to VFI dynamics, as shown in Section IV (Fact 2). Second, our indicator measures the mismatch between spending and revenue decentralizations; it widens when countries devolve more spending than revenue. Third, the VFI also varies with changes in the general government overall balance (Box 2). Intuitively, the general government balance term describes the size of the revenue and spending “pies” to be shared among levels of government, whereas the decentralization terms determine the sharing formulas.

Owing to data constraints, our VFI measure cannot be easily refined. Its main shortcoming—common to other empirical studies—is that it is an imperfect indicator of the fiscal autonomy of sub-national governments. Several studies (Blöchliger and others, 2006; Rodden, 2002) show that “own revenues” do not measure accurately the discretion of sub-national

⁵According to Boadway (2002) and Lazar and others (2004), the existence of a vertical gap does not necessarily imply that there is an imbalance. A VFI appears when the actual VFG differs from the optimal gap. In their view, the VFI concept is a normative concept founded in theory in contrast to the VFG. Our paper does not make this distinction.

⁶According to Oates (2006), “Soft budget constraints manifest themselves both in terms of transfer dependency and a poorly functioning banking system that is subject to manipulation by public officials for funding deficits.” Rodden and others (2003) also claim that “If soft budget constraints exist and the sub-national governments can appeal to the central government for additional resources through channels such as intergovernmental fiscal transfers, state-owned enterprises, and banking, they are likely to overspend, undertax, or overborrow.”

governments over their resources in part because tax sharing arrangements are recorded by some countries under taxes. Also, sub-national governments may be given only restricted discretion concerning tax rates/bases. A similar issue arises on the spending side, with much sub-national spending being regulated, mandated or earmarked (Bach, 2009). On the revenue side, this issue cannot be easily addressed as databases do not report separately tax sharing arrangements.⁷ Another problem is that our VFI indicator is based on actual spending and revenue, which may differ from assigned responsibilities owing to cyclical factors, administrative and capacity constraints, or simply the willingness of sub-national governments to use the powers assigned to them.

This paper focuses on vertical rather than horizontal imbalances. In contrast to “horizontal fiscal imbalances” (HFIs),⁸ VFIs measure differences in spending and revenue between levels of government, not across sub-national entities. However, VFI and HFI cannot always be clearly separated (Bird and Tarasov, 2004). For instance, vertical balance can be achieved for the richest sub-national government (balancing own expenditure and own revenues) but not for the other sub-national governments when there are regional disparities (HFIs). Another form of interdependence is generated by vertical equalization schemes: intergovernmental transfers often include equalization grants whose purpose is to reduce income disparities across sub-national jurisdictions; this implies that, in general, measures of VFIs may also capture HFIs.

⁷This said, the magnitude of the problem should not be overplayed: shared taxes are only sizeable in a few countries (usually federal ones) and account on average for less than 20 percent of sub-national revenues (Blöchliger and King, 2006).

⁸HFIs materialize when they are differences between the revenue capacities of individual sub-national governments.

Box 2. Vertical Fiscal Imbalance: Definition and Accounting Determinants

We define the VFI as:

$$VFI = 1 - \frac{SNG \text{ own revenue}}{SNG \text{ own spending}}$$

- i. The vertical imbalance is covered by transfers from the center and sub-national borrowing.

$$SNG \text{ spending} = SNG \text{ own revenue} + \text{transfer received by SNG} + SNG \text{ net borrowing}$$

and $SNG \text{ spending} = SNG \text{ own spending} + \text{transfer paid by SNG}$, then:

$$VFI = \text{Transfer dependency} + SNG \text{ deficit}$$

where:

$$\text{Transfer dependency} = \frac{\text{Net transfer}}{SNG \text{ own spending}}$$

$$SNG \text{ deficit} = \frac{SNG \text{ net borrowing}}{SNG \text{ own spending}}$$

- ii. The vertical imbalance depends on the mismatch between revenue and spending decentralization (and the size of the general government deficit).

$$VFI = 1 - \frac{\text{revenue decentralization}}{\text{spending decentralization}} * (1 - GG \text{ deficit})$$

where:

$$\text{Revenue decentralization} = \frac{SNG \text{ own revenue}}{GG \text{ revenue}}$$

$$\text{Spending decentralization} = \frac{SNG \text{ own spending}}{GG \text{ spending}}$$

$$GG \text{ deficit (as a share of spending)} = \frac{GG \text{ spending} - GG \text{ revenue}}{GG \text{ spending}}$$

IV. SOME STYLIZED FACTS ON VERTICAL IMBALANCES

This section presents stylized facts on vertical fiscal imbalances, their evolution over time, their dispersion across countries, and their relation to fiscal performance. We use data from the OECD General Government Accounts database (OECD, 2010a) covering the years 1995–2007.⁹ We exclude 2008 and 2009, as the financial crisis likely disrupted intergovernmental relations, creating breaks in the series.

Fact 1. The financing of sub-national spending varies greatly across countries, resulting in sizeable differences in vertical imbalances. VFIs average about 40 percent over the sample between 1995 and 2007. However, VFIs present a large dispersion, varying from 13 percent in Iceland to 83 percent in Mexico (Figure 1, upper chart). From an accounting point of view, this heterogeneity is mostly related to the dispersion of sub-national expenditures across countries rather than to the dispersion of transfers and borrowing (Figure 1, lower chart)—the standard deviation being twice as high for the former. Charbit and Goodspeed (2009) show that differences in the tax-transfer balance reflect country-specific structural factors, including the role of sub-national governments as providers of national public goods and services (health), regional imbalances, degree of externalities, historical circumstances, collective preferences, and institutional features (in particular the constitution).

Fact 2. Although vertical imbalances are mostly covered by transfers, sub-national borrowing is essential to understanding the change in vertical imbalances over time. On average, sub-national spending is almost entirely financed by transfers (Figure 2, upper chart). In the sample, the share of sub-national borrowing has been close to zero over the period, local authorities being usually constrained to borrow either by administrative procedures, explicit rules, financial market discipline, or cooperative arrangements (Plekhanov and Singh, 2007). However, the effect of borrowing should not be overlooked, as its contribution to the change in VFIs over the period is not negligible: between 1995 and 2007, the change in borrowing was of comparable magnitude to the change in transfers¹⁰ (Figure 2, lower chart). In other words, sub-national borrowing is low on average but very volatile, which explains its relatively high contribution.¹¹ This result suggests that measuring vertical gaps with “transfer dependency”—as it is done in many empirical papers—can be misleading for some countries.

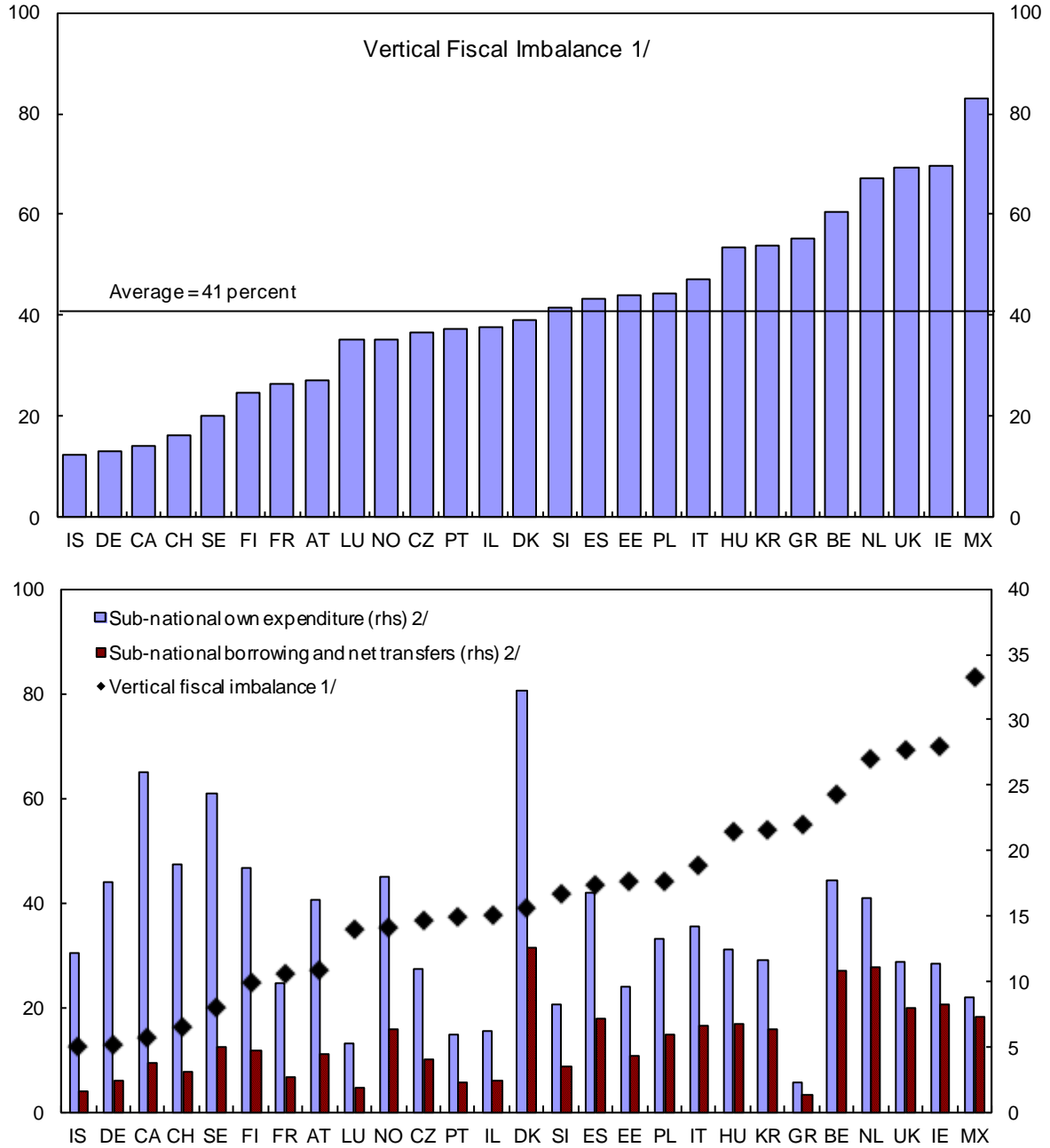
⁹To have the most complete country coverage, we use data from 1995 in this section; 1995 is the starting year for one-third of the country series (see Appendix 1, Table 1A).

¹⁰In Figure 2, the change in VFI, transfer and borrowing is computed between the average 1995–97 and the average 2005–07 (instead of 1995 and 2007), to ensure that our results are not too sensitive to the choice of the initial and final data points.

¹¹Among financing sources of sub-national governments, borrowing has the highest volatility relative to transfers (medium volatility) and taxes (lowest volatility).

Figure 1. Vertical Fiscal Imbalance, Sub-national Own Revenue, and Expenditure

(Percent of sub-national own expenditure, unless otherwise indicated; average over 1995–2007)

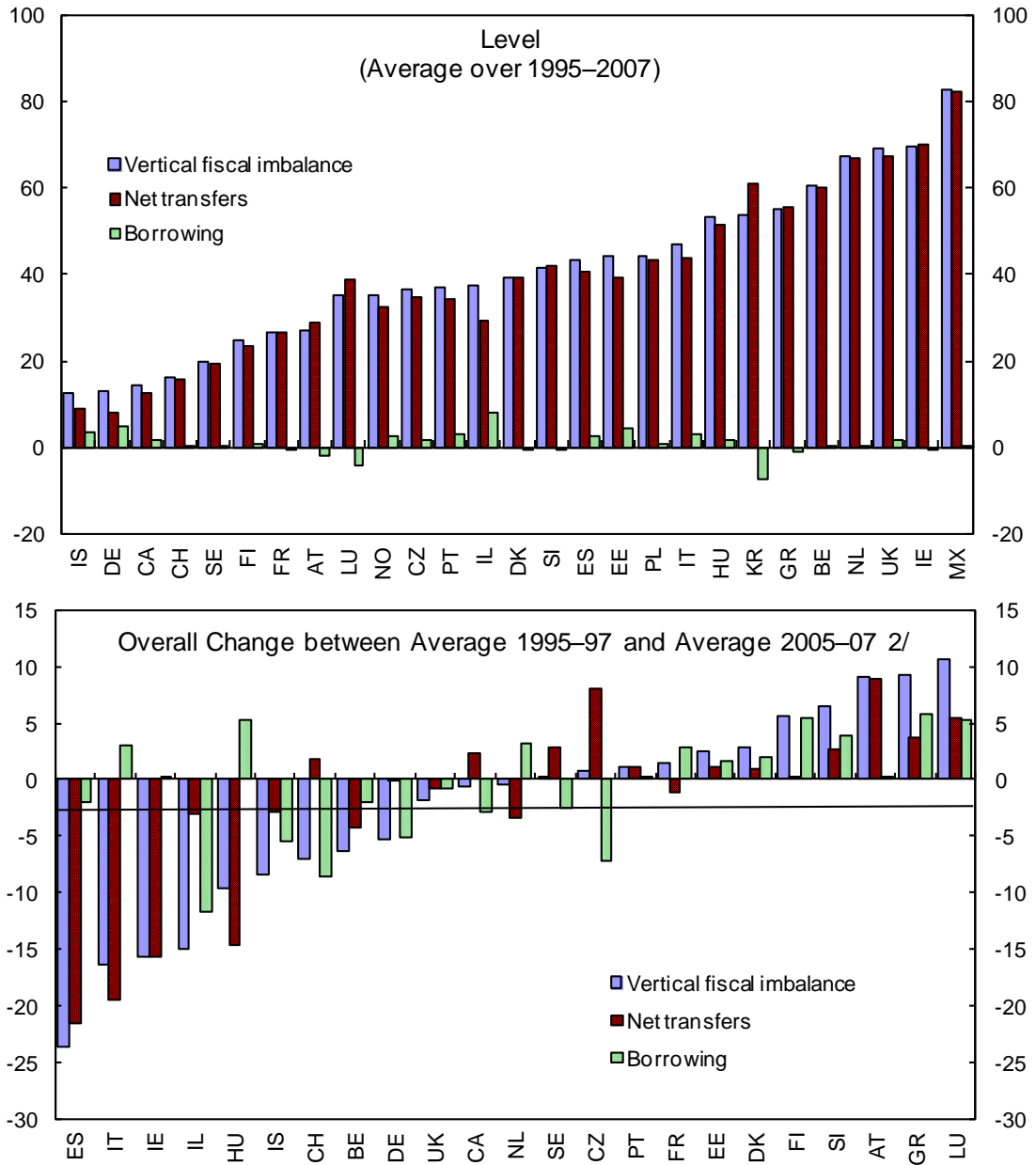


Sources: OECD; and IMF staff estimates.

1/ Vertical fiscal imbalance is defined as the share of sub-national own spending (excluding transfers paid) not financed through own revenue (excluding transfers received).

2/ Percent of GDP.

Figure 2. Vertical Fiscal Imbalance: Level and Change 1/
 (Percent of sub-national own expenditure, unless otherwise indicated)



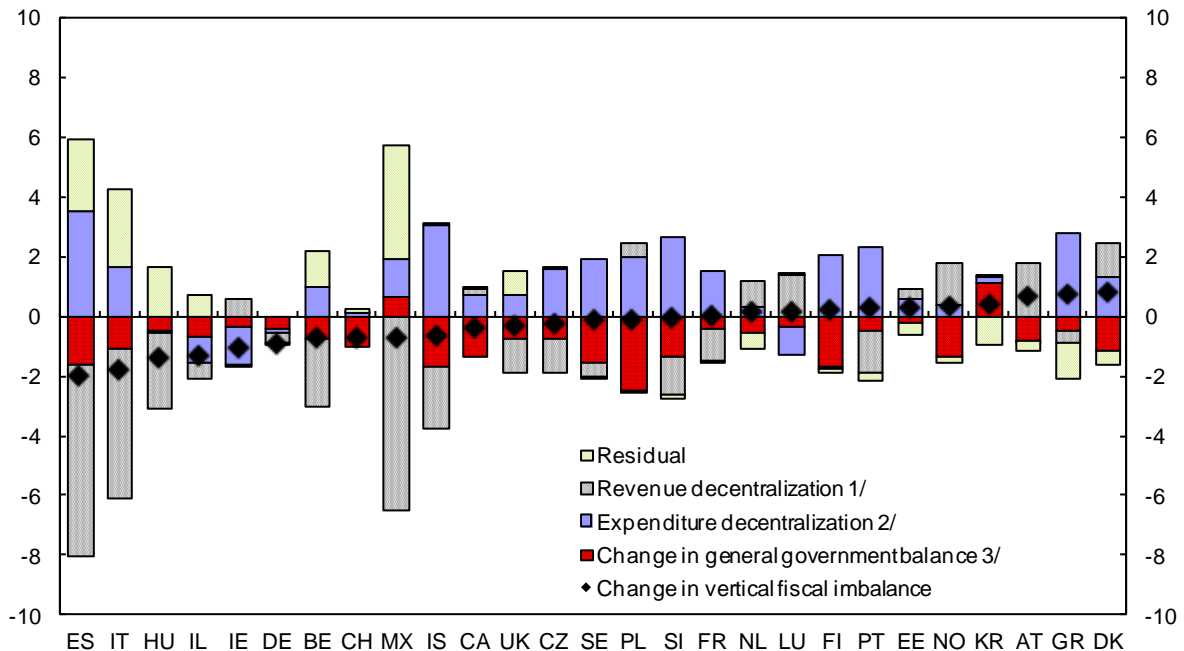
Sources: OECD and IMF staff estimates.

1/ Vertical fiscal imbalance is defined as the share of sub-national own spending (excluding transfers paid) not financed through own revenue (excluding transfers received).

2/ Percentage points of sub-national own expenditure; the line represents the change in the VFI between 1995–97 and 2005–07 on average over the country sample (-2.5 percentage points of sub-national spending).

Fact 3. Vertical fiscal imbalances have decreased over time. Between 1995 and 2007, VFIs decreased in most countries, with an average change of about -2.5 percent of sub-national own spending. This result seems to contrast with the common view that vertical gaps are increasing in most countries, driven by the mismatch of spending and revenue decentralizations. In fact, these two findings are not contradictory. Figure 3 shows average contributions to the annual changes in VFIs (Box 3). The fact that spending decentralization outpaced revenue decentralization did widen the VFIs on average; however, this was more than offset by the improvement in the general government balance over the period. In other words, sub-national governments received a larger share of general government spending responsibilities without getting an equivalent share of taxes over the period; nonetheless the VFIs narrowed because general government spending increased less than general government revenues on average.¹²

Figure 3. Breakdown of the Annual Change in Vertical Fiscal Imbalances
(Average over the period of 1995–2007; percentage points)



Sources: OECD; and IMF staff estimates.

1/ Negative values = Increase in revenue decentralization.

2/ Positive values = Increase in expenditure decentralization.

3/ Negative values = Improvement in general government overall balance.

¹²This suggests that the gap between revenue and spending decentralization, as often used in the literature, is not a good indicator of the VFI.

Box 3. Contributions to the Change in the Vertical Fiscal Imbalance

According to Box 2:

$$1 - VFI = \frac{\text{revenue decentralization}}{\text{spending decentralization}} * (1 - GG \text{ deficit})$$

Taking the logarithm of this expression and then the first difference, and using the approximation $\ln(1 - x) \cong -x$, we compute the contributions of the three variables to the change in the VFI:

$$dVFI \approx d\ln(\text{spend. decentralization}) - d\ln(\text{rev. decentralization}) + d(GG \text{ deficit})$$

Changes in the VFI reflect the impact of two factors: the mismatch between spending and revenue decentralization, and the change in the general government deficit. This accounting decomposition has also an economic interpretation, as the two terms are relatively independent: the growth differential between spending and revenue decentralizations is a structural institutional feature, which can be considered as given when decisions related to the annual overall deficit are made. Intuitively, countries first agree on how to share the spending and revenue pies between levels of government before determining the size of these pies.

Fact 4. There is no evidence that revenue decentralization follows expenditure decentralization, at least in the short run. The conventional wisdom of “finance-follows-function” suggests that devolution of spending responsibilities should precede the decentralization of revenue. However, country experience often points to a reverse sequencing because revenue devolution is easier to implement (more attractive for local governments; less resistance at the center to transfer expenditure functions after the funds have been devolved; better understanding and agreement on basic tax assignment principles), while assigning expenditure responsibilities is more politically driven with less well-established assignment rules (Bahl and Martinez-Vazquez, 2006). In our sample, bi-variate Granger causality tests (for levels of the degree of decentralization, in logarithms) suggest diverse patterns of relationship between spending and revenue decentralization (Table 1). There seems to be limited support of the “finance-follows-function” rule (lower-left section of Table 1). In most countries, we either find the opposite causality, bi-causality, or no causality. However, Granger tests can only detect short-term sequencing, as lag length is restricted to three years by the data.

Table 1: Granger Non-Causality Test Results

	Expenditure decentralization=> Revenue decentralization	Expenditure decentralization?> Revenue decentralization
Revenue decentralization=> Expenditure decentralization	CZ, GR, IT, SK, SL, EE	DK, FI, FR, IE, PT
Revenue decentralization?> Expenditure decentralization	DE, IS, IL, LU, NL, ES, SE, UK, HU	AT, BE, CA, NO, CH

Notes:

1/ Decentralization variables in logarithms; lags=3.

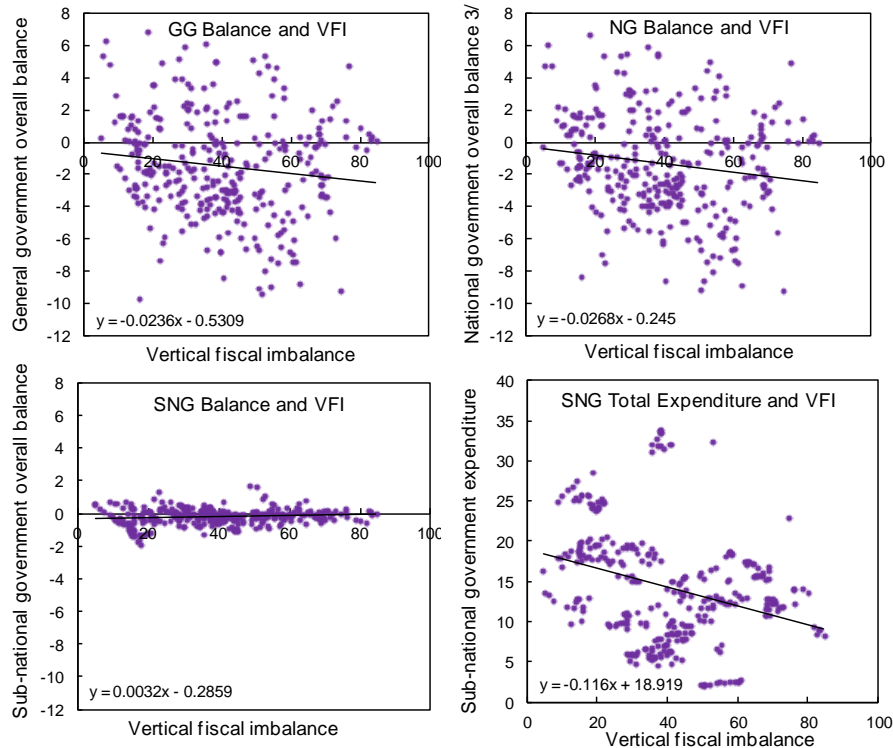
2/ X=>Y: X Granger-causes Y; X?>Y: X does not Granger-cause Y.

3/ Significant at least at 10 percent significance level.

Fact 5. Large vertical imbalances are associated with worse fiscal performance.

Consistent with the literature, the higher the VFI, the lower the fiscal balance of the general government (Figure 4, upper-left). While sub-national budgets are generally close to balance regardless of whether they rely on transfers or own revenues,¹³ fiscal performance at the national level (central plus social security) deteriorates slightly at higher levels of VFI (Figure 4, upper-right). One explanation could be that large VFIs relax the fiscal discipline of sub-national governments, forcing central governments to bail them out. However, this hypothesis is not supported by the negative correlation between sub-national spending and VFI (Figure 4, lower-right)—a somewhat unexpected result that seems to contradict the findings of the “flypaper-effect” literature. We also find a negative correlation between VFI and the overall balance when both series are in first differences, suggesting that the speed at which VFIs change also matters (results are not reported here).

Figure 4. Fiscal Performance and Vertical Fiscal Imbalance 1/
(Percent; average over 1995–2007) 2/



Sources: OECD; and IMF staff estimates.

1/ Vertical fiscal imbalance is defined as the share of sub-national own spending (excluding transfers paid) not financed through own revenue (excluding transfers received).

2/ Fiscal performance variables are in percent of GDP; vertical fiscal imbalance is in percent of sub-national own expenditure.

3/ National government includes central government and social security funds.

4/ GG = General government; NG = National government; and SNG = Sub-national government.

¹³This result should not be interpreted as reflecting the good performance of sub-national governments, which are usually borrowing-constrained and may receive bailout transfers from the center.

V. ECONOMETRIC EVIDENCE

A. Model Specification

To assess the impact of vertical imbalances on fiscal performance, we estimate a panel equation relating the general government primary balance to the VFI, spending decentralization, covariates, and interaction terms. Our purpose is not to model a full-fledged fiscal policy reaction function but to estimate the partial effect of VFI. We apply the following specification to a sample of 27 OECD countries over 1969–2007 (sample period varies across countries, see Appendix 1, Table 1):

$$PB_{it} = \alpha \times VFI_{it} + \beta \times Decentralization_{it} + X_{it} \times \delta + \varphi_i + \tau_t + \varepsilon_{it} \quad (1)$$

where the indices i and t denote countries and years, respectively; PB_{it} is the primary balance of the general government as a share of GDP; VFI_{it} is the vertical fiscal imbalance (defined in Section III but we also use “transfer dependency” in the robustness checks)¹⁴, $Decentralization_{it}$ is spending decentralization (sub-national own expenditure as a share of general government expenditure); X_{it} denotes control variables; φ_i represents country-specific fixed effects; τ_t time dummies, and ε_{it} is a time- and country-specific error term.

The dependent variable is the headline (unadjusted) rather than the structural balance in order to capture cyclical effects of VFI (consistent with the literature on transfer procyclicality; Rodden, 2009). The inclusion of the output gap in the equation guarantees that direct effects of the cycle are taken into account. We tested the significance of a large set of covariates including: government debt, output gap, political variables (including federal/unitary state structure), governance indicators, measures of regional disparities (income and unemployment), borrowing constraints,¹⁵ GDP per capita, trade openness, inflation, and demographic variables, as well as multiplicative terms (to assess whether the impact of VFI is conditional on the covariates). These variables are described in Table 2 in Appendix 1.

Two relationships are of particular interest. They can be explored within model (1), by using multiple regression analysis in order to interpret the coefficients alpha and beta, “other

¹⁴The fact that the VFI is connected to sub-national borrowing through an accounting relation (Box 2) could be viewed as creating an artificial correlation between VFI and the primary balance of the general government. We do not see this as a serious problem. First, the general government primary balance and sub-national borrowing have different denominators. Second, an instrumental variable procedure is used to correct for the possible endogeneity of the VFI. Third, the equation is re-estimated with “transfer dependency” to check the robustness (see Section V.C.). Fourth, the contribution of the sub-national balance to the general government balance volatility is small in the sample. Fifth, the econometric estimation should capture the “true” economic relation, despite the accounting identity, as is the case in many empirical applications.

¹⁵The impact of fiscal rules other than borrowing constraints could not be tested due to data availability constraints for the OECD sample.

factors being equal.” We expect a negative alpha and a positive beta based on the results of the economic literature and the stylized facts:

- *Effect of changing the sub-national financing mix:* The coefficient alpha measures the impact of VFI keeping spending decentralization constant. Thus, alpha assesses the effect of a shift in the structure of sub-national financing—from own revenues to transfer/borrowing—within a given envelope of sub-national spending (as a share of general government spending).
- *Effect of own-revenue financed spending decentralization:* The coefficient beta has a more dynamic interpretation. It evaluates the effect of increasing spending decentralization while keeping VFI constant; beta therefore measures the impact of spending decentralization financed through own revenues.¹⁶

We intentionally did not include revenue decentralization in the equation for two reasons. First, it may generate multicollinearity with VFI and spending decentralization. Second, as shown in Box 3, when spending and revenue decentralizations are kept constant, a direct accounting relation relates VFI to the fiscal deficit: a regression including all three variables would capture an artificial correlation between VFIs and fiscal performance, other factors being equal.

B. Main Results

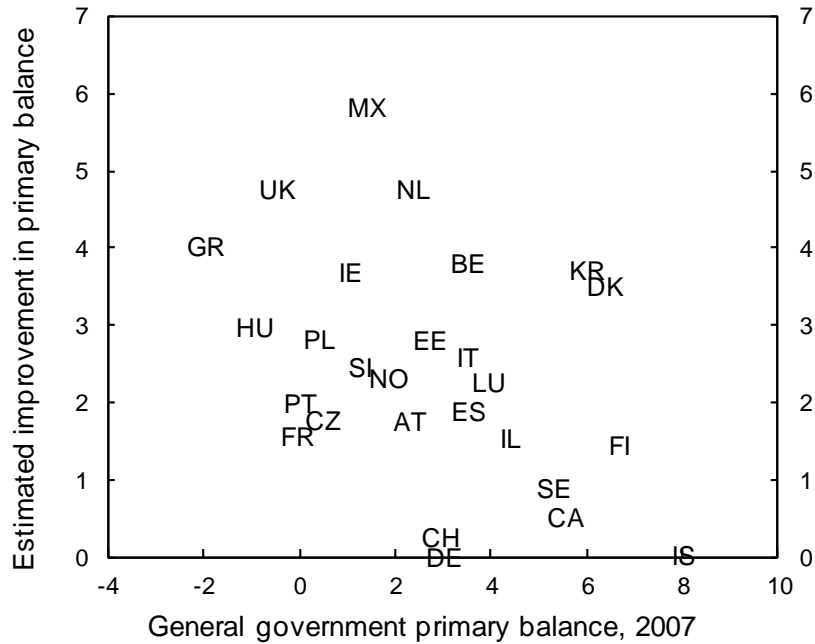
As expected, vertical imbalances negatively affect fiscal performance, while spending decentralization financed from own revenues has a positive effect (Table 2). Beta is positive and strongly significant in all equations. The impact of the VFI is always found negative (in the equations with interaction terms, the effect of VFI should be assessed by summing alpha and the coefficients of interactive terms for different values of the covariates). Depending on the specification, the estimated elasticity of the VFI ranges from -0.08 to -0.18, indicating that a 1 percent increase in the VFI deteriorates the general government primary balance by 0.1–0.2 percentage points of GDP. Including regional income disparities (HFI) in the equation reduces this elasticity to -0.08 (Table 2, columns 6–7), suggesting that other specifications may suffer from omitted variable bias.¹⁷ We also find a lower elasticity in the

¹⁶More precisely, this second interpretation would require that the vertical gap be measured as a share of general government spending. In that case, keeping the vertical imbalance constant while increasing spending decentralization would imply that the share of sub-national own revenues in sub-national own spending increases. In the robustness analysis, we propose an alternative equation based on this definition of VFI, and beta is still found positive.

¹⁷When the regional disparities variable is omitted, the negative effect of the VFI is overestimated, consistent with the prediction of the econometric theory (in a simple model, the bias on alpha is expected to be negative when the effect of HFIs on fiscal performance is negative and HFIs are positively correlated with VFIs).

instrumental variable specifications discussed below.¹⁸ Based on these estimates, Figure 5 reports the fiscal gain that countries can expect from reducing their current VFI to that of the least imbalanced countries in the sample.

Figure 5. Potential Fiscal Gains from VFI Reduction 1/
(Percent of GDP)



Source: IMF staff estimates.

1/ Assumes a reduction in VFI from its 2007 level to the average VFI of the three countries with the smallest VFI (DE, IS, CH); estimated elasticity of -0.08 is used to derive the impact of VFI reduction on the general government primary balance.

The estimated coefficients of other covariates are consistent with priors. The debt coefficient is positive, suggesting that fiscal policy incorporates debt sustainability constraints. The output gap has a positive effect, possibly reflecting the effect of automatic stabilizers (this could also suggest that fiscal policy is on average countercyclical in the sample). Governance (rule of law) improves fiscal performance, while the presence of large regional income disparities deteriorates fiscal performance. Finally, more trade and financial openness is associated with better fiscal outcomes, reflecting the disciplinary effect of a larger market exposure and the closer scrutiny of fiscal policies by foreign creditors.

¹⁸There are however also reasons to believe that the true elasticity could actually be more negative than the estimated coefficient. For instance, the measurement error (of revenue autonomy by the VFI, see Section III) may result in an under-estimation of the coefficient in absolute terms (“attenuation bias”).

We find some evidence that the effect of vertical imbalances is conditional, with a few multiplicative terms being statistical significant in the equation.¹⁹ Our estimations show that the effect of VFI is more negative in times of legislative elections (Table 2, column 5), or when sub-national borrowing autonomy is large, consistent with Rodden (2002) (Table 2, column 5), or when regional disparities are sizeable (Table 3, columns 7–8). The latter result is interesting, as it suggests that VFIs and HFIs interact with each other and that their combination could be particularly detrimental to fiscal performance, likely because HFIs aggravate soft budget constraints and the anticipation of bailouts. This result also implies that decreasing the VFI has a larger impact on fiscal performance in countries with high HFIs.

We were not able to find a general specification including more than two interaction terms. This was likely due to the effect of adding more interaction terms on the effective sample size (for instance, HFIs), or because of potential collinearity problems (between covariates, or between the VFI and the interaction terms). We also have some reservations about including the interaction term of spending decentralization and VFI, as done in many empirical papers. By construction, this variable is the share of the VFI in general government expenditure, which is highly correlated with the VFI and artificially reduces the statistical significance of the latter variable (Table 2, column 4). Finally, we explored another form on non-linearity by including the square of the VFI in the equation but this variable was statistically insignificant in most specifications.

¹⁹When conditional effects are tested, all the variables (conditioning variables and interaction terms) are included in the initial estimation to avoid omitted variable bias. Conditioning variables are then dropped in the final specification if they are found statistically insignificant.

Table 2. Vertical Fiscal Imbalance and Fiscal Performance
(Dependent variable: General government primary balance, percent of GDP)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VFI 1/	-0.18*** (-11.46)	-0.16*** (-6.52)	-0.14*** (-5.93)	-0.11* (-1.94)	0.16* (1.73)	-0.08*** (-2.91)	0.15** (2.07)	0.24** (2.43)
Expenditure decentralization	0.21*** (7.32)	0.17*** (3.78)	0.18*** (4.48)	0.21*** (2.77)	0.21*** (4.02)	0.13** (2.49)	0.12** (2.47)	0.23*** (3.71)
T1997			1.76*** (4.20)	1.78*** (4.23)	1.68*** (3.61)	1.59*** (3.63)	1.55*** (3.54)	1.45*** (3.42)
T1998			1.49*** (3.78)	1.52*** (3.81)	1.57*** (3.64)	1.40*** (3.39)	1.27*** (3.07)	1.30*** (3.27)
T1999			1.63*** (4.28)	1.66*** (4.30)	1.62*** (3.89)	1.64*** (4.10)	1.46*** (3.62)	1.47*** (3.77)
T2000			2.06*** (5.46)	2.09*** (5.47)	1.97*** (4.68)	2.17*** (5.14)	2.31*** (5.74)	2.00*** (4.87)
Lag debt-to-GDP ratio		0.11*** (7.12)	0.07*** (5.29)	0.07*** (5.13)	0.07*** (4.87)	0.09*** (5.28)	0.10*** (5.51)	0.11*** (6.01)
Lag of output gap		0.38*** (4.66)	0.33*** (4.45)	0.32*** (4.23)	0.39*** (4.26)	0.54*** (5.36)	0.53*** (5.16)	0.52*** (5.38)
Openness		0.02* (1.74)	0.03*** (2.82)	0.03*** (2.82)	0.03** (2.04)	0.03* (1.97)		0.04** (2.23)
Rule of law		5.77*** (4.18)	5.54*** (4.46)	5.49*** (4.40)	4.75*** (3.16)	5.84*** (2.97)		4.21** (2.14)
Regional disparity (HFI) 1/						-10.46** (-2.57)	22.00* (1.94)	
VFI x Expenditure decentralization				-0.001 (-0.54)				
VFI x Borrowing autonomy					-0.004*** (-2.65)			-0.004*** (-2.66)
VFI x Election					-0.01* (-1.84)			
VFI x Regional disparity (HFI)							-0.67*** (-3.05)	-0.23*** (-2.95)
Constant 2/	2.15* (1.91)	-13.49*** (-4.40)	-14.17*** (-5.09)	-15.38*** (-4.29)	-14.17*** (-4.58)	-12.95*** (-3.19)	-12.50*** (-2.98)	-16.35*** (-4.36)
Combined effect of VFI 3/	-0.18*** (-11.46)	-0.16*** (-6.52)	-0.14*** (-5.93)	-0.11*** (-5.53)	-0.12*** (-3.99)	-0.08*** (-2.91)	-0.08*** (-2.72)	-0.13*** (-4.15)
Within R ²	0.29	0.31	0.45	0.45	0.47	0.53	0.53	0.57
Between R ²	0.05	0.22	0.23	0.23	0.48	0.24	0.20	0.43
Overall R ²	0.08	0.21	0.24	0.24	0.40	0.44	0.37	0.39
Number of observations	447	260	260	260	200	176	176	175
Number of countries	27	24	24	24	18	19	19	18

Source: IMF staff estimates.

Notes: Annual data over 1969–2007 (sample period varies, see Appendix 1); fixed-effects estimation; t-statistics in parentheses;

***(**, *) = significant at the 1 (5, 10) percent level; T1997–T2000 time fixed effects. See Appendix 1 for the definitions and sources of variables.

1/ Changes in the magnitude and sign of estimated coefficients do not reflect instability of relations; total effect should also take into account interaction terms.

2/ One country fixed effect is excluded from equations.

3/ Combined effect of VFI = (i) VFI coefficient if no interaction term; (ii) VFI coefficient + interaction term coefficient(s) at average value of the interacted covariate(s) when significant.

C. Robustness Analysis

Sensitivity tests confirm the robustness of the results.²⁰ First, to control for the stability of the relation and the existence of possible outliers, we estimate the equation over sub-samples or exclude one country at a time. Results remain broadly unchanged. Second, removing time dummies does not significantly affect the estimates. Country-specific fixed effects, on the contrary, should not be excluded, as indicated by the Hausman test. Third, we examine whether the response of the overall balance to the VFI is asymmetric—a result emphasized by the empirical literature on transfers and spending (Gamkhar and Shah, 2007). To do so, we estimate the equation on two sub-samples, depending on whether the VFI increased or decreased over time; results are not significantly different, suggesting that the response is broadly symmetric. Fourth, to assess whether the empirical correlation between decentralization and VFI affects the results, we exclude the former from the equation and note that the VFI coefficient does not change materially. Fifth, using specifications with robust errors does not change the results (not reported here). Finally, we re-estimate our equation with two alternative measures of the VFI (Table 3): the vertical gap as a share of general government (rather than sub-national) spending (columns 1–3) and transfer dependency, defined as the share of net transfers received by sub-national government in sub-national own expenditure (columns 4–6). Our estimates are generally not altered. The signs of the VFI and spending decentralization coefficients remain the same, and the estimated elasticity of transfer dependency is very close to that of the VFI.²¹

We use instrumental variables to correct for the potential endogeneity of the vertical imbalance variable (Table 3, columns 7–8). VFI may be endogenous with regards to the fiscal balance for several reasons. First, the general government balance and the VFI are connected through an accounting relation (Box 2). Second, some unobserved, omitted variables, such as governance, could explain both variables (although this bias is likely to be corrected by the fixed-effect estimation). Third, the design of some transfers—matching grants, in particular—entails that spending and transfers are simultaneously determined (Gamkhar and Shah, 2007). Finally, when transfers are used to bail-out sub-national governments that overspend, there is reverse causality from fiscal performance to transfers.

²⁰Not all robustness checks are reported in the paper.

²¹Another potential issue—not addressed in the paper—is that the negative correlation between VFI and fiscal balance could partly be driven by the effect of spending on both the left- and right-hand side variables. Indeed, other things unchanged, higher public spending would increase the VFI ratio (Box 2) and at the same time deteriorate the overall balance of the general government. The fact that our results are robust to several measures of transfer dependency somewhat mitigates this risk, although this issue would deserve further examination.

Instrumental variables should be time-variant (the first stage uses a fixed-effects estimator), correlated with the VFI, and indirectly related to fiscal performance. Four variables ended up being exogenous, economically relevant, and statistically significant in the first stage:²²

- The share of sub-national health spending in national health spending reflects the role of sub-national governments in the delivery of public goods and services—a determining factor of the tax-grant balance across countries, according to Charbit and Goodspeed (2009). The distribution of competencies between government levels is unlikely to have a direct effect on fiscal performance, but it impacts the financing mix of sub-national governments: when large social spending responsibilities are transferred to sub-national governments, more transfers from the center are generally needed given that the scope to raise revenues from local taxation is often limited.
- The fiscal autonomy indicator of Hooghe and others (2008) measures the extent to which the legal framework gives regional governments a free hand to tax its population. This factor reduces the need for transfers without being directly related to the overall fiscal balance.
- The population size also affects the reliance on transfers, as large countries generally have to decentralize spending without being able to give equivalent tax responsibilities to sub-national authorities (for the reasons mentioned in Box 1).
- The lag of the VFI is also used as an instrument, as fiscal performance may impact current but not past VFI.

The two-stage least-squares model reports an estimated coefficient of alpha close to the lower bound of the fixed-effect specifications (-0.07 to -0.08), consistent with econometric theory.²³

Finally, we run the equation separately on general government spending and revenue to determine whether the negative impact of vertical imbalances is channeled through higher spending and/or lower tax effort. Results are reported in Table 4, where we include also some more traditional determinants of government size (columns 3 and 6). We find that the VFI increases primary expenditure and decreases revenue but the second effect is slightly stronger. The latter observation is somewhat surprising given that the literature tends to emphasize the spending side (e.g., via the “flypaper effect”). The effect of VFI is only conditional in the expenditure equation, with two significant multiplicative terms.

²²The results of the first stage regressions are available from the authors upon request.

²³In the case of reverse causality, the bias on alpha is expected to be negative, given that alpha is negative and the effect of fiscal performance on the VFI is also likely to be negative.

Table 3. Vertical Fiscal Imbalance and Fiscal Performance: Selected Robustness Checks

(Dependent variable: General government primary balance, percent of GDP)

	Fixed-Effects Model; VFI as a Share of General Government Expenditure			Fixed-Effects Model; Transfer Dependency as Alternative VFI Measure			Instrumental Variable Model	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VFI / Alternative measures in columns (1)-(6) 1/ Expenditure decentralization	-0.53*** (-12.69)	-0.29*** (-4.82)	-0.27*** (-3.95)	-0.11*** (-6.15)	0.29*** (3.04)	0.20** (2.03)	-0.07*** (-2.90)	-0.08** (-2.28)
T1997		1.87*** (4.27)	1.60*** (3.81)		0.91* (1.96)	1.78*** (3.71)	2.22*** (4.69)	1.64*** (3.84)
T1998		1.64*** (4.00)	1.64*** (4.06)			1.80*** (4.06)	1.61*** (3.67)	1.44*** (3.57)
T1999		1.83*** (4.63)	1.97*** (4.99)			1.84*** (4.31)	1.71*** (4.04)	1.64*** (4.16)
T2000		2.13*** (5.42)	2.82*** (7.06)		1.95*** (4.63)	2.03*** (4.69)	2.30*** (5.44)	2.37*** (6.00)
T2001			1.29*** (2.91)					
Lag debt-to-GDP ratio		0.06*** (4.08)	0.07*** (4.49)		0.12*** (6.23)	0.06*** (4.10)	0.08*** (6.48)	0.07*** (3.92)
Lag of output gap		0.30*** (3.90)	0.36*** (3.09)		0.62*** (5.67)	0.40*** (4.24)	0.54*** (7.95)	0.37*** (4.45)
Openness		0.03** (2.35)				0.02* (1.70)	0.02* (1.84)	
Rule of law		5.04*** (3.96)	6.00*** (3.20)			3.60** (2.27)		4.52*** (3.22)
Election		-0.40* (-1.73)						
Regional disparity (HFI)			-9.64** (-2.48)		-15.36*** (-3.58)			
VFI x Borrowing autonomy					-0.01*** (-3.33)	-0.00** (-2.35)		
VFI x Election						-0.01** (-2.14)		
Constant 2/ Combined effect of VFI 3/	-6.62*** (-6.92)	-17.49*** (-5.57)	-15.20*** (-3.95)	-0.29 (-0.23)	-3.25 (-1.11)	-12.57*** (-3.95)	-6.21*** (-2.77)	-10.52*** (-3.57)
Instruments used							Lag VFI; health spending share; fiscal autonomy	Lag VFI; population; fiscal autonomy
Within R ²	0.33			0.15	0.44	0.44	0.52	0.44
Between R ²	0.04			0.06	0.38	0.49	0.49	0.33
Overall R ²	0.08			0.07	0.31	0.42	0.45	0.29
Number of observations	447	247	176	447	175	200	236	227
Number of countries	27	23	19	27	18	18	21	22

Source: IMF staff estimates.

Notes: Annual data over 1969–2007 (sample period varies, see Appendix 1); fixed-effects estimation; t-statistics in parentheses; ***(**, *) = significant at the 1 (5, 10) percent level; T1997–T2001 time fixed effects. See Appendix 1 for the definitions and sources of variables.

1/ Changes in the magnitude and sign of estimated coefficients do not reflect instability of relations; total effect should also take into account interaction items.

2/ One country fixed effect is excluded from equations.

3/ Combined effect of VFI = (i) VFI coefficient if no interaction term; (ii) VFI coefficient + interaction term coefficient(s) at average value of the interacted covariate(s) when significant.

**Table 4. Vertical Fiscal Imbalance, Government Expenditure,
and Government Revenue**
(Dependent variables are in percent of GDP)

	Dependent variable: General Government Primary Expenditure			Dependent variable: General Government Total Revenue		
	(1)	(2)	(3)	(4)	(5)	(6)
VFI 1/	0.05** (2.17)	-0.27*** (-3.04)	0.05** (2.45)	-0.07*** (-4.80)	-0.11*** (-6.25)	-0.08*** (-5.04)
Expenditure decentralization	-0.25*** (-5.02)		-0.28*** (-6.32)	-0.03 (-0.80)		
T1997	-2.18*** (-3.84)	-1.39*** (-2.99)	-1.44*** (-2.77)			
T1998	-1.77*** (-3.26)		-1.55*** (-3.09)			
T1999	-1.58*** (-2.99)		-1.45*** (-3.16)			
T2000	-2.02*** (-3.83)		-1.44*** (-3.13)			
Lag debt-to-GDP ratio	0.02* (1.83)		0.04*** (2.90)	0.09*** (10.36)	0.06*** (6.65)	0.08*** (9.56)
Lag of output gap	-0.38*** (-5.24)	-0.73*** (-7.29)		0.10** (2.10)		
Real GDP growth			-0.44*** (-6.05)			-0.21*** (-4.39)
Lag of real GDP growth				0.08* (1.67)		
Lag inflation			-0.33*** (-5.39)			-0.16*** (-3.77)
Openness		-0.05*** (-2.75)	-0.05*** (-4.53)	-0.02*** (-3.06)		-0.02*** (-3.08)
Voice and accountability		-2.68* (-1.87)				
Corruption (higher value=lower corruption)					1.20* (1.97)	
VFI x Regional disparity (HFI)		0.40*** (4.14)				
VFI x Borrowing autonomy		0.003** (2.13)				
Constant 2/	47.60*** (21.69)	48.26*** (19.47)	54.92*** (25.53)	44.81*** (28.52)	42.38*** (34.70)	45.85*** (39.84)
Combined effect of VFI 3/	0.05** (2.17)	0.07** (2.05)	0.05** (2.45)	-0.07*** (-4.80)	-0.11*** (-6.25)	-0.08*** (-5.04)
Within R ²	0.32	0.36	0.44	0.37	0.25	0.42
Between R ²	0.00	0.01	0.02	0.11	0.44	0.18
Overall R ²	0.01	0.00	0.05	0.06	0.29	0.11
Number of observations	314	181	325	314	275	325
Number of countries	24	18	27	24	27	27

Source: IMF staff estimates.

Notes: Annual data over 1969–2007 (sample period varies, see Appendix 1); fixed-effects estimation; t-statistics in parentheses; ***(**, *) = significant at the 1 (5, 10) percent level; T1997–T2001 time fixed effects. See Appendix 1 for the definitions and sources of variables.

1/ Changes in the magnitude and sign of estimated coefficients do not reflect instability of relations; total effect should also take into account interaction terms.

2/ One country fixed effect is excluded from equations.

3/ Combined effect of VFI = (i) VFI coefficient if no interaction term; (ii) VFI coefficient + interaction term coefficient(s) at average value of the interacted covariate(s) when significant.

VI. CONCLUSION AND POLICY IMPLICATIONS

This paper provides new evidence on the impact of VFIs on fiscal performance, focusing on OECD countries. Our econometric results confirm the widespread view that spending decentralization financed through own revenues is beneficial and that increasing the share of transfers and borrowing in sub-national spending deteriorates the general government balance. Our findings also suggest that the combination of vertical and horizontal imbalances is particularly damaging to fiscal balances. Finally, we show that reducing VFIs lowers primary expenditure but also increases revenue, which may create trade-offs for governments seeking to reduce the tax burden.

In practice reducing vertical imbalances may be difficult to achieve. Our results naturally raise four questions:

- i. *How to boost sub-national revenues, given that local authorities face specific challenges, including tax base mobility, higher administrative costs, and horizontal disparities in revenue-raising capacity?* The literature is generally skeptical about the revenue-raising capacity of lower levels of government. Some papers question nonetheless the dogma that sub-national authorities should only rely on benefit taxation and that the largest tax bases cannot be transferred to them (Bird, 1999). Furthermore, not only the magnitude but also the quality of revenue decentralization is important; local taxes should be carefully selected, based on feasibility and efficiency considerations.
- ii. *If sub-national own revenues cannot be increased above a certain level, should the VFI be narrowed by recentralizing spending?* The conventional wisdom that functions should be carried out at the lowest political and administrative level and as close to citizens as possible (subsidiarity principle) is much debated today, in particular in the area of health policy (Saltman, 2008). There may be tradeoffs between traditional gains of decentralization (better tailoring spending to local needs, increased accountability, transparency, competition) and the risks and opportunity costs that decentralization generates (agency problems, externalities, economies of scale).
- iii. *If sub-national own revenues cannot be increased and spending should not be recentralized, can the transfer system be reformed to become less distortionary?* A large part of the empirical literature suggests that grant and tax-sharing design can actually be improved (Bergvall and others, 2006; Blöchliger and Charby, 2008; Blöchliger and Petzold, 2009). Well-designed grants are generally based on objective criteria that are less prone to discretionary changes. Another cause of inefficiency seems to be the use of the same grant for various purposes; for instance, subsidization grants that simultaneously attempt to equalize, or financing grants that simultaneously attempt to subsidize.

- iv. *Are there other ways to enforce fiscal discipline than raising sub-national tax responsibilities, rationing transfers, or controlling local borrowing?* Additional hard budget constraint mechanisms have come under closer scrutiny, in particular: financial market and land market discipline, fiscal rules, and adequate political institutions (Ter-Minassian, 1997a, 1997b; Rodden and others, 2003).

Appendix. Data Sources and Definitions

Appendix Table 1. List of Countries and Data Availability

	Country	Sample period
1.	Austria	1995–2009
2.	Belgium	1985–2009
3.	Canada	1970–2009
4.	Czech Republic	1997–2009
5.	Denmark	1990–2009
6.	Estonia	1997–2009
7.	Finland	1975–2009
8.	France	1995–2009
9.	Germany	1991–2009
10.	Greece	1995–2009
11.	Hungary	1995–2009
12.	Iceland	1995–2009
13.	Ireland	1990–2009
14.	Israel	1995–2009
15.	Italy	1980–2009
16.	Korea	2000–2009
17.	Luxembourg	1990–2009
18.	Mexico	2003–2009
19.	Netherlands	1969–2009
20.	Norway	2002–2009
21.	Poland	2005–2009
22.	Portugal	1995–2009
23.	Slovenia	1995–2009
24.	Spain	1995–2009
25.	Sweden	1993–2009
26.	Switzerland	1990–2009
27.	United Kingdom	1987–2009

Notes: Sample period for OECD (2010a) data; sub-national (state, where applicable, and/or local) fiscal data are not available for Australia (all years); Austria (1988–1994); France (1978–1994); Japan (all years); New Zealand (all years); United States (all years); and Poland (1995–2004); non-oil fiscal and GDP data for Norway (source: IMF).

Appendix Table 2. List of Variables, Definitions, and Sources

Variable	Definition	Source
VFI (vertical fiscal imbalance)	Share of sub-national own expenditure (i.e., excluding transfers paid to other general government units) not financed with sub-national own revenue (i.e., excluding transfers received from other general government units). Sub-national government is a consolidated state (when applicable) and local government. Transfers include both current and capital transfers.	OECD (2010a)
Transfer dependency	Share of sub-national net transfers received in sub-national own expenditure.	OECD (2010a)
Expenditure decentralization	Share of sub-national own expenditure in total general government expenditure.	OECD (2010a)
Debt-to-GDP ratio	General government gross debt (percent of nominal GDP).	IMF (2011)
Output gap	Percentage difference between actual GDP in constant prices and estimated potential GDP.	OECD (2010b)
Governance indicators: Rule of law; Corruption; Voice and accountability	Indicators are measured in units ranging from about -2.5 to 2.5, with higher values corresponding to better governance outcomes. Values for the years 1997, 1999, and 2001 are interpolated; and 1995 is assumed equal to 1996.	Kaufmann and others (2010)
Election	Dummy variable = 1, if there was a legislative election in this year, and =0 otherwise.	Beck and others (2001)
Regional disparity (HFI)	Weighted coefficient of variation of TL3 regional GDP per capita.	OECD (2009)
Borrowing autonomy	Index measuring six components of borrowing regulations (domestic/international borrowing prohibition; limits on government debt; limits on debt service; limits on borrowing for specific purposes; and Requirements of prior approval from higher levels of government).	Crivelli and others (2010)
Inflation	Percentage change in consumer price index	IMF (2011)
Real GDP	GDP, constant prices.	IMF (2011)
Openness	Share of total exports and imports in nominal GDP.	IMF (2011)
Health spending share	Share of sub-national (state and local) expenditure on health in total general government expenditure on health.	OECD (2010c)
Population	Population, in thousands.	Heston and others (2011)
Dependency ratio	Age dependency ratio (percent of working-age population).	WDI (2010)
Fiscal autonomy	{0,1,2,3,4} index measuring the extent to which a regional government can independently tax its population (with 0 if the central government sets base and rate of all regional taxes; and =4 if the regional government sets base and rate of at least one major tax).	Hooghe and others (2010).

Source: IMF staff.

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