Fiscal decentralization, macrostability, and growth

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Abstract

This paper examines how fiscal decentralization may influence economic growth. Previous research on this question has primarily focused on the potential direct relationship between decentralization and growth. In this paper, we also examine the potential indirect influence of decentralization on growth through its impact on macroeconomic stability. We find that decentralization may positively influence price stability in developed countries, though this impact is much less clear in developing and transitional countries. We also find some evidence suggesting that decentralization may directly and negatively affect economic growth in higher-income countries but that this effect is reduced through the indirect positive impact of decentralization on growth through macroeconomic stability.

Key words: Fiscal Decentralization, Economic Growth, and Macroeconomic Stability.

JEL classification: E62, H77, O20, O40

1. Introduction

Given the current drive among developing and transitional countries to decentralize expenditures and revenues to subnational governments, it is important to ask not only whether fiscal decentralization influences economic growth, but also ***how*** fiscal decentralization may influence economic growth. What evidence exists on the direct relationship between fiscal decentralization and economic growth is conflicting at best and lacks, for the most part, a convincing argument in either direction on the direct effect of fiscal decentralization. The same may be said for the theoretical development and empirical evidence on the relationship between fiscal decentralization and macroeconomic stability.

In this paper we examine the current state of knowledge in the economics literature on the relationship between fiscal decentralization and economic growth; investigate empirically the extent of such a relationship; and analyze whether fiscal decentralization also indirectly influences economic growth through its impact on macroeconomic stability. As decentralization moves to the forefront of policy options being considered by developing and

transitional countries and often figures prominently among the prescriptions offered by international donor organizations, it becomes more important to understand better the relationship between decentralization, macroeconomic stability, and economic growth. If fiscal decentralization positively or negatively influences economic growth directly or indirectly (the latter though the macroeconomic stability channel), then policymakers need to be aware of these relationships when formulating and implementing decentralization policy.

The rest of the paper is organized as follows. First, we briefly review the literature on the relationship between fiscal decentralization, macroeconomic stability, and economic growth. Second, we develop an augmented neoclassical model of economic growth that incorporates both the potential indirect effect of fiscal decentralization on economic growth through macroeconomic stability and the potential direct effect of fiscal decentralization on economic growth. Third, using an international panel data set, we estimate the impact of fiscal decentralization on macroeconomic stability and economic growth. The last section summarizes and reviews the policy implications of our findings.

2.   Review of the Literature

While the direct relationship between decentralization and growth is not one of the conventionally addressed issues in the theory of fiscal federalism, it has received a significant amount of attention in the empirical literature in recent years [1]. Whether or not a direct relationship exists between fiscal decentralization and economic growth, however, remains, an unanswered question [2]. The static proposition that fiscal decentralization enhances economic efficiency may have a corresponding effect in the dynamic setting of economic growth (Oates 1993). Of course, this linkage can be derailed if fiscal decentralization does not function effectively [3]. Others have argued that decentralization may control the Leviathan, although the evidence on this hypothesis is also mixed [4]. Some have argued that decentralization may also serve to preserve and promote the development of markets (Weingast 1995, Qian and Weingast 1997, Cao, Qian and Weingast 1999). A problem, however, is that these arguments for decentralization may be susceptible to the contention that subnational governments in developing and transitional economies lack sufficient capacity relative to the central government (Rodden and Rose-Ackerman 1997).

Nevertheless, most authors arguing for and against using fiscal decentralization as a policy option in developing and transitional economies have implicitly recognized the potential influence of fiscal decentralization on macroeconomic stability (Prud'homme 1995, McLure 1995, Sewell 1996, Fornasari, Webb, and Zou 2000, Tanzi 2000). The theory of design of fiscal decentralization suggests a number of potential tradeoffs between efficiency and other objectives such as a more equal distribution of resources across regions or macroeconomic stability. The classical view of this issue contends that macroeconomic policy should solely be the responsibility of the central government and not at all the responsibility of subnational governments, more recently, a number of authors have argued that devolving at least some

measure of macroeconomic policy to subnational governments can promote, not hinder, macroeconomic stability (Gramlich 1995, Shah 1999, Rodden and Wibbels 2002).

On the negative side, some have argued that the apparent disregard of some subnational governments for budget constraints in decentralized systems suggests that fiscal decentralization *per se* aggravates macroeconomic instability or at least presents another obstacle to resolving chronic fiscal imbalance (Rodden 2002 and Rodden, Eskeland and Litvack 2003). Where macroeconomic instability predated decentralization, for example, in Argentina and Brazil, decentralization has made the solutions more complicated in general but not impossible (Dillinger, Perry and Webb 2000). However, in many countries, the presence of a soft-budget constraint at the local level of government remains a threat to macroeconomic stability (Bahl 1999 and Stein 1999).

The empirical evidence on the relationship between fiscal decentralization and macroeconomic stability does not provide any definitive conclusion on the direction or significance of the relationship. Lagged inflation does not appear to significantly influence government size but it does appear that decentralization affects government size (Jin and Zou 2002). There also appears to be an almost 1-to-1 correspondence between increases in subnational deficits and central government expenditures and deficits in the subsequent period (Fornasari, Webb and Zou 2000). On the other hand, others have argued that no clear relationship appears to exist between decentralization and the level of inflation (Treisman 2000 and Rodden and Wibbels 2002). In summary, with the influence of fiscal decentralization on economic growth, whether decentralization significantly influences macroeconomic stability still is an unanswered question.

3. A Model of Decentralization, Macroeconomic Stability, and Growth

Our objectives in this section are first to account for the direct relationship between fiscal decentralization and economic growth; and second, to incorporate the potential influence of fiscal decentralization on macroeconomic stability into the aggregate production function; and therefore examine the indirect influence of decentralization on growth through its impact on macroeconomic stability. While the direct relationship between fiscal decentralization and economic growth has been previously examined in the literature, the indirect influence of fiscal decentralization on growth through macroeconomic stability has not been previously studied.

We develop an augmented neoclassical model of economic growth, which includes, among other variables, the accumulation of human and physical capital, to examine the role played by fiscal decentralization [5]. We extend the model by assuming that the standard term for technological progress can be disaggregated into exogenous technical progress, the direct effect of fiscal decentralization on economic growth, and the effect of decentralization on macroeconomic stability. By augmenting the model, we can explicitly examine how decentralization may indirectly influence economic growth through its impact on macroeconomic

stability. We note that the disaggregation of the exogenous technical progress term is consistent with the literature and adheres to the conditional convergence hypothesis (Barro 1991, Barro and Sala-i-Martin 1992, 1997).

We assume a Cobb-Douglas production function for the entire economy for country i at time t is given by (Mankiw, Romer and Weil 1992 and Islam 1995)

$$Y_{it} = V_{it} K_{it}^{\alpha} G_{it}^{\beta} H_{it}^{\varphi} L_{it}^{\theta} \qquad [1]$$

where α, β, φ, $\theta > 0$ and $\alpha + \beta + \varphi + \theta \geq 1$. Y is the level of output and V is the level of technology and other institutional factors. We define K, G and H as the stocks of private, public, and capital while L is the stock of labor. We further specify V as the product of exogenous technical progress (A), decentralization (D), and macroeconomic stability (MS) or

$$V_{it} = A_{it} D_{it} MS_{it} \qquad [2]$$

We note that D is synonymous with the direct effect of fiscal decentralization on output. If fiscal decentralization indirectly influences output through its impact on inflation, *ceteris paribus*, then it will indirectly influence economic output through MS. We note that disaggregating exogenous technological progress should not be interpreted as inflation or decentralization affecting economic growth through technological progress. If one expands the theoretical model, it becomes apparent that macroeconomic stability, decentralization, and technological progress affect the physical inputs separately, that is, technological progress is not a composite function of decentralization.

We further assume that L and A grow exogenously at rates n and g, respectively, and that capital depreciates at the uniform rate δ [6]. We define the level of macroeconomic stability as a function of, among other things, fiscal decentralization or

$$MS_{it} = g(D_{it}, X_{it}^1) \qquad [3]$$

where X^1 is a vector of other exogenous variables explaining the behavior of macrostability over time. At this time, for theoretical simplicity, we assume that decentralization is uncorrelated with the vector of exogenous variables X^1.

We further assume that output is subject to decreasing returns to scale with respect to physical and human capital. This implies that the economy, over the long-run, will tend to constant private capital-labor, human capital-labor, and public capital-labor ratios [7]. Once steady state output is achieved, additional increases in per capita output can only be achieved through increases in capital productivity or increases in the level of decentralization (assuming that the overall effect of decentralization on economic growth is positive) [8]. Decentralization may thus affect output through two channels, a potential direct effect on output, and a series of potential indirect effects, one of which is macrostability [9].

To determine the influence of fiscal decentralization on economic growth, we must first determine the steady state levels of the physical inputs in the production function. We as-

sume that the same production function applies to all forms of reproducible capital and consumption so that one unit of capital can be costlessly transformed into one unit of consumption and vice versa. Assuming decreasing marginal returns to all forms of reproducible capital; that no combination of capital inputs exhibits constant marginal returns; expanding V and taking the natural logarithm yields from (1) and (2) the steady state level of output per unit of labor (y^*), or

$$\ln y_{it}^* = \ln A_{it} + \ln D_{it} + \ln MS_{it} + \frac{\alpha}{1-\alpha-\beta-\varphi} \ln i_{it}^k + \frac{\beta}{1-\alpha-\beta-\varphi} \ln i_{it}^g$$

$$+ \frac{\varphi}{1-\alpha-\beta-\varphi} \ln i_{it}^h - \frac{\alpha+\beta+\varphi}{1-\alpha-\beta-\varphi} \ln(n+g+\varphi)$$

[4]

where i^k, i^g, and i^h are the fractions of output invested in private, public, and human capital, respectively. Thus, the steady state output is dependent upon the accumulation of reproducible capital, the stock of technology, the direct effect of decentralization on output, and the indirect effect of decentralization through the macrostability channel.

We can calculate the speed of convergence to steady state per capita output using

$$\frac{d \ln y_{it}}{dt} = \lambda(\ln y_{it}^* - \ln y_{it})$$

[5]

where $\lambda = (n+g+\delta)(1-\alpha-\beta-\varphi)$. The evolution of per capita output over time is given by

$$\ln \dot{y}_{it} = \ln y_{it} - \ln y_{it-1} = (1-e^{-\lambda t})[\ln D_{it} + \ln MS_{it} + \frac{\alpha}{1-\alpha-\beta-\varphi} \ln ii_{it}^k$$

$$+ \frac{\beta}{1-\alpha-\beta-\varphi} \ln i_{it}^g + \frac{\varphi}{1-\alpha-\beta-\varphi} \ln i_{it}^h - \frac{\alpha+\beta+\varphi}{1-\alpha-\beta-\varphi} \ln(n+g+\delta)$$

$$- \ln y_i^0 - e^{-\lambda t} \ln A_i^0 - e^{-\lambda t} \ln D_i^0 - e^{-\lambda t} MS_i^0]$$

[6]

where y^0, A^0, D^0, and MS^0 are the initial levels of per capita output, exogenous technical progress, decentralization, and macroeconomic stability, respectively.

The advantage of this theoretical specification over the ones used in previous papers is that it allows for the explicit examination of the out-of-steady-state dynamics. In addition, our theoretical specification also makes explicit the difference between the bounded institutional factors in the production function and the physical inputs in the production function. The bounded institutional factors directly influence economic growth while the physical inputs are weighted by the ratio of their output share to labor's share of output. Finally, our theoretical specification explicitly captures the unobservable initial conditions in the theoretical model, providing support for our error components estimation approach below. Empirically, equation (6) suggests that decentralization may affect output through multiple channels: directly as previously suggested and tested in the literature, and indirectly through its influence on the physical inputs in the production function and through the macro-stability channel.

Two empirical hypotheses thus result from our theoretical analysis: (1) fiscal decentralization directly affects the evolution of per capita output over time; and (2) fiscal decentralization affects macroeconomic stability which, in turn, affects the evolution of per capita output over time.

Two problems may arise with our derivation of the steady state production function and the equation for the convergence to the steady state output level. First, if countries have permanent differences in technology, then these differences would enter as part of the error term and be positively correlated with initial per capita output. Permanent variations in technology could bias the estimated coefficient on initial per capita output toward zero. However, the literature has yet to find convincing evidence to support the contention that countries have permanent differences in technology. Second, while countries may not have permanent variations in technology, they may have permanent variations in their institutional factors (colonial legacy, legal system, climate, geographical region) that would also enter as part of the error term. To control for these institutional factors, we employ a two-way error components model in our empirical estimations.

4.   Empirical Estimation: The Impact of Fiscal Decentralization

We now turn to the task of determining whether empirical support exists for the hypotheses of the direct and indirect effects of fiscal decentralization on economic growth. As in the case of several more recent studies of the relationship between fiscal decentralization and economic growth, we employ a panel data set of developed and developing countries. We first discuss the data sources and methodology before presenting the results of our empirical investigations.

4.1.   The Measurement of Fiscal Decentralization

The most serious difficulty we face in the cross-country study of fiscal decentralization is how to properly measure the extent of decentralization. Ideally, we would be able to construct a panel data set of measures of fiscal decentralization that effectively quantified the activities of subnational governments resulting from autonomous or independent decisions of subnational governments. This would require classifying those revenues and expenditures that are under the effective control of the central government as central government activities, regardless of the level of government at which these revenues or expenditures occurred. Likewise, activities that were under the control of subnational governments, even if they were funded by the central government, would be classified as subnational government activities. Constructing such a panel data set would require information on: (i) the nature of grants and transfers received by subnational governments (for example, lump-sum versus conditional); (ii) the structure of the tax system to determine whether and how revenues were shared; (iii) the discretion of subnational governments to levy and collect taxes and to change their bases and rates; (iv) the discretion granted to subnational governments to spend

resources to meet the needs of their constituents; and (v) the overall level of political autonomy of subnational governments.

Unfortunately, we cannot readily address these issues with the available data. As with many other empirical studies of fiscal decentralization, we employ the International Monetary Fund's Government Finance Statistics Annual Yearbook (GFS) as the primary data source for revenues and expenditures of national and subnational governments. While the GFS system reports information on grants and transfers between the various levels of government, it does not contain information on whether the grants and transfers are under the control of the central or recipient level of government or if the grants are conditional, block, or lump-sum. The GFS system also does not report information on the nature of transfers. Cross-sectional and time-series data on the number and size of subnational governments is sketchy at best for developed countries and virtually non-existent for developing and transitional countries, except in those cases where technical assistance providers have conducted surveys of subnational governments.

It is this lack of information that has led to the use of a measure of fiscal decentralization that is typically constructed as a ratio of subnational government expenditures (revenues) to general government expenditures (revenues). We are, as Oates (1972) concluded, left with the standard, albeit imperfect, measures of fiscal decentralization based on revenue and expenditure data. We, as many of the other studies that have preceded us, thus define fiscal decentralization in one dimension, that is, as the share of subnational government revenues to general government revenues or the share of subnational government expenditures to general government expenditures [10].

In our analysis, specifically, we use GFS data at the consolidated central government, regional and state government, and local government levels. For those countries that do not report consolidated central government data, we substitute data on the budgetary central government [11]. Of the 180-plus potential countries in the GFS data set, we selected those countries that reported revenues and expenditures for at least the central government and at least one level of subnational government [12]. This selection process resulted in an unbalanced base panel data set of 1491 observations for 66 developed and developing countries with observations ranging from 1972 to 2003. We then calculated two measures of fiscal decentralization: (1) the ratio of total subnational government revenues to general government revenues and (2) the ratio of total subnational government expenditures to general government expenditures. These two measures are the standard measures of fiscal decentralization that have been widely used in the previous studies of determinants and outcomes of fiscal decentralization [13].

4.2. Other Variables of Interest

We then construct an unbalanced panel data of socio-economic variables set that is drawn from three other sources: the World Bank's World Development Indicators, the United States Census Bureau's International Data Base, Freedom House's Survey of Free-

dom, the Armed Conflict database. As these databases are well known in the literature, we focus on the construction of the variables of interest for this paper.

We would prefer to measure the evolution of human capital across countries and time using schooling data; however, panel data on education levels are currently not of sufficient quantity to include in the panel data set. Most panel datasets of education data are constructed on a five-year not annual basis [14]. As a substitute, we use infant mortality as a proxy for the evolution of human capital. We readily acknowledge that this is an imperfect measure (as are all measures of human capital).

To test the hypotheses that fiscal decentralization significantly influences macroeconomic stability, we use the annual change in the Consumer Price Index (CPI), more commonly know as the inflation rate, as the measure of macroeconomic stability. We would prefer to use a composite index equal to the sum of the unemployment rate and the inflation rate as the measure of macroeconomic stability. As with measures of school enrollment, measures of unemployment are not readily available for the early periods in the sample. While unemployment data could be obtained directly from the countries in the sample, problems of consistency and comparability across countries and time prohibit the use of the data.

When we combine the data extracted from the GFS with the data extracted from the other data sources, the size of the data set is reduced from 1491 observations to 1211 observations due to missing observations in the socio-economic data sets. We note again that the panel data set is unbalanced; we do not create linear approximations of the missing data points; nor do we construct averages over periods of time to balance the data set [15]. While we acknowledge that gaps exist in our dataset, we explicitly choose to retain data rather than cull the gaps from our dataset to achieve a more tractable panel. Our approach is to examine the potential impact of decentralization in the full sample of countries using variants of the two-way error components model [16]. We then split the sample into sub-samples of developed and developing and transitional countries to investigate whether the influence of decentralization is dependent upon the level of development. These estimations allow us to test the hypotheses presented in the theoretical model.

4.3.   Fiscal Decentralization and Macroeconomic Stability

Equation (6) suggests that fiscal decentralization indirectly influences economic growth through its impact on macroeconomic stability. We recognize, however, that economic growth, in turn, may influence macroeconomic stability and fiscal decentralization. We attempt to disentangle these relationships by first empirically exploring whether fiscal decentralization affects macroeconomic stability. We address the question of simultaneity in the next section.

We follow Treisman (2000) in the specification of our empirical model in that the annual rate of inflation is determined by, among other things, fiscal decentralization, the development of the tax system, the level of economic development, and the openness of the economy. We also include measures of the subnational and central government deficits to GDP as

this has been hypothesized in the literature to be positively correlated with inflation. Unlike Treisman (2000) and others, however, we do not include time or country-invariant dummy variables that, in essence, capture the fixed differences across states and time. Variables such as ethno linguistic fractionalization, type of parliamentary system, colonial power, revolutions and coups per decade, and other variables are «swept out» by the Within transformation of the fixed effects errors components estimator.

Following the theoretical specification and Treisman (2000), our base two-way error components model is thus:

$$P_{it} = \beta_1 D_{it} + \beta_2 Tax_{it} + \beta_3 \frac{Y_{it}}{Pop_{it}} + \beta_4 Open_{it} + \delta Z_{it} + u_{it}$$

[7]

where P is the annual change in the consumer price index, D is the measure of fiscal decentralization discussed above, *tax* is the measure of tax revenue to GDP, *Y/Pop* is GDP per capita, *Open* is the ratio of exports plus imports to GDP, and the Z matrix contains additional control variables to include, population, urbanization, defense expenditures as a percentage of GDP, indicators of armed conflict, and measures of democratic governance.

Testing for the presence of endogeneity of fiscal decentralization in (7) [17], we fail to reject the null hypothesis of exogeneity for fiscal decentralization with respect to the inflation rate [18]. While we recognize that the tests for endogeneity with unbalanced panel data may be of relatively low power, our failure to reject to null hypothesis of exogeneity for decentralization is consistent with the rest of the decentralization literature.

We then examine whether the random effects GLS estimator or fixed effects Within estimator is more appropriate for the estimation of (7). While we would prefer to use the random effects estimator to avoid the loss of degrees of freedom associated with the use of the Within estimator, we reject the null hypothesis that the regressors and effects are uncorrelated [19]. As this result suggests that the random effects estimator is inconsistent, we use the fixed effects estimator for the estimation of the relationship between fiscal decentralization and inflation. Finally, we examine whether the fixed effects are jointly significant, that is, whether the time and country specific effects are significant. Using these results, we specify the estimable form of Equation (7) as a two-way fixed effects model. In each step, we test whether serial correlation is present using a modified Durbin-Watson test [20]. We unambiguously reject the null hypothesis of serial correlation at the 1% significance level for the initial model in levels. To correct for serial correlation, we employ the Prais-Winsten Panel Corrected Standard Error (PCSE) Within estimator, the Within estimator with an autoregressive order 1 error process, and finally, we examine the Within estimator using first differenced data. We believe that this approach is appropriate to examine whether our results are robust to alternative specifications.

From this paper's perspective, the evidence is mixed in the full sample whether fiscal decentralization influences inflation (Table 1). Decentralization (expenditure and revenue) appears to negatively influence inflation in the PCSE, Within Instrumental Variable (IV), and

first differenced Within IV estimations. We must note, however, that our choice of instruments is quite limited given the span of our sample, thus the estimated coefficients in the IV estimations should be viewed with caution. The results suggest that, in the full sample of countries, that decentralization may be associated with lower rates of inflation, although we must admit the affect is quite small in magnitude. For the PCSE estimations, for example, a 1% increase in the level of expenditure decentralization would appear to induce a 0.6% decrease in the prevailing rate of inflation. The estimated coefficients appear to be robust to the inclusion of other regressors, including total population, freedom status, globalization status, and urbanization. We again caution that our results are limited to the countries and time periods covered in our sample and subject to the limitations of our measures of fiscal decentralization.

Turning to the sub-sample estimations, we find contrasting evidence on the impact of fiscal decentralization. For the sub-sample of developed countries, the Within AR(1) and Within IV estimations suggest that decentralization may be associated with lower rates of inflation. The estimated coefficients resulting from the PCSE estimations, however, are not statistically significant, suggesting that these results are not robust to alternative specifications. These results suggest that the sample countries that are relatively more decentralized experience relatively lower rates of inflation.

For the sub-sample of developing and transitional countries, the results run counter to those of the full and sub-sample of developed countries. The estimated coefficients for fiscal decentralization are positive and statistically significant for the Within (uncorrected for serial correlation), Within AR(1), and first differenced Within IV estimations. The estimated coefficients for the PCSE estimations are either statistically significant at 15% (expenditure decentralization) or 10% (revenue decentralization). These results suggest, albeit subject to the caveats noted above, that decentralization may be associated with higher rates of inflation for the developing and transitional countries in the sample. While the explanatory power of the estimations is small, the results are intriguing.

The results of our analysis, even in light of the necessary cautionary notes, are quite intriguing. Expenditure decentralization appears to promote price stability among the developed countries in the sample. On the other hand, decentralization may undermine price stability in the sub-sample of developing and transitional countries. We must recognize that our results are not robust across all estimators, suggesting that the estimated coefficients are fragile to alternative specifications and estimators.

Our empirical results appear support the previous arguments in the literature that fiscal decentralization may enhance price stability and the *a priori* arguments of those who caution that decentralization, at a minimum, presents an obstacle to achieving macroeconomic stability (Prud'homme 1995). With respect to the empirical literature, our findings contradict the previous findings that decentralization either «locks in» (Treisman 2000) the current rate of inflation or has no statistically discernable effect (Rodden and Wibbels 2002). Our results appear to suggest that decentralization may be more beneficial for higher-income countries, although such a conclusion is subject to the countries and time periods covered in the sample.

Table 1: Fiscal Decentralization and Inflation
Full Sample Estimations

	Within Estimator	Within Estimator	Within IV	Within IV	Within PCSE	Within PCSE	Within AR(1)	Within AR(1)	First Difference Within IV	First Difference Within IV
Expenditure Decentralization	−0.004 (0.003)		−0.035** (0.009)		−0.006* (0.003)		−0.003 (0.003)		−0.030** (0.011)	
Revenue Decentralization		−0.005+ (0.003)		−0.032** (0.009)		−0.007* (0.003)		−0.002 (0.003)		−0.026* (0.012)
Sub-national Deficit (% of GDP)	−0.167** (0.044)	−0.172** (0.043)	−2.243** (0.433)	−2.378** (0.495)	−0.186** (0.041)	−0.187** (0.041)	−0.073+ (0.045)	−0.067 (0.045)	−2.468** (0.597)	−2.719** (0.753)
Central Deficit (% of GDP)	0.006** (0.002)	0.005* (0.002)	0.019** (0.005)	0.018** (0.005)	0.008** (0.002)	0.008 (0.002)	0.016** (0.002)	0.016** (0.002)	0.022** (0.007)	0.022** (0.009)
Log of GDP Per Capita	−0.361** (0.044)	−0.366** (0.044)	−0.030 (0.118)	−0.120 (0.117)	−0.286** (0.045)	−0.295** (0.044)	−0.196 (0.035)	−0.200** (0.035)	−0.340** (0.168)	−0.405* (0.174)
Tax Revenues (% of GDP)	0.013** (0.005)	0.014** (0.004)	−0.012 (0.009)	−0.009 (0.009)	0.008+ (0.004)	0.009+ (0.005)	0.015** (0.005)	0.015** (0.005)	0.006 (0.130)	0.007 (0.138)
Openness to International Trade	−0.003** (0.001)	−0.003* (0.001)	−0.001 (0.001)	−0.000 (0.002)	−0.004** (0.001)	−0.004** (0.001)	0.000 (0.000)	0.000 (0.001)	0.001 (0.013)	0.002 (0.014)
Conflict	0.088+ (0.054)	0.084 (0.054)	0.139 (0.094)	0.128 (0.098)	0.120* (0.057)	0.116* (0.057)	0.158** (0.055)	0.158** (0.055)	0.253+ (0.153)	0.247 (0.167)
Constant	4.820** (0.396)	4.895** (0.399)	2.207* (0.999)	2.827** (1.013)	4.368** (0.400)	4.457** (0.403)	3.025** (0.204)	3.032** (0.205)	0.503** (0.176)	0.458** (0.153)
Observations	1211	1211	1186	1186	1211	1211	1179	1179	692	692
ρ	—	—	—	—	0.35	0.35	0.32	0.32	—	—
R^2	0.19	0.20	0.11	0.11	0.23	0.23	0.17	0.17	0.14	0.13

**, *, and + signify the 1%, 5%, and 10% level of significance, respectively. Heteroskedastic-consistent standard errors in the parentheses. PCSE = Prais – Winsten Panel Corrected Standard Errors with common AR(1) process.

Table 2: Fiscal Decentralization and Inflation Developed Country Estimations

	Within Estimator	Within Estimator	Within IV	Within IV	Within PCSE	Within PCSE	Within AR(1)	Within AR(1)	First Difference Within IV	First Difference Within IV
Expenditure Decentralization	-0.007** (0.002)		-0.029** (0.006)		0.004 (0.003)		-0.010** (0.003)		0.008 (0.010)	
Revenue Decentralization		-0.006* (0.003)		-0.027** (0.007)		0.004 (0.003)		-0.006* (0.003)		-0.005 (0.009)
Sub-national Deficit (% of GDP)	0.015 (0.035)	0.020 (0.035)	-0.543* (0.223)	-0.648* (0.283)	-0.179** (0.034)	-0.179** (0.034)	-0.042 (0.040)	-0.029 (0.041)	-0.232 (0.192)	-0.084 (0.201)
Central Deficit (% of GDP)	0.008* (0.003)	0.008* (0.003)	0.026** (0.006)	0.027** (0.007)	0.011** (0.004)	0.011** (0.004)	0.029** (0.004)	0.032** (0.004)	0.018* (0.008)	0.014+ (0.008)
Log of GDP Per Capita	-0.484** (0.082)	-0.530** (0.077)	0.538* (0.249)	0.400 (0.269)	-0.677** (0.093)	0.653** (0.086)	0.250** (0.055)	0.211** (0.055)	-0.730 (0.597)	0.723 (0.560)
Tax Revenues (% of GDP)	-0.020** (0.004)	-0.019 (0.004)	-0.039** (0.008)	-0.035** (0.008)	-0.008+ (0.004)	-0.009* (0.003)	-0.007 (0.005)	-0.004 (0.005)	0.014* (0.007)	0.016+ (0.008)
Openness to International Trade	-0.001 (0.001)	-0.001 (0.001)	-0.003** (0.001)	-0.003* (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.005** (0.001)	-0.004** (0.001)	-0.008* (0.004)	-0.013** (0.004)
Conflict	0.034 (0.080)	0.044 (0.080)	-0.072 (0.103)	-0.045 (0.109)	0.060 (0.067)	0.057 (0.067)	0.208** (0.081)	0.252** (0.080)	0.051 (0.119)	0.137 (0.132)
Constant	7.072** (0.769)	7.404** (0.744)	-1.947 (2.211)	-0.952 2.420	7.780** (0.860)	7.818** (0.829)	-1.262** (0.100)	-1.194** (0.102)	-0.318+ (0.194)	-0.579** (0.215)
Observations	606	606	606	606	606	606	574	574	168	168
ρ	—	—	—	—	0.80	0.79	0.88	0.87	—	—
R²	0.31	0.31	0.22	0.21	0.50	0.50	0.17	0.16	0.21	0.01

**, *, and + signify the 1%, 5%, and 10% level of significance, respectively. Heteroskedastic-consistent standard errors in the parentheses. PCSE = Prais – Winsten Panel Corrected Standard Errors with common AR(1) process.

Table 3: Fiscal Decentralization and Inflation Developing Country Estimations

	Within Estimator	Within Estimator	Within IV	Within IV	Within PCSE	Within PCSE	Within AR(1)	Within AR(1)	First Difference Within IV	First Difference Within IV
Expenditure Decentralization	0.234** (0.006)		−0.019 (0.018)		0.009 (0.006)		0.025** (0.006)		0.046* (0.029)	
Revenue Decentralization		0.022** (0.006)		0.011 (0.013)		0.010+ (0.006)		0.028** (0.006)		0.063** (0.018)
Sub-national Deficit (% of GDP)	−0.141* (0.076)	−0.181** (0.073)	−2.591 (0.580)	−2.135** (0.500)	−0.203** (0.076)	−0.205** (0.074)	−0.085 (0.083)	−0.080 (0.080)	−0.331 (0.510)	−0.103 (0.515)
Central Deficit (% of GDP)	0.001 (0.003)	0.002 (0.003)	0.010+ (0.006)	0.006 (0.005)	0.002 (0.003)	0.003 (0.003)	0.004+ (0.003)	0.004+ (0.002)	−0.021* (0.010)	−0.022 (0.009)
Log of GDP Per Capita	−0.029 (0.071)	−0.002 (0.075)	−0.142 (0.156)	−0.156 (0.159)	−0.131 (0.084)	−0.110 (0.009)	−0.066 (0.053)	−0.054 (0.053)	−0.427 (0.330)	−0.420 (0.330)
Tax Revenues (% of GDP)	0.037** (0.007)	0.036** (0.007)	0.022* (0.011)	0.019+ (0.010)	0.038** (0.009)	0.037** (0.009)	0.041** (008)	0.041** (0.007)	0.048+ (0.028)	0.058* (0.027)
Openness to International Trade	−0.004* (0.002)	−0.005** (0.002)	−0.001 0.002	0.001 (0.002)	−0.008** (0.002)	−0.008** (0.002)	−0.003 (0.002)	−0.003 (0.002)	−0.015* (0.007)	−0.019** (0.007)
Conflict	−0.039 (0.067)	−0.031 (0.067)	0.123 (0.108)	0.132 (0.097)	0.091 (0.077)	0.092 (0.077)	0.030 (0.080)	0.039 (0.075)	0.415 (0.301)	0.353 (0.293)
Constant	1,808 (0.600)	1.609** (0.634)	2.540* (1.251)	2.391+ (1.244)	2.965 (0.067)	2.786** (0.697)	2.330** (0.203)	2.162** (0.202)	−0.505+ (0.264)	−0.566** (0.249)
Observations	605	605	580	580	605	605	573	573	136	136
ρ	—	—	—	—	0.66	0.66	0.63	0.63	—	—
R²	0.11	0.11	0.12	0.14	0.19	0.19	0.08	0.08	0.12	0.08

**, *, and + signify the 1%, 5%, and 10% level of significance, respectively. Heteroskedastic-consistent standard errors in the parentheses. PCSE = Prais – Winsten Panel Corrected Standard Errors with common AR(1) process.

4.4. Decentralization, Macrostability, and Economic Growth

We now turn to the question of the effect of fiscal decentralization on economic growth, that is, whether the static proposition that fiscal decentralization is efficiency enhancing has a corresponding proposition in the dynamic setting of economic growth. The theoretical model suggests that a direct relationship between decentralization and economic growth is possible, yet the question remains whether the relationship can be empirically substantiated in a fully specified model that controls, among other things, for the indirect effect of fiscal decentralization on economic growth. We now examine whether fiscal decentralization directly affects economic growth and also whether there is an indirect impact on economic growth through the inflation channel.

Drawing on the neoclassical economic growth literature, we specify the base estimation equation for growth in per capita GDP as:

$$\dot{y}_{it} = \beta_1 D_{it} + \beta_2 i_{it}^k + \beta_3 i_{it}^h + \beta_4 P_{it} + \delta' Z_{it} + u_{it} \qquad [8]$$

where D and P are as previously discussed. The fraction of output invested in capital (i^k) is proxied by the ratio of gross domestic savings to GDP [21]. The fraction of output invested in human capital (i^h) proxied by infant mortality. The Z matrix contains a number of control regressors, including openness to international trade, population, democratic governance, tax revenues as a percentage of GDP, and armed conflict.

Following the methodology presented in the previous subsection, we first test for the endogeneity of the regressors [22]. We fail to reject the null hypothesis of exogeneity for fiscal decentralization with respect to growth in per capita GDP, a result that supports the previous findings in the literature. We do, however, reject the null hypothesis of exogeneity for the inflation rate. We again reject the null hypothesis that the regressors and effects are uncorrelated, suggesting that the fixed effects estimator is more appropriate for the task of estimating (8). We also reject the null hypothesis of no serial correlation at the 1 percent significance level.

Our measure of human capital is insignificant, regardless of specification or sample taken. We suspect that this is due to the imperfect means by which we measure human capital. Our choice is thus to either estimate using 5-year averages so we could include other measures (schooling) of human capital or to exclude this variable from the estimations. Given the criticisms in the literature as to the quality of human capital and the potential for bias, we excluded infant mortality from our final estimations. If there is any discernable impact, the fixed effects would capture this unobservable influence.

The empirical results are presented in Tables 4-6. Among the most important empirical findings of this paper is the failure to detect, for the full sample of countries, a consistent statistically significant direct relationship between fiscal decentralization and growth in per capita GDP. While the estimated coefficient for expenditure decentralization is negative, it does not approach any meaningful level of significance in those estimations in which we control for serial correlation. The estimated coefficient for revenue decentralization is also negative but insignificant in the majority of estimations. The inclusion of the control

regressors, to include total population, defense expenditures as a percentage of GDP, openness to international trade, armed conflict, and democratic governance, does not improve the significance of either of the estimated coefficients for fiscal decentralization. We also examined whether a non-monotonic relationship exists between decentralization and growth by including the square of decentralization as an additional variable. The estimated coefficients for the squared decentralization terms were also insignificant. Our findings appear to support those in the literature who have failed to detect a statistically significant *direct* relationship between decentralization and economic growth.

While we fail to observe evidence of a direct relationship between decentralization and growth, we find empirical support for an indirect relationship between decentralization and growth through the inflation channel. As noted in the previous section, expenditure decentralization appears to reduce the rate of inflation in the developed countries in the sample. The results in this section verify that a negative relationship exists between inflation and economic growth for developed countries. Thus, an increase in expenditure decentralization, all else being equal, would appear to reduce the rate of inflation over time and, in turn, indirectly enhance economic growth. The empirical evidence also suggests that, subject to the above caveats on the sample and estimation methodologies, that decentralization may retard economic growth through the inflation channel for the developing and transitional countries in the sample. We believe that this first evidence on the indirect influence of decentralization on growth is intriguing as it supports the contention that decentralization has an indirect effect on economic growth through its impact on inflation.

For the sub-sample of developed countries, we note that there appears to be a negative and statistically significant relationship between fiscal decentralization and growth in per capita GDP for the Within PCSE and Within AR(1) estimations. The estimated coefficients for expenditure and revenue decentralization are statistically significant at the 1 and 10 percent level, respectively. While the estimated coefficients for revenue decentralization are fragile and not statistically significant, the estimated coefficients for expenditure decentralization appear robust to alternative specifications, given our limited number of available control regressors. For the developed countries sub-sample, increases in expenditure decentralization appear to lower economic growth, although the same decentralization measure lowers the rate of inflation, which in turns, increases economic growth. This is an important result in that it suggests *trade-offs* exist when considering decentralization for higher-income countries.

As with the full sample estimations, we fail to detect a statistically significant direct relationship between fiscal decentralization and growth in per capita GDP for the majority of estimations. After controlling for serial correlation, decentralization is negative and statistically significant at the 5% level for only the Within AR(1) estimations. This suggests that, for the sample countries, that the significance of the estimated coefficient is fragile to alternative specifications. As with the full sample of countries, we note that inflation appears to significantly and negatively influence growth in per capita GDP. This result would appear to suggest that decentralization, for the developing countries in the sample, may indirectly affect economic growth through the inflation channel, although this conclusion is not as strong as with the developed country sub-sample.

Table 4: Fiscal Decentralization and Economic Growth
Full Panel Estimations

	Within Estimator	Within Estimator	Within IV	Within IV	Within PCSE	Within PCSE	Within AR(1)	Within AR(1)	First Difference Within IV	First Difference Within IV
Expenditure Decentralization	-0.019** (0.009)		-0.021* (0.009)		-0.008 (0.008)		-0.010 (0.009)		-0.007 (0.112)	
Revenue Decentralization		-0.016+ (0.009)		-0.018+ (0.010)		-0.005 (0.008)		-0.006 (0.009)		-0.004 (0.011)
Gross Domestic Savings (% of GDP)	0.033* (0.157)	0.030+ (0.016)	0.065** (0.024)	0.065** (0.024)	0.031+ (0.016)	0.030+ (0.016)	0.050** (0.016)	0.047** (0.016)	0.018 (0.024)	0.018 (0.024)
Log Inflation	-0.810** (0.087)	-0.809** (0.087)	0.183 (0.491)	0.213 (0.494)	-0.776** (0.087)	-0.775** (0.087)	-0.665** (0.087)	-0.664 (0.087)	-0.209 (0.322)	-0.154 (0.322)
Sub-national Deficit (% of GDP)	-0.121 (0.129)	-0.099 (0.128)	0.208 (0.190)	0.237 (0.190)	0.005 (0.120)	0.022 (0.119)	-0.096 (0.132)	-0.073 (0.132)	0.183 (0.177)	0.205 (0.176)
Central Deficit (% of GDP)	0.003 (0.006)	0.004 (0.006)	-0.014 (0.011)	-0.014 (0.011)	0.009 (0.005)	0.010 (0.006)	0.016** (0.006)	0.016** (0.006)	0.004 (0.009)	0.004 (0.009)
Tax Revenues (% of GDP)	-0.035** (0.012)	-0.036** (0.012)	-0.021 (0.014)	-0.021 (0.014)	-0.028* (0.012)	-0.029** (0.012)	-0.013 (0.012)	-0.016 (0.012)	-0.003 (0.016)	-0.004 (0.016)
Openness to International Trade	0.002 (0.003)	0.003 (0.003)	0.002 (0.003)	0.003 (0.003)	0.003 (0.003)	0.003 (0.003)	0.005 (0.003)	0.006+ (0.003)	0.001 (0.004)	0.001 (0.005)
Conflict	0.675 (0.160)	0.063 (0.161)	-0.197 (0.194)	-0.210 (0.195)	-0.060 (0.165)	-0.060 (0.166)	-0.031 (0.163)	-0.032 (0.164)	-0.261 (0.260)	-0.272 (0.261)
Constant	4.213 (0.604)	4.157 (0.610)	1.740 (1.352)	1.622 (1.363)	3.605** (0.605)	3.547** (0.610)	2.338** (0.348)	2.274 (0.350)	-0.413* (0.200)	-0.415* (0.199)
Observations	1210	1210	1185	1185	1210	1210	1178	1178	691	691
ρ	—	—	—	—	0.44	0.44	0.40	0.40	—	—
R^2	0.11	0.10	0.01	0.01	0.10	0.10	0.10	0.10	0.08	0.07

**, *, and + signify the 1%, 5%, and 10% level of significance, respectively. Heteroskedastic-consistent standard errors in the parentheses. PCSE = Prais – Winsten Panel Corrected Standard Errors with common AR(1) process.

Table 5: Fiscal Decentralization and Economic Growth
Developing Country Estimations

	Within Estimator	Within Estimator	Within IV	Within IV	Within PCSE	Within PCSE	Within AR(1)	Within AR(1)	First Difference Within IV	First Difference Within IV
Expenditure Decentralization	-0.028** (0.008)		-0.015 (0.012)		-0.026** (0.008)		-0.014+ (0.008)		-0.021 (0.030)	-0.007 (0.027)
Revenue Decentralization		-0.018* (0.009)		-0.006 (0.010)		-0.010 (0.008)		-0.003 (0.008)		
Gross Domestic Savings (% of GDP)	0.078** (0.022)	0.067** (0.021)	0.070** (0.023)	0.063** (0.022)	0.128** (0.026)	0.102** (0.024)	0.121** (0.024)	0.105 (0.023)	-0.028 (0.206)	-0.034 (0.183)
Log Inflation	-0.381** (0.129)	-0.326** (0.128)	0.425 (0.491)	0.622 (0.446)	-0.328** (0.116)	-0.295** (0.115)	-0.410** (0.123)	-0.384** (0.122)	4.679 (3.20)	3.978 (3.165)
Sub-national Deficit (% of GDP)	0.080 (0.105)	0.098 (0.107)	0.127 (0.112)	0.150 (0.114)	0.064 (0.116)	0.081 (0.116)	0.047 (0.114)	0.085 (0.115)	0.943 (0.710)	0.782 (0.695)
Central Deficit (% of GDP)	-0.014 (0.011)	-0.008 (0.011)	-0.027+ (0.014)	-0.026+ (0.015)	0.008 (0.013)	0.018 (0.013)	0.025* (0.011)	0.028** (0.011)	-0.031 (0.052)	-0.011 (0.50)
Tax Revenues (% of GDP)	-0.045** (0.014)	-0.041** (0.014)	-0.023 (0.020)	-0.017 (0.018)	-0.007 (0.012)	-0.005 (0.012)	-0.005 (0.013)	-0.005 (0.013)	-0.064 (0.090)	-0.048 (0.088)
Openness to International Trade	0.004 (0.003)	0.006* (0.003)	0.006+ (0.003)	0.007** (0.003)	-0.001 (0.003)	0.002 (0.003)	0.004 (0.004)	0.006 (0.003)	0.048 (0.050)	0.041 (0.047)
Conflict	-0.025 (0.252)	0.004 (0.254)	-0.033 (0.261)	-0.018 (0.266)	-0.057 (0.198)	0.033 (0.199)	0.102 (0.232)	0.016 (0.230)	-0.040 (0.594)	-0.275 (0.544)
Constant	3.462** (0.847)	2.929** (0.835)	1.369 (1.510)	0.634 (1.352)	0.810 (0.780)	0.273 (0.780)	-0.309 (0.216)	-0.641 (0.213)	1.450 (1.291)	1.200 (1.272)
Observations	606	606	606	606	606	606	574	574	168	168
ρ	—	—	—	—	0.79	0.79	0.79	0.79	—	—
R^2	0.10	0.10	0.03	0.01	0.15	0.14	0.08	0.08	0.01	0.01

**, *, and + signify the 1%, 5%, and 10% level of significance, respectively. Heteroskedastic-consistent standard errors in the parentheses. PCSE = Prais – Winsten Panel Corrected Standard Errors with common AR(1) process.

**Table 6: Fiscal Decentralization and Economic Growth
Developed Country Estimations**

	Within Estimator	Within Estimator	Within IV	Within IV	Within PCSE	Within PCSE	Within AR(1)	Within AR(1)	First Difference Within IV	First Difference Within IV
Expenditure Decentralization	−0.020 (0.020)		−0.107* (0.043)		−0.015 (0.018)		−0.037+ (0.021)		−0.064 (0.09)	
Revenue Decentralization		−0.020 (0.019)		−0.102** (0.043)		−0.014 (0.017)		−0.038+ (0.020)		−0.057 (0.119)
Gross Domestic Savings (% of GDP)	0.031 (0.023)	0.029 (0.023)	0.077* (0.033)	0.064* (0.031)	−0.015 (0.024)	−0.016 (0.024)	0.011 (0.023)	0.009 (0.23)	−0.054 (0.065)	0.059 (0.067)
Log Inflation	−1.102** (0.144)	−1.104** (0.144)	0.920 (0.821)	0.787 (0.853)	−0.920** (0.132)	−0.918** (0.132)	−0.793** (0.144)	−0.782** (0.145)	−0.077 (1.590)	−0.136 (1.704)
Sub-national Deficit (% of GDP)	−0.417+ (0.260)	−0.393 (0.247)	0.271 (0.418)	0.416 (0.459)	−0.219 (0.240)	−0.200 (0.231)	−0.612** (0.273)	−0.597* (0.264)	−0.004 (0.845)	0.016 (0.820)
Central Deficit (% of GDP)	0.006 (0.009)	0.006 (0.009)	0.005 (0.011)	0.005 (0.011)	0.021** (0.009)	0.021** (0.009)	0.032** (0.008)	0.032** (0.009)	0.032 (0.034)	0.029 (0.035)
Tax Revenues (% of GDP)	0.001 (0.021)	−0.001 (0.021)	−0.043 (0.031)	−0.040 (0.030)	0.006 (0.024)	0.005 (0.024)	−0.004 (0.023)	−0.006 (0.023)	0.048 (0.083)	0.049 (0.090)
Openness to International Trade	−0.007 (0.006)	−0.007 (0.006)	−0.002 (0.007)	−0.002 (0.007)	−0.003 (0.006)	−0.003 (0.007)	−0.001 (0.007)	−0.001 (0.007)	−0.006 (0.025)	−0.006 (0.029)
Conflict	0.036 (0.228)	(0.228)	−0.180 (0.286)	−0.247 (0.290)	−0.071 (0.249)	−0.076 (0.249)	−0.006 (0.258)	−0.020 (0.257)	0.198 (1.097)	0.177 (1.092)
Constant	4.800** (0.916)	4.854** (0.926)	0.812 (1.914)	1.312 (1.900)	3.953 (0.931)	3.972 (0.941)	4.086** (0.372)	4.169** (0.373)	−0.381 (1.032)	−0.465 (1.089)
Observations	604	604	579	579	604	604	572	572	136	136
ρ	—	—	—	—	0.70	0.70	0.73	0.73	—	—
R²	0.13	0.13	0.04	0.03	0.11	0.11	0.10	0.10	0.03	0.06

**, *, and + signify the 1%, 5%, and 10% level of significance, respectively. Heteroskedastic-consistent standard errors in the parentheses. PCSE = Prais – Winsten Panel Corrected Standard Errors with common AR(1) process.

5. Summary and Conclusions

In this paper we have examined the linkages between fiscal decentralization, inflation, and economic growth and have found support for the hypothesis that decentralization may promote price stability in higher-income countries and detract from price-stability in developing and transitional countries. While it is quite clear that poorly designed or implemented fiscal decentralization policies may create incentives for subnational governments to over-borrow relative to their debt-servicing capacity and potentially lead to macroeconomic instability, it appears that, by allowing governments at different levels to mobilize their own revenues, decentralization ultimately leads to more stable prices in higher-income countries. The mechanism by which this takes place is not well established and it should be investigated in the future. However, an appealing conjecture is that by mobilizing their own tax revenues, local governments put less pressure on the central government budgeting, thus lowering the chances for larger central government deficits and ultimately increases in the money supply and inflation. We must also note that this logic may not be as straightforward in developing and transitional countries, though we caution that our results are limited to the countries and time periods in our sample.

The other significant finding of this paper is that we find no evidence supporting the existence of a direct role for fiscal decentralization in economic growth in the full sample of countries. However, fiscal decentralization appears to directly lower the rate of growth in the sample of developed countries, although this effect is offset to some degree by decentralization's positive indirect influence through the inflation channel. For developing countries, the evidence is not as clear as to whether decentralization directly influences economic growth, though it does appear that decentralization may retard economic growth through the inflation channel.

From the perspective of future research, refining the measures of fiscal decentralization and macroeconomic stability to include measures of unemployment and other dimensions should be the next step of future work. A more complete understanding of the contemporaneous and time-wise causality flows between decentralization, its influences, and economic growth, should also be considered avenues for future research.

Notes

(1) Considerable attention has also been paid to the determinants of fiscal decentralization. For reviews of this literature, see, among others, Oates (1999), Panizza (1999), and Martinez-Vazquez and McNab (2003).

(2) See, for example, Xie, Zou, and Davoodi (1999), Zhang and Zou (1998), Lin and Liu (2000), and Thiessen (2003) for empirical analyses of the relationship between between fiscal decentralization and economic growth.

(3) Bahl and Linn (1992), Prud'homme (1995), Tanzi (1996), and Bahl (1999) have questioned whether or not voting mechanisms and mobility function well enough in developing economies to allow the realization of efficiency gains associated with decentralization.

(4) Marlow (1988) argues that decentralization is negatively associated with government size; Anderson and Van den Berg (1998) fail to detect a statistically significant relationship between decentralization and government

size; Stein (1999) argues that decentralization's may reduce or increase government size, dependent upon the extent of vertical imbalance; Jin and Zou (2002) and Rodden (2003) find that expenditure decentralization and smaller vertical imbalance control government size.

(5) Decentralization is typically measured by the ratio of total subnational government expenditures (revenues) to total government expenditures (revenues) and this measure is bounded between zero and one.

(6) We follow Mankiw, Romer, and Weil (1992) in assuming that the rate of depreciation is uniform across all types of reproducible capital for theoretical simplicity. See Lucas (1988) and Tondl (1999) for alternative approaches to the question of depreciation.

(7) The growth model specified in Equation 1 can be either a Solow-augmented neoclassical growth model with constant returns to scale for all production factors or an endogenous growth model with increasing returns to scale for all production factors. Also, if any combination of the capital inputs exhibits constant returns to scale then (1) would similarly be characterized as an endogenous growth model. Senhadji (1999) notes that a large part of the empirical growth literature supports the assumption of decreasing returns to capital.

(8) While changes in resource endowments (the discovery of new resources or new developments such as a cure for AIDS) may affect short-term capital-labor ratios, these changes would not necessarily affect the steady state capital-labor ratio unless these changes influence capital productivity.

(9) Policies that lead to a permanent increase in the steady state capital-labor ratio cannot lead to long-run per capita growth, unless A is steadily increasing. Since the convergence to the new steady state may take years to occur, fiscal policy can still lead to higher output growth rates for a significant period of time, even though the neoclassical model might imply that these policies would affect only the level of output and not its long-run growth rate (Gerson 1998).

(10) See Ebel and Yilmaz (2002) for a discussion of the pitfalls associated with the conventional measurement of fiscal decentralization. The OECD dataset suggested by Ebel and Yilmaz, however, includes only data for six countries on a period of only three years (1997-1999). Stegarescu (2004) measures of decentralization only focus on OECD members.

(11) This is consistent with previous examinations of fiscal decentralization in the literature.

(12) We did not include those countries that stopped reporting revenue and expenditure information prior to 1990 and those countries whose reported data were mathematically inconsistent. We did include countries that reported zero or minimal expenditures or revenues for at least one subnational level of government.

(13) While some studies of fiscal decentralization have attempted to construct measures of decentralization net of grants and transfers and net of certain types of expenditures, we do not construct such measures, as we are not able to ascertain, with any degree of certainty, whether these techniques reduce or enhance the bias already present in our measures of fiscal decentralization. See, for example, Woller and Phillips (1998) and Lin and Liu (2000).

(14) De la Fuente and Domenech (2000) and Levine and Renelt (1992) note that poor measurement and data quality casts suspicion on the estimated coefficients for human capital variables in growth equations.

(15) A linear approximation, which may merely reflect the time-wise average of the series around the missing data points, is likely to obscure the variability in the series that may arise, in part, due to the influence of fiscal decentralization. Linear approximation may also introduce bias into the series depending upon which observations are used to create the approximations for the missing data points. It is entirely possible that the observations may reflect a period in time in which the structure of the economy is significantly different from other periods in time (during an oil or policy shock, for example).

(16) See Baltagi (2001) for a discussion of the two-way fixed effects error component estimator.

(17) See, among others, Hausman (1978), Hausman and Taylor (1981), and Wooldrige (2002) for a discussion of testing for endogeneity in the presence of an unbalanced panel data set.

(18) We also fail to reject the null hypothesis of exogeneity for openness to international trade, tax revenues as a percentage of GDP, population growth, and Gross Domestic Savings as a percentage of GDP. The test statistics are available upon request.

(19) We employ Breusch and Pagan's Lagrangian Multiplier test and reject the null hypothesis of no correlation at the 1% level.

(20) When specified in levels, the modified Durbin-Watson test statistic for unbalanced panel data is 0.971 while the Baltagi-Wu LBI statistic is 1.596, both rejecting the null hypothesis of no serial correlation at the 1% level.

(21) We would prefer to examine the disaggregated impact of public and private capital, however, the World Bank no longer maintains the gross domestic fixed investment data series for all the countries in the sample and thus we are no longer able to construct the series of interest. We are left with gross domestic savings as a percentage of GDP as a proxy for capital.

(22) The test statistics are available upon request.

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Variable Appendix

Variable	Definition and Source
Revenue Decentralization	Ratio of total subnational government revenues, including grants and transfers, to the sum of government revenues at the subnational and central government level Government Finance Statistics
Expenditure Decentralization	Ratio of total subnational government expenditures, including grants and transfers, to the sum of government expenditures at the subnational and central government level Government Finance Statistics
Subnational Deficit as % of GDP	Authors' Calculations
Central Government Deficit as % of GDP	Authors' Calculations
Gross Domestic Product Per Capita in Constant 2000 U.S. Dollars	World Development Indicators (2005)
Tax Revenues as Percentage of GDP	Authors' Calculations
Openness to International Trade (Exports + Imports as % of GDP)	World Development Indicators (2005)
Armed Conflict	Armed Conflict 1946-2004
Gross Domestic Savings as % of GDP	World Development Indicators (2005)
Infant Mortality per 1,000 live births	International Data Base (2005)

Sample Countries

Country	Observation Period	Country	Observation Period
Albania	1995-1998	Argentina	1978-2001
Australia	1972-2002	Austria	1972-1997, 2000-2002
Azerbaijan	1994-1999	Belarus	1992-2000
Belgium	1978-2002	Bolivia	1986-2003
Brazil	1980-1998	Bulgaria	1988-2003
Canada	1974-2002	Chile	1974-1988, 1992-2003
Costa Rica	1972-1996	Croatia	1994-2001
Czech Republic	1993-2003	Denmark	1977-2003
Dominican Republic	1972-1996	Estonia	1992-2001
Fiji	1974-1993	Finland	1972-2003
France	1972-2002	Georgia	1997-2001
Germany	1972-2003	Hungary	1981-2002
Iceland	1972-2002	India	1974-1999
Indonesia	1975-1998	Ireland	1972-1997
Israel	1974-2002	Italy	1995-2000
Kazakhstan	1997-2003	Kenya	1972-1994
Kyrgyz Republic	1995-2001	Latvia	1994-2003
Lithuania	1991,1993-2003	Luxembourg	1972-2003
Malaysia	1972,1985,1991-2003	Mauritius	1980-1999,2002-2003
Mexico	1972-2000	Moldova	1995-2003
Mongolia	1992-2003	Netherlands	1975-1997, 1999-2002
New Zealand	1992-2002	Norway	1972-2003
Panama	1980-1994	Paraguay	1973-1980, 1984-1993
Peru	1990-2003	Philippines	1978-1992
Poland	1994-2002	Portugal	1975-1976, 1987-2001
Romania	1990-2001	Russia	1994-1995, 1998-2003
Slovak Republic	1996-2003	Slovenia	1992-2003
South Africa	1977-2003	Spain	1972-2002
Sweden	1972-2002	Switzerland	1972-1984, 1991-2001
Tajikistan	1998-2001	Thailand	1972-2003
Ukraine	1999-2001	United Kingdom	1974-2003
United States	1972-2001	Zimbabwe	1976-1991